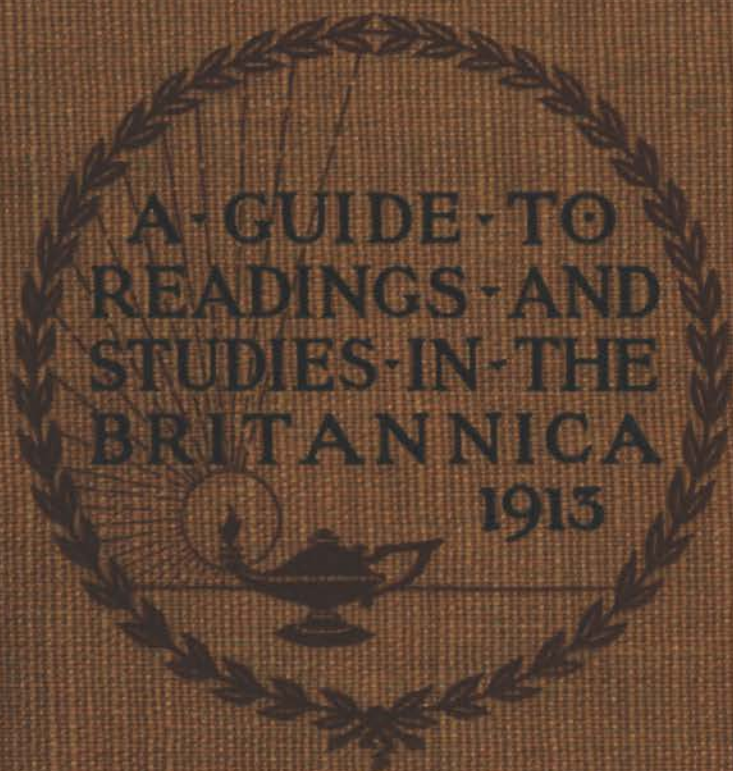


A · GUIDE · TO  
READINGS · AND  
STUDIES · IN · THE  
BRITANNICA  
1913



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**THE READER'S GUIDE**  
**TO THE**  
**ENCYCLOPAEDIA BRITANNICA**

**A HANDBOOK CONTAINING SIXTY-SIX COURSES  
OF SYSTEMATIC STUDY OR OCCASIONAL READING**

**THE ENCYCLOPAEDIA BRITANNICA COMPANY, Limited**  
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## INTRODUCTION

In your ordinary use of the Encyclopaedia Britannica, you give your attention to the *one* article that will answer the *one* question you have in your mind. The aim of this Guide is to enable you to use the Britannica for an altogether different purpose, namely, for systematic study or occasional reading on any subject.

The volumes of the Encyclopaedia Britannica contain forty-four million words—as much matter as 440 books of the ordinary octavo size. And the subjects treated—in other words, the whole sum of human knowledge—may be divided into 289 separate classes, each one completely covering the field of some one art, science, industry or other department of knowledge. By the mere use of scissors and paste the alphabetical arrangement of the articles could be done away with, and the Britannica could be reshaped into 289 different books containing, on the average, about half as much again as an ordinary octavo volume. It would misrepresent the Britannica to say that you would then have 289 *text-books*, because there is an essential difference in tone and purpose. A text-book is really a book intended to be used under the direction and with the assistance of a teacher, who explains it and comments upon it. The Britannica, on the other hand, owes the position it has enjoyed since the first edition appeared in 1768 to the fact that it has succeeded, as no other book has succeeded, in teaching without the interposition of a teacher.

It is not, of course, claimed that the idea of reading certain groups of Britannica articles in the order in which they will combine themselves into complete books is a novel invention. Thousands of men owe the greater part of their educational equipment to a previous edition of the Britannica. And not only did they lay out their own courses of reading without the aid of such a Guide as this, but the material at their disposal was by no means so complete as is the 11th Edition. Every edition of the Britannica before this one, and every other book of comparable size previously published, appeared volume by volume. In the case of the last complete edition before the present, no less than 14 years elapsed between the publication of the first volume and the last. It is obvious that when editors have to deal with one volume at a time, and are unable to deal with the work as a whole, there cannot be that exact fitting of the edges of one article to the edges of another which is so conspicuously a merit of the 11th

Edition. All the articles in this edition were completed before a single volume was printed, and the work stood, at one stage of its preparation, in precisely the form which, as has already been said, might be given to it by merely rearranging the articles according to their subjects.

In this Guide, the principal articles dealing with the subject of each chapter are named in the order in which you may most profitably study them, and the summaries of the larger articles afford such a preliminary survey as may assist you in making your choice among the courses. Besides, where it seems necessary, there is added to the chapter a fairly complete list of all articles in the Britannica on the subject, so that the reader may make his study exhaustive.

A brief review of the six parts into which the Guide is divided will show the general features of its plan, of which a more detailed analysis is given in the Table of Contents.

Part I contains 30 chapters, each designed for readers engaged in, or preparing for, some specific occupation. To the beginner, who still has everything to learn, the advantages derived from such a course of study may well be so great as to make the difference between success and failure in life, and to those who have already overcome the first difficulties, to whom the only question is how marked a success awaits them, the Britannica can render invaluable service of another kind. No amount of technical training and of actual experience will lead a man of sound judgment to believe that he alone knows everything that all his competitors put together know; or that his knowledge and theirs is all that ever will be known. The 1500 contributors in 21 different countries who wrote the articles in the Britannica include the men who have made the latest advances in every department of knowledge, and who can forecast most authoritatively the results to be expected from the new methods which are now being experimentally applied in every field of activity. The experienced merchant, manufacturer, or engineer, or the man who is already firmly established in any other profession or business, will naturally find in some of the articles facts and figures which are not new to him, but he can profit by the opportunity to review, confirm, reconsider and "brush up" his previous knowledge.

Part 2 contains 30 chapters, each devoted to a course of systematic study designed to supplement, or to take the place of, some part of the usual school and college curriculum. The educational articles in the Britannica are the work of 704 professors in 146 universities and



colleges in 21 different countries. No institution of learning in the world has a faculty so numerous, so authoritative, or so highly specialized. Nor has any system of home study ever been devised by which the student is brought into contact with teachers so trustworthy and so stimulating. The fascination of first-hand knowledge and the pleasure of studying pages intended not for reluctant drudges submitting themselves to a routine, but for students eager to make rapid progress, are factors in the educational value of the Britannica that cannot be overestimated, and the elasticity with which any selected course of study can be enlarged and varied is in full accordance with the modern theories of higher education.

Part 3 is devoted to the interests of children. The first of its chapters describes Britannica articles of the utmost practical value to parents, dealing with the care of children's health, with their mental and bodily training, and with the intelligent direction of their pastimes. The second chapter indicates varied readings in the Britannica for children themselves, showing how their work at school can be made more interesting and profitable to them by entertaining reading on subjects allied to those included in their studies. The third chapter in this Part gives a number of specific questions such as children are prone to ask, as well as questions which may be put to them in order to guide their natural inquisitiveness to good purpose. The references to pages in the Britannica show where these questions are clearly and instructively answered.

Part 4 suggests readings on questions of the day which relate to American citizenship and to current politics. A study of the articles indicated in this section of the Guide will aid the reader not only to form sound opinions for himself, but also to exercise in private or public life the influence for good which arises from a clear view of the arguments on both sides of controverted questions. It is no exaggeration to say that the Britannica is the only existing work in which such subjects as tariffs, trusts, immigration, labour and the relation between legislative and judiciary powers are treated without partisan bias and with adequate fulness.

Part 5, especially for women, deals with their legal and political status in various parts of the world, their achievements in scholarship, art and science, as well as with home-making, domestic science and kindred subjects. The important part which women, both among the contributors and on the editorial staff of the Britannica, took in the preparation of the work sufficiently indicates that the editor-in-chief made ample provision for the subjects peculiarly within their sphere.

Part 6 is an analysis of the many departments of the Britannica which relate to recreation and vacations, travel at home and abroad, photography, motoring, outdoor and indoor games and other forms of relaxation and of exercise. The extent to which the work can be used in planning motoring tours, and the superiority, in such a connection, of its articles to the scant information found in ordinary guide books, are shown in the extracts, included in this Part 6, relating to a trip from New York through the Berkshire Hills to the White Mountains.

It will be seen from this brief survey of the field covered by the Guide that provision has been made for every purpose which can dictate the choice of a course of reading. But as you proceed to examine its contents for yourself, you should remember that the lists it gives name only a fraction of the articles in the Britannica, and that for a fuller summary of the work as a whole you should turn to the Table on pp. 881-947 of Vol. 29.

Finally, the form in which this Guide is printed may call for a word of justification. It is inevitable that chapters of an analytical character, bespattered with references to the numbers of volumes and of pages, and terminating with lists of the titles of articles, should bear a certain air of formality. There is no danger that the possessor of the Britannica, familiar with the fascination of its pages and the beauty of the illustrations which enhance their charm would permit his impression of the work itself to be affected by the bleak appearance of the Guide. But he may feel that because a list has a forbidding aspect the pleasure he has derived from browsing at will in the Britannica would give place to a sense of constraint if he rigidly pursued a course of reading. It may easily be shown that such a fear would be groundless, for the Britannica articles are all the better reading when one carries forward the interest which one of them has excited to others of related attraction. But to anyone who is firmly determined that he shall not be persuaded to read systematically, the Guide will none the less be useful, for he may flit from one chapter to another, selecting here and there an article merely because the account which is given of it pleases him. Or, better yet, he may find, in one portion only of a selected course, a series of only three or four articles which will, in combination, make the best of occasional reading.

THE EDITORS.

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# PART I

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COURSES OF READING ESPECIALLY  
USEFUL TO THOSE ENGAGED IN  
CERTAIN OCCUPATIONS OR  
PREPARING FOR THEM





## CHAPTER I

### FOR FARMERS

SEE ALSO CHAPTER II, FOR STOCK-RAISERS, CHAPTER III, FOR DAIRY FARMERS

**E**VERY farmer in the United States knows that farming is today an industry which calls for study of the world's agricultural products, processes, and markets as well as for scientific knowledge of soils, crops, and animals. Fifty years ago the farmer sold for consumption in his immediate neighborhood the small surplus of his crops that was not needed for his own household and live stock. Today he competes, in all the world's great markets, with all the world's farmers, and is the chief among American exporters. The Russian wheat fields and the Argentine cattle ranches are really nearer to him than a farm in the next township was to his grandfather. He lives better, does more for his children and pays higher wages than do farmers in other parts of the world, and yet he can successfully compete with them, because, as the article on Agriculture in the *Encyclopædia Britannica* says, in speaking of the United States, "there is no other considerable country where as much mental activity and alertness has been applied to the cultivation of the soil as to trade and manufactures." American farmers "have been the same kind of men, out of precisely the same houses, generally with the same training, as those who filled the learned professions or who were engaged in manufacturing or commercial pursuits"; and their competitors abroad have been, for the most part, ignorant peasants. The course of reading indicated here is designed for wide-awake farmers who intend to be large

farmers—by whom the latest information and the broadest outlook are recognized as essential to their calling. *If you think the articles named here cover a great deal of ground, remember that the Massachusetts Agricultural College provides no less than sixty-four distinct courses of instruction, and that the subjects included in all the sixty-four are treated in the Britannica.*

#### GETTING "GROUNDWORK" KNOWLEDGE

You may think, as you look at the titles of articles mentioned in these pages, that there are some which you need not read because you have already read bulletins of the United States Department of Agriculture or of your State Experiment Station. These official publications are most valuable, but naturally, they do not attempt to cover the whole range of agricultural subjects as the *Britannica* does—they are not intended for that purpose. Their arrangement and the way in which they are issued shows that they are designed to meet only certain special needs, not to give a general view of all the branches of farming. One subject may for example be discussed in three different bulletins, published in three different years, and the first may be out of print before the third appears. In the *Britannica* you get information that forms the very foundation of a thorough knowledge of farming and that also extends over the widest field. Of course it would be absurd to say that merely reading these articles will make

any man a successful farmer as to say that a medical student who works hard at his books will always develop the tact and the sound judgment that a doctor needs. But unless the medical student has studied those text books he will never make a successful doctor; and similarly the information in the Britannica will give the farmer new advantages, no matter how much practical experience and special training he has had.

There are in the Encyclopædia Britannica 1,186 articles dealing with animal and vegetable life; and among the 11,341 geographical articles

#### Scope of the Articles

a great many give important information about the production, distribution and consumption of farm products. Those upon continents, countries, states and provinces describe the local crops and any local methods of farming that are of special interest. *There are some 600 articles on individual plants*, of which a list will be found on pp. 889 and 890 of Vol. 29 (the index volume). If any one of these thousands of articles were not in the Britannica, it would not be quite so valuable as it is to you, for you may, any day, want to find out about any plant that grows, or about farming in any part of the world. A professor in an agricultural college would of course be glad to study the whole series. But in this Course of Reading only the articles which are of most immediate use to all practical farmers are mentioned, and the contents of each of these is described, so that you can omit any article that goes into details which you think you do not want. If you do skip any of them, it will, however, be a good plan to mark their titles in this list, for you may like to come back to them later when you realize how practical and understandable all the Britannica articles are—even those with dull-sounding names.

Of course you will begin by reading the article AGRICULTURE (Vol. 1, p. 338),

by Dr. Fream and Roland Truslove, which is the key to the whole subject. And remember that this chapter of the Readers' Guide *mentions only those subjects that are treated more fully in other parts of the Britannica than in that article*, so that the chapter does not attempt to tell the whole story.

The first thing a farmer has to deal with is the ground from which his crops are to come. The whole surface of the earth was originally hard

#### Soil and Subsoil

rock. The article on PETROLOGY, the science of rocks (Vol. 21, p. 323), by J. S. Flett, and the second part (Vol. 11, p. 659) of the article GEOLOGY, by Sir Archibald Geikie, deal with the "weathering" of rock, which has in great part broken it down into the small particles of stone that, mixed with decayed roots and plants, form the soil or subsoil. It may seem that it is going very far back into the origin of things for a farmer to read about the sources from which soil comes, but the nature of the mineral substances in it has a great deal to do with its power to nourish plants, and you cannot know too much about the material on which your principal work is done. The article which should next be read, SOIL (Vol. 25, p. 345), continues the story of these particles of rock and shows how sand and clay must be combined with decaying vegetable or animal matter in order to make the best soil. This mixture is in turn "weathered" by air, heat, frost, and moisture; and not only the size of the grains in which it lies, but also their shape—which makes them pack more or less tightly—affect the pores, or spaces between the grains, through which the roots of the plants must push their way, and through which air and water must reach these roots. The article EARTHWORM (Vol. 8, p. 825) describes the useful part that worms play in stirring the mixture, while the natural and artificial fertilizers, which supply

whatever ingredients the soil lacks, are discussed in the article **MANURES AND MANURING** (Vol. 17, p. 610). An important part of this article deals with the best methods of keeping farm yard manure in such a way that it does not lose its value before it is spread over the fields, and with the use, in this connection, of the liquid-manure tank. The microbes in the soil render the farmer an enormous service by changing crude nitrogen, which plants cannot digest, into the forms in which it is indispensable to them, and this process is described in the article **BACTERIOLOGY** (Vol. 3, p. 164), by Professor Marshall Ward, Professor Blackman, and Professor Muir.

The action of light, the supply of which is just as necessary in causing growth as the warmth the sun gives, and the action of water and of heat and cold, are explained in the section "Physiology" (Vol. 21, p. 745) of the article on **PLANTS**. The

**Sunlight and Shade, Heat and Cold, Water Enough—and Not too Much** proper method of working each farm, with a view to using these four in the right proportions, is influenced by the latitude in which it lies, its height above sea level, the protection that mountains give it, the slope at which the fields face the sun or turn away from it, the rain-fall, the relative dampness or dryness of the air when it is not raining, and the moisture of the soil. Every one of these subjects is vital to the farmer, and the Britannica brings to its readers the latest information regarding them in articles written by the leaders of progress. You will find the latest scientific guidance, in the most practical shape, in the articles **CLIMATE** (Vol. 6, p. 509), by Professor R. de C. Ward, of Harvard, **METEOROLOGY** (Vol. 18, p. 264), by Professor Cleveland Abbe, of the United States Weather Bureau, and **ACCLIMATIZATION** (Vol. 1, p. 114). The distribution of

heat in the soil is described in the article **CONDUCTION OF HEAT** (Vol. 6, p. 893), where the diagram showing variations of temperature at different depths in the soil should be carefully studied.

The brackish water that troubles farmers near tidal creeks, the alkali water that often occurs West of the Mississippi, and the stagnant water that never does the farm any good, are all as

**Drainage and Irrigation** bad in their way as the river-floods or the merely sodden soil in which nothing will grow but coarse grass that is always unsafe pasturage. Drains and embankments need very careful planning, and sound information will be found in the articles **DRAINAGE OF LAND** (Vol. 8, p. 471), **RECLAMATION OF LAND** (Vol. 22, p. 954), and **RIVER ENGINEERING** (Vol. 23, p. 374), the latter by Professor L. F. Vernon H. Harcourt, the leading authority on such subjects the world over.

The saving of water and the method of bringing it to the farm and distributing it over the fields are authoritatively discussed in the articles **IRRIGATION** (Vol. 14, p. 841), **WATER SUPPLY** (Vol. 28, p. 387), by G. F. Deacon, **WINDMILL** (Vol. 28, p. 710), **PUMP** (Vol. 22, p. 645), and in the section headed "Utility of Forests" (Vol. 10, p. 646) of the article **FORESTS AND FORESTRY**, by Gifford Pinchot, formerly U. S. Chief Forester. The other parts of this article, dealing with the timber industry, are of course important to farmers whose land includes any lumber. **WATER RIGHTS** (Vol. 28, p. 385) explains the laws which regulate the taking of water from streams and lakes, and the article **LAKE** (Vol. 16, p. 86) is also of interest in connection with irrigation.

When the farmer, who has to be everything by turns, has been an engineer long enough to get the water off his farm or on his farm—and perhaps he has to do both in different parts of the

same farm—he must next take on the builder's job. He will be reminded of a good many precautions and economies that are often overlooked, and may find, too, some hints that are quite new

### Farm Buildings and Fences

to him, in the excellent series of articles, all by experts in the building trade: FARM BUILDINGS (Vol. 10, p. 180), BUILDING (Vol. 4, p. 762), FOUNDATIONS (Vol. 10, p. 738), BRICKWORK (Vol. 4, p. 521), STONE (Vol. 25, p. 958), MASONRY (Vol. 17, p. 841), TIMBER (Vol. 26, p. 978), CARPENTRY (Vol. 5, p. 386), and ROOFS (Vol. 23, p. 697). The use of concrete for buildings, tanks, irrigation works, etc., has proved so successful, and is so rapidly increasing, that you will be especially interested by the article CONCRETE (Vol. 6, p. 835). BARBED WIRE (Vol. 3, p. 384), in which the meshed field fencing, of late increasing in favor, is also dealt with, is another practical article.

Advertisers no doubt supply you with more literature about farm machinery than you find time to read, but that makes it all the more essential to get sound information that has no trade bias. The

### Agricultural Machines

Britannica goes into the principles of construction and helps you to see the good and bad points in the new models you are constantly offered. You can learn a great deal from the articles PLOUGH (Vol. 21, p. 850), HARROW (Vol. 13, p. 27), CULTIVATOR (Vol. 7, p. 618), HOE (Vol. 13, p. 559), and the sections on machines in the articles HAY (Vol. 13, p. 106), REAPING (Vol. 22, p. 944), SOWING (Vol. 25, p. 523) and THRASHING (Vol. 26, p. 887). OIL ENGINE (Vol. 20, p. 35), WATER MOTORS (Vol. 28, p. 382) and TRACTION (Vol. 27, p. 118) are also of importance

Farm horses and the other live-stock required in general farming fall under Chapter II of this Guide.

You cannot read the articles already mentioned, and consider all that has to be done in merely getting a farm ready to be worked, without realizing how grossly unfair it is that the American farmer should

### Farm Finance

be hampered, as he is, by the want of proper banking facilities when he is making a start. And after he has bought and prepared his land and equipped and stocked his farm he needs, each year, money to finance his crops. For any loan used in the purchase of land and in permanent improvements such as buildings, drainage, irrigation, a mortgage is the natural security; but the short-term farm mortgages—five years at most—customary in the United States, do not give the farmer as much time as he needs for repayment, no matter how successful he may be. The average farm offers quite as good a certainty of continued earning power as does the average railroad, and farm mortgages should be—in fairness—regarded not as opportunities for short loans, but as sound standing investments, just as suitable as railroad bonds for conservative investors. The farmer's position is even worse when he needs a short loan that he will be able to repay as soon as his crops have been sold, for he is then expected either to give a mortgage as security or to pay exorbitant interest.

Notwithstanding the prosperous conditions of farming in the United States, the country as a whole produces only half as much grain for every acre of farm land as is produced in Europe, and the only reason is that most of our farmers lack the capital needed in order to get the fullest yield from their land. In the chief European countries, the system of banking facilities for farmers, described in the article CO-OPERATION (Vol. 7, p. 86), by Aneurin Williams, shows what can be done, and sooner or later will be done, in the United States. This article fully describes the admirable



Raiffeisen banks in Germany, which are based upon the idea that a society of farmers (restricted to the neighborhood, so that each member's honesty and capability are known to the other members) make themselves jointly responsible for loans to the members. A promissory note is the only security required. The French, Italian, Austrian, and other systems are also discussed in the *Britannica*, but the German plan is that which offers the best example to America.

This course of reading has now covered the conditions and the material required for farming, and it is time to get down to something that *grows*. In the old books everything about the life of a

plant was treated as a part of the science of botany, and if you remember the botany you were taught at school, you remember a string of long names and very little else. There is of course an article on botany in the *Britannica*, but it deals chiefly with the history of botanical science, and the life of the plant is treated under another heading, and in a novel, interesting, and practical way. The article **PLANTS** (Vol. 21, p. 728) is indeed one of the most important and unusual in the *Encyclopædia*, giving the results of recent investigation which you could not find in any other book. It is written by eight contributors, all men who have done a great deal of original work. The section on classes of plants is by Dr. Rendle, that on the anatomy of plants by A. G. Tansley, that on the healthy life of plants by Professor J. Reynolds Green, that on their diseases by Professor H. Marshall Ward, that on the relation between plants and their surroundings by Dr. C. E. Moss, that on plant cells by Harold Wager, that on the forms and organs of plants by Professor S. H. Vines, and that on the distribution of plants in various parts of the world by Sir. W. Thiselton-Dyer. Special accounts of the chief parts of the plant are

given in the articles **LEAF** (Vol. 16, p. 322), **STEM** (Vol. 25, p. 875), and **ROOT** (Vol. 23, p. 712). The success of artificial fertilization or impregnation is explained (Vol. 13, p. 744) in the article **HORTICULTURE**.

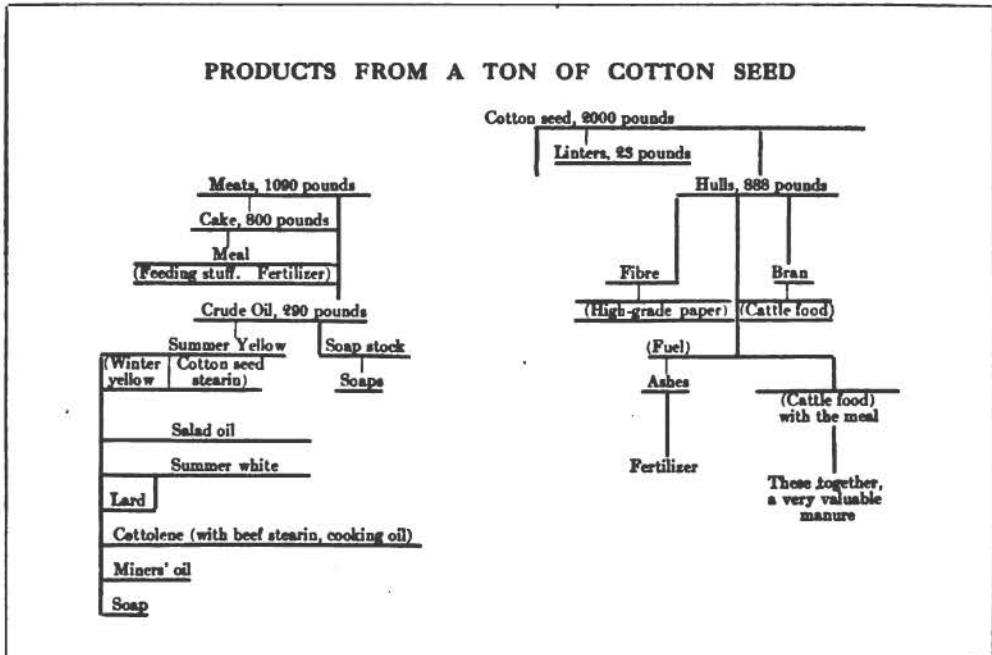
Apart from the diseases described in the section, already mentioned, of the article **PLANTS**, the greatest danger to which crops are exposed is that of insect pests, and the special article **ECONOMIC ENTOMOLOGY**, dealing with them (Vol. 8, p. 896), gives a full account of each of the remedies that have proved useful. The cotton boll weevil is the subject of a most interesting section of the article **COTTON** (Vol. 7, p. 261). Separate articles are devoted to individual pests, such as **LOCUST** (Vol. 16, p. 857), and —turning to a larger enemy—**RABBIT** (Vol. 22, p. 767). There is no bird that troubles the farmer, or helps him by killing insects, upon which there is not an article, for more than 200 distinct bird articles are listed under the heading "Birds" on p. 891 of Vol. 29 (the index volume), in addition to the information in the article **BIRD** (Vol. 3, p. 959), and the article on families of birds (Vol. 20, p. 299).

The crops of all climates are treated in general in the article **AGRICULTURE**, and in particular under their individual names, all of which are so familiar, and indeed so fully listed on p. 889 of Vol. 29 (the index volume), that they need not be repeated here. Naturally you will include in this course of reading the crops with which you are personally concerned, and in any case you ought to read **GRASS AND GRASSLAND** (Vol. 12, p. 367), and **GRASSES** (Vol. 12, p. 369).

The article **WHEAT** (Vol. 28, p. 576) deals with one of the chief products of "the greatest cereal producing region of the world." It begins the story of a wheat crop with the burning of the old straw of the previous year, then takes up ploughing, harrowing,

seeding, thrashing, labor in connection with all these operations, and transportation and marketing. At this point, the article **FLOUR AND FLOUR MANUFACTURE** (Vol. 10, p. 548), by G. F. Zimmer, takes up the later history of wheat. It may surprise you to learn from the Britannica that wheat first found its way to America through a few grains being accidentally mixed with

some rice. **BARLEY** (Vol. 3, p. 405) is an interesting article on the grain that is the oldest cereal food of the human race, and that is also remarkable for its power to grow over a greater range of latitude than any other grain. **COTTON** (Vol. 7, p. 256), by Professor Chapman, is an article of which the vast importance may be judged by the following table taken from page 261:



Every one of the other cereal and general crops produced in any part of the world is treated in the Britannica with the same fullness of information and with the same practical detail which characterizes these articles on wheat, barley and cotton.

Some of the principal articles on the routine of farming such as sowing, reaping, and the like, have already been mentioned in connection with agricultural machinery. The articles on individual countries contain sections on the crops of each of them, and you will find **CANADA** (Vol. 5, p. 152), and **GERMANY**

(Vol. 11, p. 810), of special interest. The special features of tropical farming are described in the articles on tropical crops.

The article **FRUIT AND FLOWER FARMING** (Vol. 11, p. 260) covers fruit culture in general, and, in the section of it which deals with the United States (Vol. 11, p. 268), the American fruit crops. This section describes the wonderful development of the fruit industry since cold transportation and cold storage enabled consumers in every part of the

country, and in Europe as well, to purchase fruit grown in whatever state most advantageously produces any one variety. You should select, from the twenty separate articles on individual fruits, not only those on the varieties which you are already growing, but those on any others that are possible in the part of the country where your land lies. The section on fruit in the article on **HORTICULTURE** (Vol. 13, p. 775) is devoted to growing on a smaller scale, in gardens. It contains (Vol. 13, p. 780) a practical calendar to show each month's work.

Flower culture is the subject of special sections in both the articles above named and there is a descriptive list (Vol. 13, p. 766) of more than three hundred hardy annuals, biennials, and perennials, full of practical information. The calendar already mentioned indicates the dates for indoor and outdoor operations. From the many articles on individual flower plants listed at the end of Part 3 of this chapter you can make your own choice.

Poultry and their rearing are dealt with in the articles **POULTRY AND POULTRY FARMING** (Vol. 22, p. 213), **FOWL** (Vol. 10, p. 760), **Poultry and TURKEY** (Vol. 27, p. 467), **Bees GUINEA FOWL** (Vol. 12, p. 697), **DUCK** (Vol. 8, p. 630), **GOOSE** (Vol. 12, p. 241), and **INCUBATION AND INCUBATORS** (Vol. 14, p. 359). Bee-keeping and the honey industry are treated in the articles **BEE** (Vol. 3, p. 625) and **HONEY** (Vol. 13, p. 653). Truck farming is treated in the section dealing with vegetables (Vol. 13, p. 776), of the article **HORTICULTURE**. Apart from the law as to water rights already mentioned the legal doctrine most particularly affecting farmers is that of **EMBLEMENTS** (Vol. 9, p. 308). **GRAIN TRADE** (Vol. 12, p. 322), and **GRANARIES** (Vol. 12, p. 336), the latter describing the latest type of grain elevators, are articles of great interest to farmers who specialize in cereal crops.

The new system of purchase of grain by the government, which is working admirably in Western Canada, protects the farmer against the speculators who buy standing crops for less than a fair price, and it is to be hoped that some similar plan may be adopted in the United States.

**ECONOMICS** (Vol. 8, p. 899), by Professor Hewins, **CO-OPERATION** (Vol. 7, p. 82), and **TARIFF** (Vol. 26, p. 422), deal with topics related to the marketing of all agricultural products. The articles on learned societies have an extensive section (Vol. 25, p. 317) on the agricultural societies of all countries.

Agricultural history is, naturally, based upon the history of vegetable life, and the fossil plants described in the article

**The History of Farming** **PALÆOBOTANY** (Vol. 20, p. 524), long as their appearance preceded that of man,

greatly affected the nature of the earth's crust which he was to occupy.

The earliest of all known writings, the Code of Khammurabi, described in the article on **Babylonian Law**, shows (Vol. 3, p. 117) that agriculture was the subject of careful legislation under the oldest government of which a contemporary record has survived; and the provisions as to the working of land on the "metayer" system, under which the landowner received from the landholder a share of the crops, and as to irrigation, are most explicit and practical. Ancient Egyptian implements of agriculture are fully described (Vol. 9, p. 69) in the article **EGYPT**, and pictures of them appear on page 72 of the same volume. If the ancient history of farming interests you, it is only necessary for you to turn to the heading "Agriculture," in the Index (Vol. 29), where you will find references to a number of other articles on the early civilizations.

From these articles, as from the historical section of the guiding article **AGRICULTURE**, and the passages relating

to agriculture in many of the 6,292 articles on the histories of races and countries, the reader may learn that agriculture has been the key to all history. The earliest migrations of the human race, as definitely as the comparatively recent development of America, Australasia and the interior of Africa, were based upon an agricultural impetus. And his reading upon other subjects in the Encyclopædia Britannica will often remind him that the wool and cotton and linen and leather that we wear, the carpets and blankets and sheets in our houses, all originated in farming of one kind or another; while every food that nourishes us, save fish and game, is directly an agricultural product. All the bustle of the great cities, all the wheels that turn in the mills, all the intricate mechanism of industry and commerce, all the world's work and thought and happiness, depend upon the mysterious and inimitable processes by which the brown soil yields green growth. For all the progress science has made, we are no nearer to replacing these processes by any short cut of chemistry than were the first farmers whose husbandry is recorded in history. If all the little roots ceased for one year to do their work in the dark, the

human race would hopelessly starve to death.

The alphabetical list of articles at the end of Chapter III of this Guide will make it easy for you to add to this course of reading, choosing for yourself the line that will be most attractive to you. In making your choice, do not forget that plant-life is a subject you cannot study too closely. No matter what crop you make your specialty, you have to *educate* the plants that produce it to do their work, just as carefully as a teacher trains children. Another fact to keep in mind is that just as a doctor is dealing with organs in the human body which he cannot see, so you are particularly concerned with the roots down in the soil, and the more you know about the way they eat and drink, the better for your farm.

The names of many of the writers of these articles are given in the table of the 1,500 Contributors to the Britannica, beginning at page 949 of Vol. 29 (the index volume); a glance will show you what authoritative positions they occupy and how thoroughly they command your confidence.

[See list of articles on subjects connected with farming, at the end of Chapter III of this Guide.]

## CHAPTER II

### FOR STOCK-RAISERS

**S**TOCK-RAISING in the United States was, until quite recent years, under the evil influence of the careless methods which had been handed down from the old days of the range-cattle industry. Chicago men still tell the story of the Chicago banker, afterwards Secretary of the Treasury, who declared, in reply to a request for a loan on the security of range-cattle, that he "would as soon lend money on a shoal of mackerel in the Atlantic Ocean."

The vague possession and the vague methods of breeding and marketing which suggested this comparison did not form the habits of close observation and incessant care which became necessary when land and food began to cost money. The lesson has been learned, and the present conditions of the industry are infinitely better for the country at large. It has been proved that fattening as well as breeding can be successfully undertaken in almost every part of the United



States. Even in the North West, the tendency today is to turn from exclusive grain growing to a combination of cropping and feeding. Cattle, and also work horses of the right type, for which the demand is always greater than the supply, are yielding fair profits on many of the New England farms which had been neglected for years.

One of the most encouraging features of the present situation is that the broader distribution of the livestock

### Staying on the Land

industry encourages farm-bred boys to remain at home. It has long been a popular belief that the attraction of the cities lies largely in the facilities for amusement which they offer; but the best class of young men who have left the farms have done so because they did not believe that plowing and sowing and reaping gave enough scope for their intelligence and their initiative. When stock-raising is combined with tillage, there is not only a greater interest in farm life and a greater chance to make general knowledge effective, but there are also better opportunities for a young man to make a small venture of his own while he is still a farm hand. It is certainly true that stock-raising needs the young man who is determined to know something about everything and all there is to know about one thing. To him the articles in the Britannica which are indicated in this chapter should be of the greatest value, for they cover a broad range, and they are written by specialists of the highest authority. They do not profess to teach what can only be learnt in the course of practical experience, but they will make each day's work more interesting and more effective.

You cannot do better than to begin your reading with the article (Vol. 4, p. 337) on the family of animals to which cattle belong, a family so varied that it includes so small a creature as the hare, and so large a one as the

rhinoceros. The article **CATTLE** (Vol. 5, p. 359), by Professor Wallace and Dr. Fream, begins by reminding you that the idea of cattle owning has always been so closely associated with the idea of wealth that the two words "capital" and "cattle" have the same root, and that our word "pecuniary" is taken from the Latin term for cattle. This article, illustrated with photographs of the best specimens of bulls and cows of different breeds, deals with Shorthorns, Herefords, Devons, Holsteins, Dutch Belteds, Sussexes, Longhorns, Aberdeen-Angus, Red Polleds, Galloways, Highlands, Kerry's, Dexters, Jerseys and Guernseys, and has a section on the rearing of calves. **Ox** (Vol. 20, p. 398) is chiefly about the origin of domestic cattle. **AGRICULTURE** (Vol. 1, p. 388) contains information of a more general kind as to practical stock-raising. The best methods of mating are described fully in **BREEDS and BREEDING** (Vol. 4, p. 487), **VARIATION and SELECTION** (Vol. 27, p. 906), and **HEREDITY** (Vol. 13, p. 350), by Dr. Chalmers Mitchell. **MENDELISM** (Vol. 18, p. 115) will tell you all about the theory which is nowadays the great subject of discussion among experts in breeding. **EMBRYOLOGY** (Vol. 9, p. 314), by Dr. Hans Driesch, and **REPRODUCTION** (Vol. 23, p. 116), by Professor Vines, contain the results of the latest investigations, and the article **SEX** (Vol. 24, p. 747) describes the recent experiments undertaken with the hope that breeders may at some future time be enabled to vary at will the proportion of males and females. **TELEGONY** (Vol. 26, p. 509) gives you the evidence for and against the belief that offspring are influenced by a previous mate of the dam. **FOOD PRESERVATION** (Vol. 10, p. 612) and **REFRIGERATING** (Vol. 23, p. 30) cover the cold shipping and cold storage of beef. **LEATHER** (Vol. 16, p. 330), by Dr. J. G. Parker, one of the foremost

technical experts on this subject, follows hides through the market to their final distribution and industrial uses.

Notwithstanding the harm that trolley cars and automobiles and mechanically propelled agricultural machines have

### Horses and Mules

done to important branches of the horse business, and notwithstanding the competition which American exporters find in Europe from the Argentine ranches, there is still an active market for farm horses and for stock suited to trucking and light delivery work in cities. You no doubt find, in whatever part of the United States your interests lie, that you need to watch the market very closely, and that you must always be ready to change your plans at short notice. But it is to the quick-witted man who is always prepared to vary his methods that the Britannica offers the greatest practical services. The article on the horse family in general (Vol. 9, p. 720) is very interesting, but you will give more time to the elaborate article HORSE (Vol. 13, p. 712), by Richard Lyddeker, E. D. Brickwood, Sir William Flower, and Professor Wallace. The illustrations are unusually valuable, for instead of following the usual custom of making all the photographs the same size, the Editors of the Britannica showed good sense and originality by making each one to scale. The breeds are separately described, and the sections on feeding and breaking are full of useful hints. The history of the thoroughbred strain is carefully traced, the pedigree of one famous type being shown in a table naming more than one hundred ancestors. The article HORSE-RACING (Vol. 13, p. 726), by Alfred Watson, shows how the sport has influenced breeding, and the description of American trotting goes back to the day when "Boston Blue," in 1818, trotted a mile in three minutes, "a feat deemed impossible" at that period! The English race meetings, in

which American owners and jockeys now play so conspicuous a part, are described in special sections, as well as the training at Newmarket. RIDING (Vol. 23, p. 317), and DRIVING (Vol. 8, p. 585), are by practical experts, and TRACTION (Vol. 27, p. 118) contains an interesting table analyzing the draft power of the horse. The section on Arab horses in the article ARABIA (Vol. 2, p. 261) should be read, for it adds to the information, in the articles already named, on the breed that has influenced every variety of horse. MULE (Vol. 18, p. 959) will tell you about the varieties not only in the United States and Mexico, but also in France, Spain, Portugal, Italy, Asia Minor, Syria, Egypt, Algeria and North China. The section on Hybrids (Vol. 13, p. 713) of the article HORSE deals with all the attempts that have been made to get a perfect type of mule by introducing various strains of blood.

SHEEP (Vol. 24, p. 817) contains separate descriptions of the 28 best breeds, discussing their values both for wool and for the meat trade. **Sheep and the Wool Market** Breeding, feeding, dipping and lambing are fully

treated. Sheepdogs and other breeds useful to the stock-raiser fall under the article DOG (Vol. 8, p. 374). WOOL (Vol. 28, p. 805), by Professor Aldred Barker, is an article in which you will at once be impressed by the splendid thoroughness that is characteristic of the Britannica. It goes to the very foundation of the subject by giving you microscopic photographs, on a scale of 320 to 1, of each of the six great varieties of wool, and explaining the structure of the fibres. The article FIBRES (Vol. 10, p. 309) will enable you to compare another microscopic photograph of wool fibre with similar pictures of silk, flax, cotton, jute, and other textile materials. The article wool deals next with wool-yolk and wool-fat, and then goes on to show why greasy wool is better than

wool washed before shearing. Wool classing and sorting are next described, and then scouring. From this point the treatment of wool hardly comes within the jurisdiction of the sheep-man, although he cannot know too much about the qualities of the yarns obtained from different kinds of wool. It is interesting to note in this article that the first fulling mill in America was built at Rowley, Mass., in 1643, only thirty-four years after the first sheep was brought to America, and only twenty-three years after the Pilgrims landed on Plymouth Rock.

The article SWINE (Vol. 26, p. 236) deals with the swine family in general, and the article PIG (Vol. 21, p. 594), containing a fine full-

**Pigs and Pork** page plate, gives a detailed account of the breeds most profitable on the farm, including the Poland-China, the Berkshire, the Duroc, and the Chester White. Eleven breeds in all are particularized. The breeding and fattening of hogs, although it is now successfully followed as a distinct branch of the live-stock industry, must always remain in great part a mere branch of general farming; for the pig's power of thriving on many kinds of food, enables the farmer to utilize produce that cannot advantageously be shipped, and to keep his pigs following his cattle over the fields. Much information will be found all through the article AGRICULTURE (Vol. 1, p. 388). TRICHINOSIS (Vol. 27, p. 266) deals with a disease that has sometimes seriously affected the pork market, and been made the excuse, too, for some very harsh restrictions on American exportation.

You will find in the Britannica (Vol. 28, p. 6) a very full and clear account of the diseases of all domestic animals, by Dr. Fleming and Professor McQueen, with special sections on the maladies of the horse, of cattle, of sheep, and of pigs, and on the parasites that infest

**Diseases and Parasites of Live-stock**

them. TUBERCULOSIS (Vol. 27, p. 354) calls for special study, for it is a "disease of civilization" almost unknown among wild animals in their natural state and among the uncivilized races of mankind. The connection between the disease in cattle and its spread among human beings is fully explained in this article. PLEURO PNEUMONIA (Vol. 21, p. 838) deals with the lung disease from which cattle are the only sufferers, RINDERPEST (Vol. 23, p. 348), with the infectious fever which affects both cattle and sheep, and ANTHRAX (Vol. 2, p. 106), with the terribly infectious carbuncles communicated from cattle and sheep to man by the microbes carried in wool and hides. GLANDERS (Vol. 12, p. 76) describes the form in which this disease of horses and mules afflicts human beings, the symptoms and course of which, in the animals themselves, fall under the subject of horse diseases (Vol. 28, p. 8). The microbe by which this disease is carried is shown in the plate facing one of the pages (Vol. 20, p. 770) of the article PARASITIC DISEASES. FOOT AND MOUTH DISEASE (Vol. 10, p. 617) afflicts cattle, sheep, and pigs, and occasionally human beings.

Among the articles on continents and countries which contain special information on stock-raising, you should not miss the interesting general review of the European live-stock industry in the article EUROPE (Vol. 9, p. 914), the section on live-stock in CANADA (Vol. 5, p. 153), that in ARGENTINA (Vol. 2, p. 465), in AUSTRALIA (Vol. 2, p. 950), and in NEW ZEALAND (Vol. 19, p. 627). The history of stock-raising is fully treated at the beginning of the article AGRICULTURE (Vol. 1, p. 388).

When you have read the articles mentioned in the three parts of this chapter on Farming, do not turn away with the idea that you have got from the

### How to "Even Up"

\*Britannica all that it can give you to help you in your business. Remember that you have to judge men, as well as live-stock, in order to succeed, and that general knowledge is of the greatest use in doing that. The one sure sign of the kind of man you cannot rely upon is that he talks confidently about subjects of which he really knows little, and the more you yourself know, the more readily you can detect the pretentious people who might make you think too well of them.

If you turn over the pages of this guide, and ask yourself, as you glance at the chapters, in what departments of general knowledge you are weakest, you will see what courses of reading will do most to make you an "evened up" man,

without any weak threads in your intellectual texture. And, whatever you read, do not forget that the Britannica is a book of reference as well as for reading: that you are debasing your mind every time you leave unanswered any question that comes up in the course of the day's work or talk, or while you are reading your newspaper. A vigorous mind wants an answer whenever it becomes conscious of a question or of a doubt, and if you fail to feed it with the information it asks for, it loses health. Now that you have the Britannica, the food is in the store-room, do not leave it there!

[See list of articles on subjects connected with stock-raising and other branches of farming, at the end of Chapter III of this Guide.]

## CHAPTER III

### FOR DAIRY FARMERS

SEE ALSO CHAPTER I, FOR FARMERS, AND CHAPTER II, FOR STOCK-RAISERS

**T**HE admirable set of rules for dairy farmers issued by the United States Department of Agriculture begins by telling you to "read current literature and keep posted on new ideas." And you can easily see that the information on dairy-farming and the many subjects connected with it, supplied by the Britannica, must cover a much broader field of new ideas than can be included in any periodical or dairying manual. The branches of science in which the greatest advance has been made since the beginning of the present century happen to be those that have most to do with dairying; and the industry itself has been completely revolutionized since the days when cities got their milk from ramshackle cow-sheds in their suburbs, and

when butter-making was regarded as one of the "chores" to be done at odd times.

The key article in the Britannica, DAIRY AND DAIRY FARMING (Vol. 7, p. 737), deals with the best milking breeds, the installation, equipment, and management of a dairy farm, the values of various kinds of pasturage and fodder; with the milk trade, with butter-making and cheese-making, with condensed milk, skim milk, and milk powder and with the organization and operation of creameries, cheeseries, and dairy factories in general. Such subjects as soil, grass, hay and other fodder crops fall under Part I of this chapter, and the articles dealing with the breeding and rearing of dairy cattle are mentioned in Part II, "For Stock-Raisers."



Cattle diseases in general are also covered by the course of reading suggested in Part II; but the dairy farmer

### Dairy-Herd Diseases

has a special interest in contagious mammitis, milk fever, contagious

abortion, and cowpox, all of which are described (Vol. 28, p. 10) in the article on VETERINARY SCIENCE. You cannot study too carefully the article on TUBERCULOSIS (Vol. 27, p. 354), for this terrible infection is not only a standing danger to your herd, but also affects the transportation and marketing of milk. Dr. Hennessy, who wrote the article, is an expert of the first rank and, like most other great authorities, is not inclined to encourage the popular exaggeration of the dangers for which newspaper "sensations" are responsible.

You get to the very foundation of the supply of milk in Professor Parson's and Dr. Edmund Owen's article MAMMARY

### Milk and the Milk Market

GLAND (Vol. 17, p. 528), in which the comparative anatomy of the milk yield-

ing organ is fully treated. The article MILK (Vol. 18, p. 451) discusses the chemistry of many kinds of milk and the diseases carried by milk, and deals with the gravest problems of the industry: the difficulty of sterilizing milk, so that tuberculosis and typhoid cannot be carried by it, and the difficulty of sterilizing cream, so that butter may be quite safe, without making the milk less nutritious and the butter less delicate in flavor. The article BACTERIOLOGY (Vol. 3, p. 156), by Professor H. Marshall Ward and Professor Blackman, goes to the root of this whole question of infection. Milk is, on the other hand, used to convey into the human system the "friendly microbes," and the use of soured milk and cheese for this purpose is explained in the articles THERAPEUTICS (Vol. 26, p. 800) and LONGEVITY (Vol. 16, p. 977), which deal with Metch-

nikoff's system of treatment. PEPSIN (Vol. 21, p. 130) describes the process by which milk is rendered more digestible, and INFANCY (Vol. 14, p. 513) deals with the preparation of milk to be sold for the use of young children. There is so general a demand for prepared milk which is from every point of view wholesome that you will find it worth while to read, in this connection, FOOD (Vol. 10, p. 611), NUTRITION (Vol. 19, p. 920) and DIETETICS (Vol. 8, p. 214).

BUTTER (Vol. 4, p. 889,) and CHEESE (Vol. 6, p. 22) are brief articles which you should not overlook, although they

### Products and Marketing

refer you to the key article on dairying for details; and OILS contains (Vol. 20,

p. 47) an interesting analytical table in which butter is compared with other animal fats. FOOD PRESERVATION (Vol. 10, p. 612) deals with the cold storage of butter, cheese, condensed milk and milk powder; and REFRIGERATING (Vol. 23, p. 30) with the processes and machinery employed. KOUMISS (Vol. 15, p. 920) describes the milk-wine or milk-brandy prepared by fermenting mare's milk, and the similar product "kerif" made from cow's milk. Although the special developments of dairying in various parts of the world are discussed in the article DAIRY AND DAIRY-FARMING, the articles on individual countries also contain information of value. The section on dairying (Vol. 5, p. 154) in the article CANADA, and the account of co-operative dairying (Vol. 7, p. 87) in Denmark should not be overlooked.

In reading these articles in Britannica, and thinking of the present conditions of this great business, you will be reminded that dairying is an industry of peculiar importance to the whole people of the United States, not only because of the money made out of it, and not only because it gives hundreds of thousands of men employment on the land instead of in crowded cities, but also because it

promises to develop the co-operative action which harmonizes with the best ideals of democracy. The co-operative plants which are beginning to be established by dairy farmers are the only institutions our modern civilization has created in which you find the neighborly spirit that the first American settlers showed in the days when they joined to defend themselves against the Indians. At political meetings, in machine shops and cotton mills and shoe factories, you hear unhappy talk about the relations of capital and labor, about strikes and trusts, about the man on top and the man underneath. But where the farmer's wagons clatter up to the

separator platform, there is combination in the best sense of the word. The Britannica article on co-operation says that the word "in its widest usage, means the creed that life may best be ordered not by the competition of individuals, where each seeks the interest of himself and his family, but by mutual help, by each individual consciously striving for the good of the social body of which he forms part, and the social body in return caring for each individual; 'each for all, and all for each' is its accepted motto. Thus it proposes to replace among rational and moral things the struggle for existence by voluntary combination for life."

#### ALPHABETICAL LIST OF ARTICLES IN THE BRITANNICA ON SUBJECTS CONNECTED WITH FARMING, STOCK-RAISING AND DAIRYING

(The more important articles have already been mentioned in the preceding pages, but the following list includes many others in which valuable information will be found.)

|                      |               |                |                     |                  |
|----------------------|---------------|----------------|---------------------|------------------|
| Aal                  | Amaryllis     | Auricula       | Bottle-brush plants | Camellia         |
| Aaron's Rod          | Amentiferae   | Autogamy       | Bouvardia           | Campanula        |
| Abaca                | Ammoniacum    | Auxanometer    | Boxwood             | Candytuft        |
| Abutilon             | Ampelopsis    | Averruncator   | Bracket-fungi       | Cane             |
| Acacia               | Anatto        | Avocado Pear   | Bramble             | Cannon-ball Tree |
| Acanthus             | Anemone       | Axile or Axial | Bran                | Capers           |
| Acaulescent          | Angelica      | Azalea         | Brazil Nuts         | Caprifoliaceae   |
| Acerose              | Angiosperms   | Bael Fruit     | Brazil Wood         | Capsule          |
| Achimenes            | Angulate      | Balm           | Bread-fruit         | Caraway          |
| Acinus               | Anise         | Bamboo         | Breed and Breed-    | Cardamon         |
| Acorn                | Anise         | Banana         | ing                 | Cardoon          |
| Acorus Calamus       | Antirrhinum   | Baneberry      | Bromeliaceae        | Carnation        |
| Acotyledones         | Apiculture    | Banksia        | Brooklime           | Carrageen        |
| Acrogene             | Apple         | Baobab         | Broom               | Carrot           |
| Adonis               | Apricot       | Barberry       | Broom-rape          | Caryophyllaceae  |
| African Lily         | Araucaria     | Barley         | Bryophyta           | Cashew Nut       |
| Agave                | Arbor Day     | Bdellium       | Buchu               | Cassava          |
| Agrimony             | Arbor Vitae   | Bean           | Buck-bean           | Cassia           |
| Ailanthus            | Arboretum     | Bee            | Buckthorn           | Casuarina        |
| Alburnum             | Arboriculture | Beech          | Buckwheat           | Catalpa          |
| Alder                | Archil        | Beet           | Bulrush             | Cataphyll        |
| Aleurites            | Aristolochia  | Begonia        | Bur, or Burr        | Catha            |
| Alexanders           | Aroideae      | Benzoin        | Burnet              | Cattle           |
| Algae                | Arrowroot     | Betel-nut      | Buttercup           | Cayenne Pepper   |
| Algum or Almug       | Artichoke     | Bilberry       | Butter-nut          | Ceanothus        |
| Alismaceae           | Ascus         | Birch          | Butterwort          | Cecropia         |
| Allamanda            | Ash           | Bird's Eye     | Cabbage             | Cedar            |
| Alliaria Officinalis | Asparagus     | Blackberry     | Cactus              | Celandine        |
| Allium               | Aspen         | Bladder-wort   | Caducous            | Celery           |
| Almond               | Ashpodel      | Boletus        | Caespitose          | Centaurea        |
| Aloe                 | Aspidistra    | Boll           | Calabash            | Centauray        |
| Amadou               | Aster         | Borage         | Calabash Tree       | Chantarelle      |
| Amanita              | Aubergine     | Boraginaceae   | Calceolaria         | Chenopodium      |
| Amaranth             | Aucuba        | Botryis        | Calf                | Cherry           |

|                  |                 |                    |                   |                    |
|------------------|-----------------|--------------------|-------------------|--------------------|
| Chestnut         | Dairy & Dairy   | Forests & For-     | Heath             | Lancewood          |
| Chicory          | Farming         | estry              | Hedges and Fences | Larch              |
| Chive            | Dahlia          | Forget-me-not      | Heifer            | Larkspur           |
| Chlorosis        | Daisy           | Fork               | Heliotrope        | Lattice Leaf Plant |
| Chrysanthemum    | Dame's Violet   | Foxglove           | Hellebore         | Laurel             |
| Churn            | Dammar          | Freesia            | Hemlock           | Laurustinæ         |
| Cicely           | Dandelion       | Fritillary         | Hemp              | Lavender           |
| Cimicifuga       | Daphne          | Frog-bit           | Hen               | Leaf               |
| Cinchona         | Darlingtonia    | Fruit              | Henbane           | Leek               |
| Cineraria        | Date Palm       | Fruit & Flower     | Henna             | Leguminosæ         |
| Cinnamon         | Deciduous       | Farming            | Herb              | Lemon              |
| Citron           | Dewberry        | Fuchsia            | Herbarium         | Lentil             |
| Cleavers         | Diatomacæ       | Fumitory           | Hickory           | Lettuce            |
| Clematis         | Dicotyledons    | Fungi              | Hippeastrum       | Lichens            |
| Climbing Fern    | Dictyogens      | Funkia             | Hoe               | Lilac or Pipe Tree |
| Cloudberry       | Dividivi        | Furze              | Holly             | Liliacæ            |
| Clover           | Dock            | Fustic             | Hollyhock         | Lily               |
| Cloves           | Dodder          | Gale               | Honey             | Lime or Linden     |
| Cocoa, or Cuca   | Dogwood         | Galls              | Honey Locust      | Liquidambar        |
| Cocculus Indicus | Dracena         | Gardenia           | Honeysuckle       | Litchi             |
| Cock's-comb      | Dragons Blood   | Garlic             | Hop               | Lobelia            |
| Cocoa            | Drainage        | Genista            | Horehound         | Loco-weeds         |
| Coco de Mer      | Dropwort        | Gentian            | Hornbeam          | Locust             |
| Coco-nut Palm    | Duck            | Gentianacæ         | Horse             | Loosestrife        |
| Codisæum         | Duckweed        | Geoponicæ          | Horseradish       | Loquat             |
| Coffee           | Dulse           | Geraniacæ          | Horsetail         | Lotus              |
| Colchicum        | Duramen         | Geranium           | Horticulture      | Lucerne            |
| Coleus           | Durian          | Geum               | Houseleek         | Lupine             |
| Colleter         | Durra           | Gillyflower        | Huckleberry       | Lycopodium         |
| Colocynth        | Earth-nut       | Ginger             | Humus             | Madder             |
| Colt's-foot      | Earth-star      | Gladiolus          | Huon Pine         | Magnolia           |
| Columbine        | Ebony           | Glasswort          | Hyacinth          | Mahogany           |
| Compass plant    | Economic Ento-  | Glaucous           | Hydrangea         | Maidenhair         |
| Compositæ        | mology          | Gloriosa           | Hydrocharidæ      | Maize              |
| Convolvulacæ     | Edelweiss       | Gloxinia           | Hyssop            | Mallow             |
| Copaiba          | Eglantine       | Goat               | Ice-plant         | Malvacæ            |
| Copal            | Elder           | Golden Rod         | Iceland Moss      | Mammee Apple       |
| Coppice          | Elecampine      | Goose              | Idioblast         | Mandrake           |
| Coriander        | Elephant's foot | Gooseberry         | Immortelle        | Mangel-wurzel      |
| Cork             | Elm             | Goose Grass        | Impatiens         | Mango              |
| Corn             | Endive          | Gorse              | India Hemp        | Mangosteen         |
| Corn - salad or  | Ensilage        | Gourd              | Indian Corn       | Mangrove           |
| Lamb's Lettuce   | Entada          | Graft              | Insectivorous     | Manila Hemp        |
| Correa           | Ericacæ         | Grains of Paradise | Plants            | Manna              |
| Cotoneaster      | Espalier        | Gram or Chick-pea  | Iridacæ           | Manures            |
| Cotton           | Esparto         | Granadilla         | Iris              | Maple              |
| Cow-tree         | Eucharis        | Grass and Grass-   | Irish Moss        | Marcascent         |
| Cranberry        | Eunonymus       | land               | Iron-wood         | Mare's-tail        |
| Crassulacæ       | Euphorbia       | Grass of Parnassus | Ivy               | Marguerite         |
| Crazy Weed       | Euphorbiacæ     | Grasses            | Jarra Wood        | Marigold           |
| Cress            | Evergreen       | Greenheart         | Jasmine           | Marjoram           |
| Crinum           | Everlasting     | Ground Nut         | Jew's Ears        | Mastic             |
| Crocus           | Fairy Ring      | Groundsel          | Job's Tears       | Mate               |
| Crowberry        | Fallow          | Guano              | Judas Tree        | Mattock            |
| Cruciferæ        | Farm            | Guava              | Jujube            | Medlar             |
| Cryptomeria      | Farm Buildings  | Guelder Rose       | Juncacæ           | Melon              |
| Cucumber         | Fennel          | Gulfweed           | Juniper           | Meristem           |
| Cucurbitacæ      | Fenugreek       | Gum                | Jute              | Mesquite           |
| Cumin or Cummin  | Fern            | Gumbo              | Kaffir Bread      | Merino             |
| Cupulliferæ      | Fig             | Gutta Percha       | Kauri Pine        | Mignonette         |
| Cultivator       | Filmy Ferns     | Gymnosperms        | Kerguelen's       | Mildew             |
| Currant          | Finger-and-toe  | Hacienda           | Cabbage           | Milkwort           |
| Custard Apple    | Fir             | Hackberry          | Kumquat           | Millet             |
| Cyclamen         | Flail           | Harebell           | Labiatæ           | Mimosa             |
| Cyperacæ         | Flax            | Harrow             | Labrador Tea      | Mimulus            |
| Cypress          | Flower          | Hawthorn           | Laburnum          | Mint               |
| Cystolith        | Fool's Parsley  | Hay                | Lac               | Mistletoe          |
| Daffodil         | Forage          | Hazel              | Lace-bark Tree    | Moly               |

|                   |                   |                    |               |                  |
|-------------------|-------------------|--------------------|---------------|------------------|
| Momordica         | Pellitory         | Ranunculaceæ       | Sesame        | Tomato           |
| Moonseed          | Pennyroyal        | Rape               | Shaddock      | Tonqua Bean      |
| Moon-wort         | Pentstemon        | Raspberry          | Shallot       | Toothwart        |
| Moraceæ           | Pepper            | Reaping            | Sheep         | Topiary          |
| Moretton          | Peppermint        | Reed               | Sisal Hemp    | Traveller's Tree |
| Chestnut          | Pepper Tree       | Rhododendron       | Skirret       | Tree             |
| Mucuna            | Persimmon         | Rice               | Snake-root    | Tree-fern        |
| Mulberry          | Petunia           | Richardia          | Snapdragon    | Trowel           |
| Mushroom          | Phlox             | Robinia            | Snowdrop      | Truffle          |
| Mustard           | Phormium          | Rocambole          | Soap-bark     | Tuberose         |
| Myrobalans        | Pig               | Roller             | Soil          | Tulip            |
| Myrrh             | Pimento           | Root               | Solanaceæ     | Tulip Tree       |
| Myrtle            | Pine              | Rosaceæ            | Sorghum       | Tumble-weed      |
| Narcissus         | Pine-apple        | Rose               | Sorrel        | Turkey           |
| Nard              | Pin-eyed          | Rosemary           | Sowing        | Turmeric         |
| Nasturtium        | Pink              | Rosewood           | Spade         | Turnip           |
| Nettle            | Pistachio Nut     | Rosin or Colophony | Spanish Broom | Turnsole         |
| Nettle Tree       | Pistil            | Royal Fern         | Spanish Grass | Umbelliferæ      |
| New England       | Pitcher Plants    | Rubraceæ           | Spikenard     | Urticaceæ        |
| Flax              | Plane             | Rubber             | Spinach       | Vanilla          |
| Nightshade        | Plantain          | Ruderal            | Spruce        | Vegetable        |
| Nut               | Plough and        | Rue                | Stem          | Vegetable Marrow |
| Nutmeg            | Ploughing         | Rush               | Stink-wood    | Venus's Fly Trap |
| Oak               | Plum              | Rye                | Strawberry    | Venus's Looking  |
| Oat               | Poinsettia        | Sabicu Wood        | Strophanthus  | Glass            |
| Okra              | Pokeberry         | Safflower          | Sudd          | Veratrum         |
| Oleander          | Pollination       | Saffron            | Sumach        | Verbena          |
| Oleaster          | Polyanthus        | Sago               | Sundew        | Vetch            |
| Olive             | Polygonaceæ       | Sainfoin           | Sunflower     | Vine             |
| Onagraceæ         | Polypodium        | St. John's Wort    | Sunn          | Violet           |
| Onion             | Pomegranate       | Salsafy or Salsify | Sweet Gum     | Walnut           |
| Orach or Mountain | Pondweed          | Salvia             | Sweet Potato  | Water-lily       |
| Spinach           | Poplar            | Sap                | Sweet-sop     | Water-thyme      |
| Orange            | Poppy             | Sapan Wood         | Swine         | Wax-tree         |
| Orchard           | Potato            | Sarcocarp          | Switch-plants | Wheat            |
| Orchids           | Potentilla        | Sarmentose         | Synanthry     | Whin             |
| Orris-Root        | Poultry & Poultry | Sarracenia         | Tallow Tree   | Whortleberry     |
| Osier             | Farming           | Satin Wood         | Tamarind      | Willow           |
| Ox                | Primrose          | Saxifrage          | Tamarisk      | Willow-herb      |
| Oxalis            | Primulaceæ        | Saxifragaceæ       | Tea           | Wintergreen      |
| Pæony             | Privet            | Scammony           | Teasel        | Winter's-bark    |
| Palm              | Pteridophyta      | Scion              | Terebinth     | Witch Brooms     |
| Palmetto          | Puff-ball         | Scorzonera         | Thistle       | Witch Hazel      |
| Pansy or Hearts-  | Pumpkin           | Screw-pine         | Thorn         | Woad             |
| ease              | Purslane          | Scrophulariaceæ    | Thrashing     | Wormwood         |
| Papyrus           | Pyrethrum         | Scythe             | Thrum-eyed    | Yam              |
| Paraguay Tea      | Quince            | Sea-kale           | Thyme         | Yew              |
| Parsley           | Radish            | Seawrack           | Tiger-flower  | Yucca            |
| Parsnip           | Ram               | Sedum              | Toad-stool    | Zinnia           |
| Passionflower     | Ramie             | Secund             | Tobacco       |                  |
| Pea               | Ramsons           | Seed               |               |                  |
| Peach             | Ranch             | Sequoia            |               |                  |
| Pear              | Ranunculas        | Service Tree       |               |                  |



## CHAPTER IV

### FOR MERCHANTS AND MANUFACTURERS: GENERAL AND INTRODUCTORY

**T**HE article on **TECHNICAL EDUCATION** in the new (Eleventh) Edition of the *Encyclopædia Britannica* (Vol. 26, p. 487), written by Philip Magnus, one of the greatest educational authorities in the world, says that:

**Technical Education for Manufacturer and Merchant**

“The widespread appreciation of the advantages of the higher education among all classes of the American people, and the general recognition among manufacturers, engineers and employers of labour, of the value to them in their own work, of the services of college-trained men, has largely helped to increase the number of students in attendance at the universities and technical institutions.”

A still broader truth is that the men who have learned to think clearly, by whatever study or *reading* they may have developed that power, possess the greatest of all advantages. As the *Britannica* article on **EDUCATION** indicates, the true value of education (not simply school education, but all education) lies as much in the influence which intelligently directed study exerts upon the mind as in the immediate usefulness of the information acquired, and the articles in the *Britannica* not only supply the most recent and authoritative information, but are so logically arranged, one dove-tailing into another, that they give the reader precisely that *orderly*

view of knowledge which is the foundation of all mental training.

Since all of the series of chapters which immediately follow and which are intended for merchants and manufacturers, deal with commerce and manufactures, it will be for the reader's convenience to begin by dealing with those two subjects in general. But certain branches of industrial and manufacturing knowledge are dealt with in special chapters. The articles on banking and finance are described fully in this Guide in the chapter *For Bankers and Financiers*, those on insurance in the chapter *For Insurance Men*, and those on law in the chapter *For Lawyers*. Three of the legal articles should, however, be mentioned here, as they are on especially important subjects: **SALE OF GOODS** (Vol. 24, p. 63), **COMPANY** (Vol. 6, p. 795), which deals with the laws in various countries regulating corporations, and **EMPLOYERS' LIABILITY** (Vol. 9, p. 356), on this topic so important in modern industrial law and in the relations between capital and labour.

The broad questions of commercial and industrial policy are discussed in **ECONOMICS** (Vol. 8, p. 899), by Prof. Hewins; **COMMERCE** (Vol. 6, p. 766); **TRUSTS** (Vol. 27, p. 334); **MONOPOLY** (Vol. 18, p. 733), and **TRADE ORGANIZATION** (Vol. 27, p. 335), which describes commercial associations in the United States, the work of the consular service, and the organizations in Germany, France, Great

**Practical Economics for Practical Men**

Britain and other countries. **BOOK-KEEPING** (Vol. 4, p. 225), with its up-to-date account of modern accounting methods, card ledgers and loose leaf systems; **ADVERTISEMENT** (Vol. 1, p. 235), and **MERCANTILE AGENCIES** (Vol. 18, p. 148) may be named as specimens of the many practical articles on business methods which need not all be enumerated here.

Much of what you read and hear about the tariff systems of the United States and various other countries and about their influence upon trade is so vague and confusing that you will be

**Imports and Exports**

delighted with the group of clear, common-sense articles in the Britannica. **TARIFF** (Vol. 26, p. 422) is by one of the most famous American economists, Prof. Taussig of Harvard, and is a very full and fair discussion of the points in controversy. **PROTECTION** (Vol. 22, p. 464) is by Prof. James of the University of Illinois, and **FREE TRADE** (Vol. 11, p. 89) by William Cunningham. You should read with care **CUSTOMS DUTIES** (Vol. 7, p. 669); **FREE PORTS** (Vol. 11, p. 88), and **BOUNTY** (Vol. 4, p. 324). **BALANCE OF TRADE** (Vol. 3, p. 235) and **TAXATION** (Vol. 26, p. 458) are both by Sir Robert Giffen. **EXCHANGE** (Vol. 10, p. 50), by E. M. Harvey, a partner in one of the largest firms of bullion brokers in the world, deals with the movement of gold. **COMMERCIAL TREATIES** (Vol. 6, p. 771) is by Sir C. M. Kennedy. Freights are discussed in **AFFREIGHTMENT** (Vol. 1, p. 302) by Sir Joseph Walton. **LIEN** (Vol. 16, p. 594), with its section on "Stoppage in transitu," is by F. W. Raikes; **SALVAGE** (Vol. 24, p. 97), by T. G. Carver, and **BLOCKADE** (Vol. 4, p. 72), by Sir Thomas Barclay, the great international lawyer in Paris. Marine insurance, indemnity, Lloyds, and other insurance subjects fall under the chapter of this Guide *For Insurance Men* to which you

should refer. Cargo-carrying and merchant shipping are further covered by **SHIPPING** (Vol. 24, p. 983). This article is by Douglas Owen, honorary secretary and treasurer of the Society of National Research, and author of *Ports and Docks*; it contains information about the great freight carrying lines of the world that can be found in no other book. Railroad freighting is covered by the article **RAILWAYS** (Vol. 22, p. 819), in which there is a special section (p. 854b) on the new models of American freight cars.

In the article **UNITED STATES**, which contains more matter than a whole book of ordinary size and more information than a dozen ordinary books, the sections on **Manufacturing and Consuming Nations** (Vol. 27, p. 639) on manufactures and on foreign

and domestic commerce, are by F. S. Philbrick, Ph.D. *The internal commerce of the United States, as this article states, is in itself greater than the total international commerce of the world, and is so far from exhausting the country's power of production and consumption, that even when coastwise traffic is disregarded, New York is the most active port in the world.* A section (Vol. 9, p. 916) of the article **EUROPE** deals with European commerce in general. The articles on the great manufacturing towns of Europe contain much information as to industries. Great Britain's industries are dealt with in the article **UNITED KINGDOM** (Vol. 27, p. 691). The industries of England alone are separately treated in a section (Vol. 9, p. 426) of the article **ENGLAND**. Germany's industries are the subject of sections (Vol. 11, p. 811) of the article **GERMANY**; and it is interesting to note that although Germany has outranked France in cotton manufactures since Mülhausen, Colmar and other important milling centres of Alsace became German, France has retorted by

overtaking and passing Germany in the production of linen. The sections (Vol. 10, p. 785) on foreign commerce in the article FRANCE show her position as in the main a self-supporting country, though only a fourth of the cargoes loaded and discharged in French ports are carried under the French flag. It would be a waste of space to enumerate here the articles on Belgium, Switzerland, Italy and other countries, which you will consult in relation to those of their exports in which you are especially interested; but you should not overlook the article on Japan. The Britannica has done commerce a great service in giving to the world at last a good account of this extraordinary country.

The body of the article JAPAN (Vol. 15, p. 156) is by Capt. Brinkley, long editor of the *Japan Mail*, whose opportunities of seeing Japanese life from the inside have been greater than those of any other foreign observer. Baron Dairoku Kikuchi, President of the Imperial University of Kyoto, a statesman of great experience and authority, contributes to the article a section (Vol. 15, p. 273) dealing with Japan's international position. His remarks upon the commercial morality of the Japanese are so ingenuous and so candid that an extract from them cannot be omitted:

Now when foreign trade was first opened, it was naturally not firms with long-established credit and methods that first ventured upon the new field of business—some few that did failed owing to their want of experience—it was rather enterprising and adventurous spirits with little capital or credit who eagerly flocked to the

newly opened ports to try their fortune. It was not to be expected that all or most of those should be very scrupulous in their dealings with the foreigners; the majority of those adventurers failed, while a few of the abler men, generally those who believed in and practised honesty as the best policy, succeeded and came to occupy an honourable position as business men. . . . Commerce and trade are now regarded as highly honourable professions, merchants and business men occupy the highest social positions, several of them having been lately raised to the peerage, and are as honourable a set of men as can be met anywhere. It is, however, to be regretted that in introducing Western business methods, it has not been quite possible to exclude some of their evils, such as promotion of swindling companies, tampering with members of legislature, and so forth.

The account (Vol. 15, p. 201) by Capt. Brinkley of the curious system of creating branches of Japanese business houses is another part of this article which should not be overlooked.

The proportion of labour cost to the total cost of production is in most industries so great that you cannot study too carefully every aspect of the labour question. The chief articles are LABOUR

LEGISLATION (Vol. 16, p. 7), jointly written by the late Dr. Carroll D. Wright, the great American authority on the subject, and Miss A. M. Anderson, Principal Lady Inspector of Factories to the British government; TRADES UNION (Vol. 27, p. 140); STRIKES AND LOCKOUTS (Vol. 25, p. 1024); WAGES (Vol. 28, p. 229), by Prof. J. S. Nicholson; PROFIT SHARING (Vol. 22, p. 423), by Aneurin Williams and APPRENTICESHIP (Vol. 2, p. 228), by J. S. Ballin. The article EMPLOYERS' LIABILITY (Vol. 9, p. 356), has already been mentioned.

## CHAPTER V

### FOR MERCHANTS AND MANUFACTURERS OF TEXTILES

**T**HE Course of Reading outlined in this chapter will help anyone who has to do with the making or with the buying and selling of textiles, in three ways, at least, each of the greatest importance to him—and possibly in many more. Taking up these three:—In the first place, it will teach him many facts about manufacturing and merchandizing in general, and about dry goods in particular, that he could learn nowhere else, because the scope of the Britannica is broader than that of any other book—or, for that matter, than the scope of any collegiate course can well be. In the second place, the number of distinguished men who have devoted their exclusive attention to the subjects upon which they write, and have given to the Britannica the

#### Practical Men Among the Contributors

results of their research and of their experience as practical experts—in many cases, indeed, as successful business men—is far greater than the number of men who form the faculty of any university in the world. The fifteen hundred contributors in fact include no less than 704 connected with the staffs of 151 different universities, technological and commercial institutes and colleges in twenty countries. The reader thus gets the benefit of contact with the thought of many, of varied, and always of authoritative, personalities. In the third place, the *textile trade is peculiarly an international trade*, the

raw materials often traveling from one end of the world to the other before manufacture, and making as long a journey in the finished form, before they reach the consumer, and the international character of the Britannica gives equal weight to the articles which deal with the textiles and with the markets of all countries—a statement which it would certainly not be safe to make about any other book.

The article FIBERS (Vol. 10, p. 309), by C. F. Cross, whose name has been much before the public in connection with the

#### Textile Fibres and their Treatment

recent scientific investigation of the subject, compares the fibres yielded by all the vegetable and animal substances used in textiles. The 18 microscopic photographs on the full page plates (facing pp. 310 and 311) and the table of vegetable fibres (p. 311) should be carefully studied. CELLULOSE (Vol. 5, p. 606) deals with the “body” of cotton, flax, hemp and jute fibres. CARDING (Vol. 5, p. 324) deals with the brushing and combing of fibres. SPINNING (Vol. 25, p. 685) covers both cotton and linen, and it is curious to note from this article that in preparing yarns for the exquisite Dacca muslins one pound of cotton has been spun into a thread 252 miles long; while the article DACCА says that a piece 15 feet by 3 was once woven that weighed only 900 grains. YARN (Vol. 28, p. 906) deals with cotton,

woollen and silk yarns. **WEAVING** (Vol. 28, p. 440), by Prof. T. W. Fox, author of *Mechanics of Weaving*, and Alan Cole, is the first article you should read in a group dealing with processes applied to more than one material. The first section is on the various combinations of warp and weft, and contains 23 illustrations showing the chief weaving "schemes." A section on weaving machinery follows, and then one on weaving as an art, illustrated with a number of reproductions of famous specimens of hand-loom work. The whole article is full of practical every-day information of the kind the merchant and manufacturer wants to know. **BLEACHING** (Vol. 4, p. 49) describes the chemical processes which have expedited the bleaching of cotton, wool, linen and silk, which it used to take all summer to complete. **DYEING** (Vol. 8, p. 744), by Prof. Hummel, author of *The Dyeing of Textile Fabrics*, and Prof. Knecht, author of *A Manual of Dyeing*, is another of the thorough articles which entitle the Britannica to rank as a great original work on textiles. Every dye is separately treated, and the latest models of dyeing machinery are carefully described. **FINISHING** (Vol. 10, p. 378) deals with the processes used for cotton, woollens, worsteds, pile fabrics, silks and yarns. **TEXTILE-PRINTING** (Vol. 26, p. 694) is by Prof. Knecht and Alan Cole, author of *Ornament in European Silks*, and not only describes all the styles of printing, but gives sixty recipes for various shades of colour. The full page plates reproduce fine specimens of early printing. The art of textile-printing "is very ancient, probably originating in the East. It has been practised in China and India from time immemorial, and the Chinese, at least, are known to have made use of engraved wood-blocks many centuries before any kind of printing was known in Europe."

The elaborate article **COTTON** (Vol. 7, p. 256) begins by discussing the pe-

culiar twist of the hairs on the cotton seed which by facilitating spinning gives cotton its predominant position as a textile material. The section on cultivation, by W. G. Freeman, deals with the soils, bedding, planting, hoeing and picking, then with ginning and baling. A section on diseases and pests of the cotton plant follows, then a discussion of the improvement of yield by seed selection. The section on marketing and supply is by Prof. Chapman, and his practical study of "futures," "options," and "straddles" shows how greatly the movement of prices is affected by speculation and often by artificial manipulation.

**COTTON MANUFACTURING** (Vol. 7, p. 281) describes the industry in England, that of the United States, with a special section on the recent developments in the two Carolinas, Georgia and Alabama, and also the mills in Germany, France, Russia, Switzerland, Italy and in other countries, including India, China and Japan. It is interesting to note (p. 293) that "Americans were making vast strides in industrial efficiency even before the period when American theories and American enterprise were monopolizing in a wonderful degree the attention of the business world" abroad. As far back as 1875 progress in the United States was so rapid that the production for each operative had increased during the ten years 1865-75, by 100% in Massachusetts as against only 23% in England. One explanation of American success is that the American employer "tries to save in labour but not in wages, if a generalization may be ventured. The good workman gets high pay, but he is kept at tasks requiring his powers and is not suffered to waste his time doing the work of unskilled or boy labour."

**COTTON SPINNING MACHINERY** (Vol. 7, p. 301) describes all the machines in great detail and contains a number of



full-page plates and other illustrations. **MERCERIZING** (Vol. 18, p. 150) is another important article.

**WOOL, WORSTED AND WOOLLEN MANUFACTURES** (Vol. 28, p. 805) is by Prof. Aldred F. Barker. The development in

**Wool, Linen  
and Silk**

wool production of various countries is first described and then the wool fibre is studied and microscopic photographs reproduced to show the structure of different varieties. A diagram of a fleece shows the qualities obtained from various parts of the animal, ranging from the shoulders, where the finest is found, to the hind quarters. Lamb, hogg and wether wools are compared and the article discusses shearing, classing, sorting, scouring, drying, teasing, burring, mule spinning, combing, drawing and spinning. The centres of the industry are then compared, with details as to the special products of each. The article contains illustrations of a number of machines. Articles dealing with certain sources of wool or of the wool-like hair used in textiles, and with the finished products, are: **ALPACA** (Vol. 1, p. 721), the history of its manufacture being "one of the romances of commerce;" **MOHAIR** (Vol. 18, p. 647), which deals with the hair of the Angora goat, familiar from discussions of the Underwood Tariff bill, and dealing with its weaving and the imitations of the cloth; **LLAMA** (Vol. 16, p. 827); and the articles **GUANACO** (Vol. 12, p. 649) and **VICUGNA** (Vol. 28, p. 47), on the two wild animals from whose hair high priced materials, extraordinarily warm and light, are woven.

**FLAX** (Vol. 10, p. 484) describes the cultivation of the crops which are harvested by being "pulled," roots and all, instead of being cut, the process of separating the capsules from the branches, and the subsequent stages of preparation. **LINEN AND LINEN MANUFACTURES** (Vol. 16, p. 724), by Thomas Woodhouse, takes up the story where the flax fibre is ready

for market and carries it to the point where the yarn is delivered for weaving. The winding, warping, dressing and beaming, and the looms employed, are virtually the same processes and machines that are used for cotton. The article states that the finest linen threads used for lace are produced by Belgian hand spinners who can only get the desired results by working in damp cellars, the spinner being guided by touch alone, as the filament is too fine for him to see. This thread is said to have been sold for as much as \$72 an ounce.

**JUTE** (Vol. 15, p. 603) deals with the vegetable fibre which ranks, in its industrial importance, next after cotton and flax and with the processes employed in its manufacture.

**SILK** (Vol. 25, p. 96) contains illustrations of cocoons and worms, microscopic photographs of fibre, and pictures of the moths which produce wild silk. The section on the fibre and its production and preparation is by Frank Warner, president of the Silk Association of Great Britain and Ireland; and that on the silk trade by Arthur Mellor, a well known manufacturer of Macclesfield, the great British center. The degree of fineness to which silk thread can be spun is stated (Vol. 28, p. 906) to be such that 450,000 yards of thread have been produced from one pound of silk, and this is slightly in excess of the fineness of the Dacca cotton thread already mentioned as producing 252 miles for a pound. But at Cambrai the lace maker's linen thread already described has been made as fine as 272 miles to the pound, and the drawing of platinum wire to the fifty-thousandth part of an inch in thickness (Vol. 28, p. 738) seems hardly more wonderful than this. Spider silk is as valuable as the best qualities of the silk-worm product, but spiders are such fierce cannibals that it is necessary to keep each one in a separate cage, and the cost of doing this has prevented the fibre from being

generally used (Vol. 25, p. 664). Artificial or "viscose" silk is described in the article CELLULOSE (Vol. 5, p. 609), and is a textile of which the importance is rapidly increasing.

Felting is an even older textile process than weaving, just as weaving, which no doubt originated in basket making (Vol. 3, p. 481) is older than spinning. The article FELT (Vol. 10, p. 245) deals with asphalted felts used for roofing as well as with the hat felts; and the article HAT (Vol. 13, p. 60) gives further details as to both woollen and fur felts and describes the machinery for hatmaking, which originated in the United States.

Save that gold, silver and other metals are occasionally used in cloth or gauze, ASBESTOS (Vol. 2, p. 714) is the only mineral employed in textiles, and its value for jacketing steam pipes and boilers and for insulating fabrics and fire-proofing gives it great importance. RAMIE (Vol. 22, p. 875) is not so largely used in textiles, but experiments in the production of better fibre are being made.

SHODDY (Vol. 24, p. 992) is an article which shows how unfair it is to treat the re-manufacture of "devilled" fabric as an illegitimate if not absolutely fraudulent branch of the textile industry, for really serviceable cloths are woven from it, and masses of poor people who would otherwise be in rags are thus comfortably clad. "Mungo," another re-manufactured cloth, is described (Vol. 28, p. 906) in the article YARN. Pineapple fibre is described (Vol. 10, p. 311) as of exceptional fineness and is used in yarn cloths of the best quality. The article PINE-APPLE (Vol. 21, p. 625) describes its culture. SISAL HEMP (Vol. 25, p. 158) is used in bagging as well as cordage, and the same is true of PHORMIUM (Vol. 21, p. 471), sometimes called New Zealand flax. Paper pulp yields a yarn which is used in some cheap fabrics as described (Vol. 5, p. 609) in the article CELLULOSE already mentioned.

The many varieties of woven cloths are described in the articles already mentioned in the manufacture of cotton, linen, wool, and silk,

**Textile Merchandise** and in articles on special fabrics. HOSIERY (Vol. 13, p.

788) covers the textiles that are produced by knitting or looping, and gives an account, with illustrations, of the machinery employed. NET (Vol. 19, p. 412) covers the textiles of which the mesh is knotted.

LACE (Vol. 16, p. 37), by Alan Cole, contains some of the most beautiful full-page plates and other illustrations to be found in the Britannica, and is a very full treatise on the history and the present state of the lace-making art.

FLANNEL (Vol. 10, p. 480) describes the true flannels made from wool, and FLANNELETTE (Vol. 10, p. 481) the cotton imitations and the new fire-resisting fabrics of this class. DRILL (Vol. 8, p. 580) covers both the cotton and linen tissues sold under this name. CREPE (Vol. 7, p. 379) mentions the curious fact that the Chinese and Japanese makers of soft crepe guard their secret processes, which are still unknown to western manufacturers, so carefully that the different stages of their production are carried on in towns far distant from one another.

CARPET (Vol. 5, p. 392) contains full-page plates of rare specimens and describes pile carpets, flat-surfaced carpets and the printed carpetings.

TAPESTRY (Vol. 26, p. 403) deals with another luxurious branch of the textile industry, and is illustrated with photographs of the finest specimens and with pictures showing the methods of weaving. BROCADE (Vol. 4, p. 620) describes and illustrates this stately class of fabrics. EMBROIDERY (Vol. 9, p. 309) with six full-page plates and SHAWL (Vol. 24, p. 814) deal with other art textiles.

TARTAN (Vol. 26, p. 431) describes the colours and patterns of all Scottish

clan tartans. **DAMASK** (Vol. 7, p. 785) discusses this fine class of fabrics, the weaving of which is the subject of a special section (Vol. 28, p. 454) of the article **WEAVING**. The enormous consumption of coarse bags for the packing of raw cotton and of sugar gives importance to the articles **BAGGING** (Vol. 3, p. 200) and **SACKING AND SACK MANUFACTURE** (Vol. 23, p. 975). **CANVAS** (Vol. 5, p. 223) discusses sail cloth and artists' canvas, and **TARPAULIN** (Vol. 26, p. 430) deals with waterproof covers.

It is unnecessary to describe one by one the seventy articles on other fabrics and tissues, ranging through the alphabet from Alpaca to

**The Seventy Articles on Special Fabrics** are all included in the list at the end of this chapter, and all

are fully described in the Britannica. **Velveteen**; but they are all included in the list at the end of this chapter, and all are fully described in the Britannica. **COSTUME** (Vol. 7, p. 224) is a long and important article, with a full page plate and many other illustrations. The section on dress in general is by T. A. Joyce, of the British Museum staff, that on ancient costumes by H. S. Jones, director of the British School at Rome, and that on modern costume by Oswald Barron, editor of *The Ancestor*. The account of underclothing is of especial interest, as most books on costume altogether neglect this branch of the subject. Another section of this article is on national and official costumes by W. Alison Phillips, principal assistant editor of the Britannica. The study of ceremonial robes is carried into further detail by the article **ROBE** (Vol. 23, p. 408), with its five richly colored plates, in one of which the judicial robes of the U. S. Supreme Court Justices are shown. Liturgical vestments are dealt with in **VESTMENTS** (Vol. 28, p. 27) and in a series of articles such as **DALMATI** (Vol. 7, p. 776) and **ALB** (Vol. 1, p. 497).

Among the biographies which are of interest in connection with textiles are those of **ARKWRIGHT, RICHARD** (Vol. 2,

p. 556), the barber who invented the spinning frame; **CARTWRIGHT, EDMUND**, (Vol. 5, p. 425), inventor of the power

**Inventors of Textile Machinery and Great Textile Merchants** **loom**; **CROMPTON, SAMUEL** (Vol. 7, p. 486), inventor of the spinning mule; **SALT, TITUS** (Vol. 23, p. 87), who

created the alpaca industry; **STRUTT, JEDEDIAH** (Vol. 25, p. 1044), who did much to perfect the manufacture of cotton; and of **WHITNEY, ELI** (Vol. 28, p. 611), who went from Yale to Savannah to secure a position as school teacher and then, being disappointed, turned his attention to a device for separating the cotton fibre from the seeds and refuse, and invented the gin which has "profoundly influenced American industrial economic and social history." Another name of a great American inventor who individually rendered great services to the textile industry is that of **HOWE, ELIAS** (Vol. 13, p. 835), who invented the sewing machine. You will also be interested in the lives of successful merchants such as **CANNYNGES, WILLIAM** (Vol. 5, p. 223), the great 15th Century cloth manufacturer who became a clergyman after making a large fortune; **MACKINTOSH, CHARLES** (Vol. 17, p. 250), who introduced lightweight waterproof garments; **WANAMAKER, JOHN** (Vol. 28, p. 302), who began life as an errand boy in a book store; **FIELD, MARSHALL** (Vol. 10, p. 322), who when Chicago was a comparatively unimportant city founded there what has become the finest dry goods store in the world; **STEWART, A. T.** (Vol. 25, p. 912), who after studying for the ministry in Dublin, immigrated to New York and gradually built up the largest retail store in the city; **PEASE, EDWARD** (Vol. 21, p. 31), founder of a famous Quaker family of textile manufacturers in England; and **CLAFLIN, H. B.** (Vol. 6, p. 418), who came from Worcester, Mass., to New York where he for years controlled "the greatest mercantile business in the world."



If you turn to the Article WORCESTER (Vol. 28, p. 823) you will note the associations of the locality with Elias Howe, Eli Whitney, Samuel Crompton, already mentioned, L. J. Knowles, another inventor who helped to perfect the power loom, and Erastus Bigelow, who invented the carpet-weaving machine (Vol. 6, p. 530) and was one of the incorporators of the Massachusetts Institute of Technology. Other lives of successful textile makers and dealers are those of RYLANDS, JOHN (Vol. 23, p. 950), founder of the largest cotton mills in Lancashire; DEXTER, TIMOTHY (Vol.

8, p. 141), the eccentric New England merchant of the 18th Century who beat his wife for not weeping heartily enough at the rehearsal of his funeral; HORROCKS, JOHN (Vol. 13, p. 712), the great English cotton manufacturer who was far ahead of his time and died of brain fever produced by overwork in 1804; WORTH, C. F. (Vol. 28, p. 834), the famous Paris dressmaker who began life as a London draper's apprentice; WHITELEY, WILLIAM (Vol. 28, p. 605), "the Universal Provider," of London; and TATA, J. N. (Vol. 26, p. 448), the great Parsee textile manufacturer.

A LIST OF THE PRINCIPAL ARTICLES IN THE BRITANNICA OF SPECIAL INTEREST TO MERCHANTS AND MANUFACTURERS OF TEXTILE GOODS

|                        |                  |                    |                         |
|------------------------|------------------|--------------------|-------------------------|
| Alb                    | Crepe            | Howe, Elias,       | Scarf                   |
| Alpaca                 | Cretonne         | Huckaback          | Scrim                   |
| Apprenticeship         | Crompton, Samuel | Jute               | Shawl                   |
| Arkwright, Richard     | Dalmatic         | Knitting           | Sheet                   |
| Artel                  | Damask           | Lace               | Shoddy                  |
| Asbestos               | Denim            | Lawn               | Silk                    |
| Bagging                | Dexter, Timothy  | Linen              | Sisal Hemp              |
| Baize                  | Demurrage        | Llama              | Sleeve                  |
| Bleaching              | Diaper           | Longcloth          | Spinning                |
| Bombazine or Bombasine | Die              | Manila Hemp        | Stewart, A. T.          |
| Book-keeping           | Dimity           | Macintosh, Charles | Stocking                |
| Bounty                 | Dowlas           | Maniple            | Stole                   |
| Brocade                | Drill            | Mantle             | Strutt, Jedediah        |
| Buckram                | Duck             | Matting            | Tare and Tret           |
| Bunting                | Dyeing           | Mercantile System  | Tariff                  |
| Calender               | Embroidery       | Mercerizing        | Tarpaulin               |
| Calico                 | Felt             | Merchant           | Tartan                  |
| Cambrie                | Fibres           | Mohair             | Tata, J. N.             |
| Camel                  | Field, Marshall  | Moleskin           | Tapestry                |
| Canvas                 | Finishing        | Mull               | Technical Education     |
| Canynges, William      | Flannel          | Muslin             | Textile-printing        |
| Carding                | Flannelette      | Nankeen            | Ticking                 |
| Carpet                 | Flax             | Net                | Tow                     |
| Cartwright, Edmund     | Flock            | Osnaburg           | Towel                   |
| Cellulose              | Floorcloth       | Padding            | Trousers                |
| Chasuble               | Frock            | Pease, Edward      | Tulle                   |
| Cheese Cloth           | Fustian          | Petticoat          | Twill                   |
| Chenille               | Gante            | Phormium           | Veil                    |
| Chintz                 | Gauze            | Pine-apple         | Velvet                  |
| Clafin, H. B.          | Gimp             | Plaid              | Velveteen               |
| Cloth                  | Gingham          | Plush              | Vestments               |
| Clouting               | Girdle           | Poplin or Tabinet  | Vicugna                 |
| Codilla                | Glass Cloth      | Print              | Wanamaker, John         |
| Coir                   | Guanaco          | Protection         | Weaving                 |
| Commerce               | Gunny            | Ramie              | Whiteley, William       |
| Corduroy               | Haberdasher      | Rep                | Whitney, Eli            |
| Costume                | Hat              | Ribbons            | Wool, Worsted and Wool- |
| Cotton                 | Hessian          | Ring               | len Manufactures        |
| Cotton Manufacture     | Holland          | Robes              | Worth, C. F.            |
| Cotton Spinning Ma-    | Honeycomb        | Rylands, John      | Yarn                    |
| chinery                | Horrocks, John   | Sacking            |                         |
| Crash                  | Hosiery          | Salt, Titus        |                         |
| Cravat                 | Hose-pipe        | Salvage            |                         |

## CHAPTER VI

### FOR MERCHANTS AND MANUFACTURERS OF MACHINERY

**A**N appreciation of the science of mechanical engineering is so indispensable to the manufacture and sale of machinery that the reader of this Guide might simply have been referred to the chapter *For Engineers* as covering the industry, if it were not that the *Britannica* contains (as the list at the end of this chapter shows) a great number of articles dealing with individual machines. The amount of space which the new *Britannica* devotes to mechanical subjects, and the great number of expert contributors whose collaboration was enlisted in this connection, are significant from more than one point of view. All other general encyclopaedias, including earlier editions of the *Britannica* itself, seem to have been influenced by the old-fashioned fetish of "pure" scholarship and "pure" science, treating theory as a

**A Change in Public Opinion** subject of study much more dignified than the application of knowledge to the practical affairs of life. Until recent days the great universities of such important manufacturing countries as England, Germany and France were almost exclusively devoted to the teaching of philosophy, history, Greek and Latin, mathematics and pure or natural science. The older universities of the United States, too, were for a long time reluctant to recognize the growing importance of technical education, and the necessity, apart from technical education, of giving the general student some knowledge of mechanics. And it is a significant fact that the *Britannica*, the first encyclopaedia

that has ever been published by a university, should be, although it comes from one of the oldest of all universities, the first to give full recognition to the importance of this department of knowledge.

Men in the machinery trade will welcome this change of attitude in the *Britannica*, not because they crave a public acknowledgment of the great share of the world's work that they are doing, but because public ignorance of mechanical subjects results in the abuse of machines and in unreasonable complaints against manufacturers when improperly used machinery fails to do its work. A curious illustration of the general disregard of the subject is supplied by the fact—as true of the United States as of England, Germany or France—that representative government is, in practice, chiefly government by lawyers, and that in this age of machinery it is the exception to find in the cabinet which directs the affairs of any country, a single member who has any knowledge of mechanics. The same ignorance is conspicuous in newspaper offices. Even the most dignified dailies seem unable to deal with any news that has to do with machinery without making ridiculous blunders.

Fortunately, the automobile is beginning to stimulate interest in practical mechanics, for no one can attempt to drive his own car, or even

**Influence of Automobiles** to obtain proper service from his chauffeur and from garage workmen, without realizing that he failed, at school, to learn some of the most useful of lessons. Before long the

authorities responsible for our public schools may realize that it is absolute barbarism to neglect mechanical teaching as they do; and the new Britannica is already doing good service in stimulating public interest in the subject.

An examination of the articles mentioned in detail in the following summary, and a glance at the long list of articles at the end of the chapter, will show the comprehensiveness with which the Britannica treats all types of machinery. The materials employed are, logically, the first subjects upon which information will be desired.

IRON AND STEEL (Vol. 14, p. 801), by Professor H. M. Howe of Columbia University, is a mine of information about the properties and uses of the different varieties of the indispensable metal of which 50,000,000 tons per annum are employed. In the manufacture of electrical apparatus COPPER (Vol. 7, p. 102) is largely employed, and for this reason alone the article has great value for the manufacturer. Almost as important is ALLOYS (Vol. 1, p. 704). Its chief author, Sir William Chandler Roberts-Austen, is the greatest living authority on alloys, and it is full of interesting facts about new admixtures.

The processes of ANNEALING, HARDENING AND TEMPERING are described in J. G. Horner's article under that title (Vol. 2, p. 70). This authority explains clearly the difference between hardening and tempering and gives valuable advice as to the most efficient methods of hardening. FOUNDRY (Vol. 10, p. 743), also by J. G. Horner, is fully illustrated, and the question of the highest economies of machine moulding are among the practical matters considered. FORGING (Vol. 10, p. 663), with 19 illustrations, discusses fulling, swaging, upsetting, bending, welding, pinching, cutting-off, and die-forging. There is also a separate article, WELDING (Vol. 28), in which the section on *Electric Welding* is written by Elihu Thomson, who invented the process. A

table of energy used in electric welding is added. See also BRAZING AND SOLDERING (Vol. 4, p. 463).

The designer of machinery will find much practical information in DRAWING, *Drawing Office Work* (Vol. 8, p. 556), and SUN-COPYING (Vol. Manufacturing Methods 26, p. 93). It is a remarkable fact that prints identical in scale with the originals are now made up to a length of 22 feet.

BEARINGS (Vol. 3, p. 578), illustrated, is written by Professor Dalby of the South Kensington Central Technical College. The article TOOL (Vol. 27, p. 14), by J. G. Horner, is 33 pages in length and has 79 illustrations. The whole subject is completely covered. In the section on *Machine Tools* are discussed turning lathes, reciprocating machines, machines with drill and bore holes, milling machines, machines for cutting the teeth of gear wheels, grinding machinery, sawing machines, shearing and punching machines, hammers and presses, portable tools, appliances, wood-working machines, and measurement. In regard to the last subject great advances have lately been made. A thousandth of an inch is now considered a coarse dimension in the machine shop, where gauges within one five-thousandth of an inch are often used. This article is an invaluable manual for the machine-shop, and supplies many hints which should be given to workmen, for, to use the author's words, "a clumsy workman is as much out of place in a modern machine-shop as he would be in a watch-factory." Another article useful to the mechanic is SCREW (Vol. 24, p. 477), with 10 illustrations, by J. G. Horner, with a section on the *Errors of Screws*, by the late Henry A. Rowland, the American physicist, whose skill, shown in the construction of dividing engines of extraordinary precision and delicacy, made him famous the world over. See also GRADUATION (Vol. 12, p. 312).

The articles on the prime-movers are an important and noteworthy part of the new Britannica. Professor Ewing, of Cambridge University, contributes

**Engines and Motors** AIR ENGINE (Vol. 1, p. 443) and STEAM ENGINE (Vol. 25, p. 818), both fully illus-

trated. The latter has a most interesting preliminary historical account of engines from the aeolipile of Hero of Alexandria (about 130 B.C.) to the steam-turbine, the most modern type of all. The newest forms of internal combustion motors, OIL ENGINE (Vol. 20, p. 35) and GAS ENGINE (Vol. 11, p. 495), are described by Dugald Clerk, inventor of the Clerk cycle gas engine, and the articles are fully illustrated. Under HYDRAULICS (Vol. 14, p. 91) will be found complete information as to the construction of water-pressure engines, water-wheels, turbines, and also pumps. The article is written by Professor W. C. Unwin, and has been universally declared to be the best treatise on the subject that has yet appeared. There is a separate illustrated article WATER-MOTORS (Vol. 28, p. 382), by Professor Beare of Edinburgh University. See also WINDMILL (Vol. 28, p. 710).

Designers and constructors of electrical machinery will be greatly interested in C. C. Hawkins' illustrated article DYNAMO (Vol. 8, p. 764), which explains fully how the dynamo is constructed and gives its history from Faraday's discovery of the principle in 1831. Dr. Louis Bell, of the General Electric Co., writes on MOTORS, ELECTRIC (Vol. 18, p. 910).

In hundreds of articles on manufacturing and manufactured products there are excellent descriptions of the machinery employed. COTTON-SPINNING MACHINERY (Vol. 7, p. 301), by Professor Fox, of Manchester University, gives details, with illustrations, of the modern systems of spinning, all founded on the inventions of Paul, Arkwright, Hargreaves and Crompton, while an historical account of primitive machines as well as much prac-

tical information, will be found under SPINNING (Vol. 25, p. 685). WEAVING has a section *Weaving Machinery* (Vol. 28, p. 443). An account of the special machinery and appliances used in the manufacture of wool-

**Machinery for Special Purposes**

lens is included in Professor Barker's illustrated article WOOL, WORSTED and WOOLLEN MANUFACTURES (Vol. 28, p. 805). In HOSIERY (Vol. 13, p. 788) we learn about frame-work knitting and warp-knitting machines. It is recorded that up to the middle of the 19th century only a flat web could be knitted, and that a circular knitting machine of American origin is the type of machine on which is produced the seamless hosiery of to-day. This was introduced by J. W. Lamb in 1863. ROPE AND ROPE MAKING (Vol. 23, p. 713), by Thomas Woodhouse, of the Dundee Technical College, is richly illustrated with pictures of the most modern type of machinery for the manufacture of fibre and wire ropes. The various machines and apparatus for sugar making are carefully described in SUGAR, *Sugar Manufacture* (Vol. 26, p. 35). For milling machinery see FLOUR AND FLOUR MANUFACTURE (Vol. 10, p. 548), by George F. Zimmer, author of *Mechanical Handling of Material*. The latest designs in agricultural machines, with illustrations, as well as a history of their development, will be found under PLOUGH AND PLOUGHING (Vol. 21, p. 850), SOWING (Vol. 25, p. 523), HARROW (Vol. 13, p. 27), REAPING (Vol. 22, p. 944), THRASHING (Vol. 26, p. 887), etc. It is a matter of interest that the first successful reaping-machine was invented by a Scotch clergyman in 1826. For machinery used in the modern dairy see DAIRY AND DAIRY PRODUCTS (Vol. 7, p. 750). The germ of the sewing machine dates back to 1755, and the whole story of its development is told in SEWING MACHINES (Vol. 24, p. 744). The descriptions of machinery of various kinds are continued

under such headings as BREWING, *Brewing Operations* (Vol. 4, p. 506), illustrated; BELLOWS AND BLOWING MACHINES (Vol. 3, p. 705), illustrated; PIN (Vol. 21, p. 615); NEEDLE (Vol. 19, p. 338); TYPOGRAPHY, *Modern Practical Typography* (Vol. 27, p. 542), illustrated; PRINTING (Vol. 22, p. 350), illustrated; BOOKBINDING, *Modern Methods* (Vol. 4, p. 218), illustrated; TEXTILE PRINTING (Vol. 26, p. 694); ALKALI MANUFACTURE (Vol. 1, p. 674), illustrated; REFRIGERATING AND ICE MAKING (Vol. 23, p. 30); SILK, *Silk Manufac-*

*ture* (Vol. 25, p. 102); LACE, *Machine-made Lace* (Vol. 16, p. 44), illustrated; CARPET, *Modern Machinery* (Vol. 5, p. 396); LEATHER (Vol. 16, p. 330), illustrated; BICYCLE (Vol. 3, p. 913), illustrated; TYPEWRITER (Vol. 27, p. 501), illustrated; DREDGE AND DREDGING (Vol. 8, p. 562), illustrated; and PAPER, *Paper Manufacture* (Vol. 20, p. 727), illustrated.

Biographies of many inventors, designers and builders of machines are included in the list of articles at the end of the chapter *For Engineers* in this Guide, and are therefore omitted in the following alphabetical summary.

ALPHABETICAL LIST OF THE PRINCIPAL MACHINES AND APPLIANCES DESCRIBED IN THE BRITANNICA AND GENERAL SUBJECTS AND ARTICLES ON MACHINERY

|                                    |                           |                             |                                   |
|------------------------------------|---------------------------|-----------------------------|-----------------------------------|
| Accumulator                        | Brass                     | Cotton-gin                  | Fire-engines                      |
| Acetylene Generator                | Brazing and Soldering     | Cotton-spinning Machinery   | Flour-sifters                     |
| Aerating Apparatus                 | Breaker Card              | Cranes                      | Flying Machines                   |
| Aeroplane                          | Brewing Machinery         | Crushing Machine            | Fly-shuttle                       |
| Air Brake                          | Bronze                    | Cultivator                  | Forging                           |
| Alternators                        | Bundling Press            | Current Meter               | Forging Press, Hydraulic          |
| Alloys                             | Burner                    | Curvometer                  | Founding                          |
| Ammunition Hoist                   | Butter Worker             | Cutting Machines            | Friction                          |
| Anemometer                         | Butyrometer               | Cutting Tools               | Furnace                           |
| Annealing, Hardening and Tempering | Calculating Machines      | Damping Machines            | Gas Engine                        |
| Archimedes, Screw of               | Calender Machine          | Dash Wheel                  | Gas Plants                        |
| Babbitt's Metal                    | Calipers                  | Depth Recorder              | Gas Producers                     |
| Back-starching Mangle              | Calorimeter               | Die                         | Gill Frame                        |
| Bale-breakers                      | Carburetter               | Differential Machines       | Glass-blowing Machine             |
| Band-knife Cutting Machine         | Carding Engine            | Dividing Engines            | Glass Press                       |
| Barbed Wire Machinery              | Carpet-making Machinery   | Diving Bell                 | Graduation                        |
| Barker's Mill                      | Case-making Machine       | Doublers                    | Gravity Stamp                     |
| Barrel Organ                       | Casing-in Machine         | Dough Kneaders              | Grinding Machinery                |
| Bearings                           | Centrifugal Machines      | Dough Dividers and Moulders | Gyroscope and Gyrostat            |
| Beating Machine                    | Chisel                    | Dough Mixers                | Hackling and Spreading Machine    |
| Beetling Machine                   | Chronograph               | Drawing-box                 | Half-stuff Machine                |
| Bellows and Blowing Machines       | Chucks                    | Drawing-frame               | Hammer                            |
| Bessemer Convertor                 | Churn, Mechanical         | Drawing-office              | Hand Drill, Electric              |
| Bevel                              | Clepsydra, or Water-clock | Dredgers                    | Harrow                            |
| Bicycle                            | Clock                     | Dressing Machine            | Hat-making Machines               |
| Black-ash Revolving Furnace        | Coal-cutting Machines     | Drill                       | Hay Elevator                      |
| Blast Furnace                      | Coal-wedging Machines     | Drop Hammer                 | Hide Mill, or Double-Acting Stock |
| Blocking Machine                   | Coal-weighing Machine     | Drying Machine, Horizontal  | Hoe, Horse                        |
| Boiler                             | Coining Press             | Dye-jigger                  | Holden Burner                     |
| Bolt-screwing Machines             | Comber                    | Dynamo                      | Hydraulic Machines                |
| Book-sewing Machine                | Compressed-air Machines   | Dynamometer                 | Hydraulics                        |
| Boring Tools                       | Continuous Press          | Eccentric                   | Hydro-extractors                  |
| Brake, Hydraulic                   | Conveyors                 | Elevators, Lifts and Hoists | Ice-making Machines               |
|                                    | Copper                    | Error of Screws             | Indicator                         |
|                                    | Copying Machines          | Fans, Rotary                | Injector                          |
|                                    | Core-making               |                             |                                   |



|                        |                         |                        |                       |
|------------------------|-------------------------|------------------------|-----------------------|
| Integrators            | Mule, Crompton's        | Roller Washing Ma-     | Sun Copying           |
| Iron and Steel         | Nail Machines           | chine                  | Swathe Turners        |
| Ironing Machines       | Needle Machines         | Rolling, Mill          | Sweep Rake            |
| Jigger, Hydraulic      | Netting Machine         | Rope-making Machines   | Table, Mathematical   |
| Jigs                   | Oil Engine              | Rotary Washing Ma-     | Tea-weighing Machine  |
| Jute-Crusher           | Oil Muffle Furnace      | chines                 | Teasel                |
| Jute-Opener            | Opening Machine         | Rounding and Backing   | Technical Education   |
| Jute-softening Machine | Ore-Breaker             | Machines               | Testing Machines      |
| Kier                   | Pantograph              | Rusden and Eeles       | Thermodynamics        |
| Knitting Machines      | Paper - making Ma-      | Burner                 | Thrashing Machines    |
| Labour Legislation     | chines                  | Salt-cake Furnace, Me- | Throstle              |
| Lace Machines          | Patent logs             | chanical               | Tool                  |
| Lappet Looms           | Patents                 | Sawing Machines        | Tractors, Steam and   |
| Lathe, Automatic       | Perpetual Motion        | Scalpers               | Oil                   |
| Laundry Machines       | Phonograph              | Screw cutting          | Trepans               |
| Lever                  | Phosphor Bronze         | Screw - Gill Drawing   | Turbine               |
| Lifts, Hydraulic       | Pin Machine             | Frames                 | Turning Lathes        |
| Linotype Machine       | Pig-casting Machine     | Screw-thread gauge     | Turret Lathe          |
| Liquid-air Machine     | Planimeters             | Screw                  | Type-setting Machines |
| Lithographing Ma-      | Planing Tools           | Screwing Machine       | Typewriter            |
| chines                 | Plug and Ring Gauge     | Scutcher               | Units, Physical       |
| Loaders                | Pneumatic Hammer        | Separators             | Vacuum brake          |
| Lock                   | Potter's Wheel          | Sewing Machines        | Valve                 |
| Locomotives            | Power-loom              | Shaping Machines       | Vanners               |
| Loom                   | Power Transmission      | Shearing and Punching  | Vernier               |
| Lubricants             | Price-c o m p u t i n g | Machines               | Voting Machines       |
| Luggage-weighing ma-   | Weighting Machine       | Shuttles               | Vulcanizer            |
| chine, Automatic       | Printing Presses        | Signal Lever           | Washing Machines      |
| Machine                | Pulley                  | Silk-reeling Machine   | Wash Mill             |
| Machine Gun            | Pumps                   | Slide-rule             | Watch                 |
| Machine Moulding       | Purifiers               | Slime-tables           | Water Motors          |
| Mandrel Lathe          | Rag Boiler, Revolving   | Slotter Tools          | Water - pressure En-  |
| Mangling Machines      | Rag-breaking Engine     | Sowing Machines        | gines                 |
| Manometer              | Rake, Horse             | Spinning-jinny         | Water Wheels          |
| Measuring Machine      | Reaping Machines        | Splitting Machine      | Weaving Machinery     |
| Mercerizing Machines   | Reciprocating M a -     | Steam Engine           | Weighing Machines     |
| Metal-turning Tools    | chines                  | Steam Hammers          | Welder, Automatic     |
| Meter, Electric        | Rectifiers              | Steam Plough           | Welding               |
| Micrometer             | Reel Paper-Cutter       | Steam Turbines         | Welding, Electric     |
| Microtome              | Reels                   | Stentering Frame       | Winding Machines      |
| Milling Cutters        | Refrigerating Machines  | Still                  | Windmill              |
| Milling Machines       | Remontoire              | Stocking Frame         | Wire-winding Machine  |
| Milling Stock          | Reverbatory Furnace     | Strength of Materials  | Wiring Machine        |
| Monotype Machine       | Rifling Machine         | Sugar-making Machin-   | Wood - working Ma-    |
| Mortising Machine      | Ring-frame              | ery                    | chines                |
| Motors, Electric       | Rock Drill              | Sugar Weighing Ma-     | Woolen Mule           |
| Motor Vehicles         | Rod Gauge               | chine, Automatic       |                       |
| Mowers                 | Roller Milling Machine  | Sulphuric-Acid Plant   |                       |



## CHAPTER VII

### FOR MERCHANTS AND MANUFACTURERS OF METALS, HARDWARE, GLASS AND CHINA

**E**LISÉE RECLUS, the great French student of the origins of civilization, says, in the Britannica article FIRE (Vol. 10, p. 399), that "human culture may be said to have begun with fire, of which the uses increased in the same ratio as culture itself." The industries grouped in the present chapter all depend upon the curiously diverse effects of heat; the softening and tempering of metals, the hardening of clay and the changes by which sand becomes glass. It is for the reader himself to decide whether he wishes to begin his course of reading by a study of the article HEAT (Vol. 13, p. 135), and the allied articles to which it refers, and thus to understand how temperature plays its dominant part in the most useful of manufacturing processes.

It is, indeed, one of the most attractive features of the Britannica that it presents knowledge in *layers*. In text-books, the

**Knowledge in "Layers"** theoretical and practical aspects of an industry are so interwoven that you cannot separate them. But in the Britannica, if you desire only to examine the finished products of any branch of industry, as you might see them and hear them described at an exhibition or in a manufacturer's sample room, you can turn to articles and sections of articles in which critical comment and elaborate illustrations put clearly before you the

varieties of, for example, plated ware, china or glass. Proceeding to the next "layer," you find technical information about the manufacture of these and all other goods; you have been permitted to pass from the sample room into the factory, which is not usually so easy of access. And in the scientific articles you arrive at the very substratum and foundation of knowledge; you have what the experts in the factory could not give you if they would: the clear teaching that only the great masters of science can supply.

The manufacturer, of course, absolutely *needs* to know all that can be learned about the origin of his materials and the principles upon which his processes are based. But the dealer, in his turn, will be a shrewder buyer, a more convincing salesman and a better manager of the salesmen under him, if he knows the whole history of his wares, of the ingredients that enter into their composition and of their manufacture. Factory experience is hardly more universal among wholesale men, most of whom begin as clerks, than among retailers, and it is impossible for a business man who has got his foot fairly on the ladder to drop his work and go through an apprenticeship or take a thorough course at a technical college. If, however, he will for a few months devote his spare time to the studies he can pursue, unaided, in the Britannica, the insight he obtains

will give a new value to all the knowledge he picks up in the course of his business.

The departments of physics and physical chemistry are of course those in which the Britannica's scientific contents

especially interest those to whom this chapter is addressed, and the authority of

the Britannica in those departments of knowledge is shown by a very striking fact. You may remember that Alfred Nobel, the great Swedish chemist, who made a fortune by the invention and manufacture of dynamite, devoted \$9,000,000 to the establishment of the annual Nobel prizes, to be awarded, irrespective of nationality, for eminence in scientific research and in the cause of peace. In physics and chemistry, *Britannica contributors have won, in eleven years, seven of these prizes*, these winners being: in 1901, Prof. J. H. van't Hoff, of the University of Berlin; in 1902, Prof. Lorentz, of the University of Leiden; in 1904, Lord Rayleigh, Chancellor of the University of Cambridge; in 1906, Sir J. J. Thomson, of the University of Cambridge; in 1909, Prof. Ostwald, of the University of Leipzig; in 1911, Prof. Van der Waals, of the University of Amsterdam. In

other words, you find that the scientific committee who award the Nobel prizes select for these unique distinctions the same men whom the editor of the Britannica selected as contributors. Now apply another test, in connection with the subject matter of this chapter. What is, by general consent, the most exquisitely finished product of any of the industries under discussion in the present section? To this question there can be but one answer: Optical glass. Where is the best glass made? At the Zeiss Works in Jena, Germany. Very well, Dr. Otto Henker and Dr. Eppenstein, both of the scientific staff of the Zeiss Works, wrote the optical articles in the Britannica

which deal with the lens and with aberration in lenses. You should therefore remember, in reading the Britannica, that whether you are only going as far as the uppermost layer of knowledge, or reaching down to the very foundations of science, the men whose articles you are reading command the respect that you can pay to them by giving your very closest attention. Do not imagine that because the book contains forty-four million words, it is made to be skimmed; every article in it is condensed; and you cannot derive the fullest benefit from your reading unless you feel, as you would feel if you were fortunate enough to be brought into personal contact with any of these great men, that you have a privilege of which you must make the most.

Other chapters of this Guide also deal in detail with the scientific side of the industries mentioned here; and in examining the groups of industrial articles, those dealing with metals claim first considera-

tion. The article **METALS** (Vol. 18, p. 198) is devoted to classification only, and would not occupy more than ten pages of this Guide. It contains information as to the physical properties of the metals, including a table in which the specific gravity of each of 42 metals is stated, a table of comparative ductility under the hammer, for rolling and for wire drawing, a table of elasticities, and other tables showing the ratio of expansion under heat, the melting and boiling points, and the relative thermic and electric conductivity. A section is devoted to the action of chemical agents upon the simple metals.

**METALLURGY** (Vol. 18, p. 203), and **ELECTROMETALLURGY** (Vol. 9, p. 232), by W. G. McMillan, lecturer on metallurgy at Mason College, Birmingham, deal with all the methods of smelting ores. Your next reading should be the great article **IRON AND STEEL** (Vol. 14, p. 801), by Prof. H. M. Howe, of Columbia Uni-

versity, containing as much matter as would fill 110 pages of this Guide. At the beginning of this article Prof. Howe disposes of the much discussed question as to the true distinction between iron and steel, as to which there has been great confusion. Before 1860, the word "steel" was never applied to a metal that could not be hardened by tempering. But when the invention of the Bessemer and open-hearth processes introduced a new class of iron, "which lacked the essential property of steel, the hardening power, yet differed from the existing forms of wrought iron in freedom from slag," the men interested in the new product did not like to call it "wrought iron," which is what it really is, because that name would confuse it with a lower-priced grade of metal. They ought to have coined a new word for it, but they appropriated the name of steel—so that today "steel" means either true steel or the low-carbon, slagless variety of malleable iron. The article is divided into 133 sections, so that to analyze its contents would swamp this chapter of the Guide, but the reader will find in it the clearest and most authoritative account of the industry which has yet been published.

Among articles on the commercial metals are COPPER (Vol. 7, p. 102), LEAD (Vol. 16, p. 314), TIN (Vol. 26, p. 995), ZINC (Vol. 28, p. 981), ALUMINIUM (Vol. 1, p. 767), NICKEL (Vol. 19, p. 658), ANTIMONY (Vol. 2, p. 127), and, on the precious metals, GOLD (Vol. 12, p. 192), SILVER (Vol. 25, p. 112), and PLATINUM (Vol. 21, p. 805).

The article ALLOYS, of which Sir W. C. Roberts-Austen, long chemist of the London Mint, is the chief contributor, with its photomicrographic illustrations, contains not only an account of the alloys already generally used in the metal industries, but also practical information as to the experiments which have been made recently with some of the newly discovered rare earths. In the article METALLOGRAPHY (Vol. 18, p. 202), by

the same specialist, the microscopic examination and photography of metals and alloys is described.

Among articles on the metallic compounds are BRASS (Vol. 4, p. 433), in which "Dutch metal," "Mannheim gold," "similor" and "pinchbeck" are described; BRONZE (Vol. 4, p. 659), which deals with steel bronze, phosphor bronze, and other combinations; FUSIBLE METAL (Vol. 11, p. 369) is an important compound. PEWTER (Vol. 21, p. 338), by Malcolm Bell, author of *Pewter Plate*, etc., is of historical interest, and of value to the dealer or collector, while he who wishes to distinguish between the older and the more modern electroplated ware is referred to the article SHEFFIELD PLATE (Vol. 24, p. 824), also by Malcolm Bell. ELECTROPLATING (Vol. 9, p. 237) describes the art that put an end to the Sheffield plate industry. Other methods of coating metals are given under GALVANIZED IRON (Vol. 11, p. 428), TIN PLATE AND TERNE PLATE (Vol. 26, p. 1000), and GILDING (Vol. 12, p. 13). The art of making gold-leaf is described in GOLD-BEATING (Vol. 12, p. 202).

In regard to manufacturing processes there are the separate articles: FORGING (Vol. 10, p. 663), with 19 illustrations; FOUNDRY (Vol. 10, p. 743), with 11 illustrations; ANNEALING, HARDENING AND TEMPERING (Vol. 2, p. 70), and BRAZING AND SOLDERING (Vol. 4, p. 463). These four articles are by J. G. Horner. And see WELDING (Vol. 28, p. 500), also by Mr. Horner, with a section on *Electro-Welding*, by Elihu Thomson, inventor of the process of electric welding and expert for the General Electric Co. The article TOOL (Vol. 27, p. 14), another of Mr. Horner's valuable contributions, has 79 illustrations and possesses special interest for the manufacturer of metal-ware as well as the dealer in hardware.

Coming now to the production of metal wares, the article METAL-WORK (Vol. 18, p. 205), beautifully illustrated, is the work of three noted experts. The late

J. H. Middleton, Slade Professor of Fine Art, Cambridge University, writes on *Methods of Manipulation in Metal Work* and tells of the metal

work of Greece, Italy, Spain, Germany, France, England, Persia and Damascus. J. S. Gardner, an expert metal worker, deals with *Modern Art Metal Work*, and J. G. Horner contributes the section on *Industrial Metal Working*, in which he deals with *Plater's Work*, *Coppersmith's Work*, *Raised Work*, *Cast Work*, *Methods of Union and Protection of Surfaces*. In connection with the last mentioned subject, see also *JAPANING* (Vol. 15, p. 275), *LACQUER* (Vol. 16, p. 53), and *PAINTER-WORK* (Vol. 20, p. 457). Further information about lacquering, with valuable formulas, will be found in the article *JAPAN* (Vol. 15, p. 188). Some of the ornamental forms of metal work are described in *REPOUSSÉ* (Vol. 23, p. 108), by M. H. Spielmann, formerly editor of *The Magazine of Art*; *INLAYING* (Vol. 14, p. 574), and *DAMASCENING* (Vol. 7, p. 783). See also *GRILLE* (Vol. 12, p. 596).

*PLATE* (Vol. 21, p. 789), an article by H. R. Hall, of the British Museum, H. Stuart Jones, director of the British School at Rome, and E. A. Jones, author of *Old English Gold Plate*, etc., is a concise, complete hand-book on work in silver and gold of any class other than those of personal ornaments and coins. It is profusely illustrated with plates and text-cuts, showing many exquisite models; and the reader can master the details of style in different periods and countries. The subjects of the assay of gold and silver plate and hall-marks are discussed, the former being treated more fully in *ASSAYING* (Vol. 2, p. 776), by A. A. Blair, chief chemist of the U. S. Geological Survey. The article *ROMAN ART*, by H. Stuart Jones, has a section devoted to *Work in Precious Metals* (Vol. 23, p. 483).

*CUTLERY* (Vol. 7, p. 671) is one of the articles pertaining specifically to hardware manufacture and trade, in which

general processes of manufacture are described; and of allied interest are *KNIFE* (Vol. 15, p. 850), *FORK* (Vol. 10, p. 666), *SPOON* (Vol. 25, p. 733), *SCISSORS* (Vol. 24, p. 407), *SHEARS* (Vol. 24, p. 815), *RAZOR* (Vol. 22, p. 937), *CHAFING-DISH* (Vol. 5, p. 800), *NAIL* (Vol. 19, p. 153), *AXE* (Vol. 3, p. 67), *HAMMER* (Vol. 12, p. 897), *CHISEL* (Vol. 6, p. 247), *WIRE* (Vol. 28, p. 738), and *BARBED WIRE* (Vol. 3, p. 384). Articles describing all forms of agricultural implements will be found under their respective headings.

*GLASS* (Vol. 12, p. 86) is most complete in its consideration of the entire subject. The introductory section by H. J. Powell, of the Whitefriars Glass Works, London, author of *Glass Making*, and W. Rosenhain, of the National Physical Laboratory, London, deals with the manufacture of optical glass, blown glass and mechanically-pressed glass. The necessary qualities of each kind are stated and the newest processes of manufacture described, with full information about materials. The second part of the article is devoted to the *History of Glass Manufacture*, by Mr. Powell and Alexander Nesbitt, who wrote the well-known *Introduction* to the South Kensington Museum Catalogue of Glass Vessels. Egyptian, Assyrian, Roman, Venetian, Bohemian and Oriental glass, as well as the modern types, are exhaustively described. The article is splendidly illustrated. *DRINKING VESSELS* (Vol. 8, p. 580), by Dr. Charles H. Read, of the British Museum, describes old forms of glass cups and goblets. It is most valuable for its information in regard to styles of different countries and periods, and the illustrations show many types.

Stained glass is the subject of the separate article *GLASS, STAINED* (Vol. 12, p. 105), illustrated, by the late Lewis F. Day, author of *Windows, a Book about Stained Glass*. It is both historical and descriptive in its nature, deals with



painted and stained glass, contains a table of examples of important historical stained glass, and treats of the latest progress in the art, including the productions of La Farge and L. C. Tiffany in this country. The art of fitting and setting of glass is described in *GLAZING* (Vol. 12, p. 116), illustrated, by James Bartlett. Here we learn about the setting of window glass, the use of glass in decoration, systems of roof glazing and the use of wire glass.

Full information about glass for optical purposes will be found under *LENS* (Vol. 16, p. 421), illustrated, by Dr. Otto Henker, of the Carl Zeiss Factory, Jena, Germany; *LIGHTHOUSE, Optical Apparatus* (Vol. 16, p. 633), illustrated, by W. T. Douglass, who erected the Eddystone and Bishop Rock lighthouses, and Nicholas G. Gedye, chief engineer to the Tyne Improvement Commission; *TELESCOPE, Instruments* (Vol. 26, p. 561), illustrated, by H. Dennis Taylor and Sir David Gill; *PHOTOGRAPHY, Photographic Objectives or Lenses* (Vol. 21, p. 507), illustrated, by James Waterhouse; *SPECTACLES* (Vol. 25, p. 617).

To those engaged in the chinaware, pottery or porcelain manufacture and trade, the great article *CERAMICS* (Vol.

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Pottery and  
Porcelain**

5, p. 703) will prove a revelation. It is the joint product of a number of experts, both practical and artistic, including William Burton, chairman, Joint Committee of Pottery Manufacturers of Great Britain, Henry R. H. Hall and Robert Lockhart Hobson, both of the British Museum, and A. Van de Put and Bernard Rackham, both of the Victoria and Albert Museum. It is 85,000 words in length and contains over a hundred beautiful illustrations, including six plates in colour. It deals fully with the artistic and economic phases of the subject, the methods of manufacture, the different varieties of ceramics, their his-

tory, decoration, etc. Japanese ceramics are treated separately in *JAPAN, Ceramics* (Vol. 15, p. 183), illustrated, by the late Capt. Frank Brinkley.

*CLAY* (Vol. 6, p. 472), by Dr. J. S. Flett, describes the occurrence, composition and properties of the various clays used in ceramics.

*TERRACOTTA* (Vol. 26, p. 653), illustrated, by William Burton and H. B. Walters, of the British Museum, deals with the artistic use to which baked clay is put, while *TILE* (Vol. 26, p. 971), illustrated, also by William Burton, has great practical value for the present-day manufacturer.

*KAOLIN* (Vol. 15, p. 672), by F. W. Rudler, of the Museum of Practical Geology, London, deals specifically with china clay and its preparation for the market. *GILDING* (Vol. 12, p. 13) contains material on the subject of the gilding of pottery and porcelain, and *PAINTING* has a section *Painting with Coloured Vitreous Pastes* (Vol. 20, p. 484), by Prof. G. B. Brown, of Edinburgh University, which describes the use of these pastes in ceramics. *ENAMEL* (Vol. 9, p. 362), illustrated, by Alexander Fisher, yields equally valuable information for those concerned with the decoration of china.

In *MURAL DECORATION*, by Walter Crane and William Morris, there is a section devoted to *Wall-Linings of Glazed Brick or Tiles* (Vol. 19, p. 17). Material of great archaeological interest relating to earthenware, etc., will be found in such articles as *AEGEAN CIVILIZATION* (Vol. 1, p. 245), illustrated, by D. G. Hogarth, of the Ashmolean Museum, Oxford; *CRETE, Archaeology* (Vol. 7, p. 421), illustrated, by Arthur J. Evans, the famous Cretan explorer, and *GREEK ART* (Vol. 12, p. 470), illustrated, by Percy Gardner, the classical archaeologist.

The following is a partial list in alphabetical order of articles and subjects in this field treated in the *Britannica*.

ALPHABETICAL LIST OF ARTICLES AND SUBJECTS IN THE ENCYCLOPAEDIA  
BRITANNICA OF SPECIAL INTEREST TO THOSE IN METAL, HARD-  
WARE, GLASS AND CHINA MANUFACTURE AND TRADE

|                       |                         |                        |                              |
|-----------------------|-------------------------|------------------------|------------------------------|
| Adze                  | Damascening             | Hizen Ware             | Plated Ware                  |
| Aegean Civilization   | Damask Steel, or Da-    | Hoe                    | Plate-glass                  |
| Ainmuller, M. E.      | mascus Steel            | Horseshoes             | Plater's Work                |
| Alloy Steels          | Damascus Ware           | Ingot                  | Platinum                     |
| Alloys                | Delft Ware              | Inlaying               | Plough                       |
| Aluminium             | Della Robbia            | Invar                  | Porcelain                    |
| Amphora               | Derby Ware              | Iron and Steel         | Pot-hook                     |
| Andiron               | Doulton, Sir Henry      | Iron Work              | Potteries, The               |
| Annealing, Hardening  | Dresden, or Meissen,    | Izumo Ware             | Potter's Marks               |
| and Tempering         | Ware                    | Japan, <i>Ceramics</i> | Potter's Wheel               |
| Antimony              | Drinking Vessels        | Japanning              | Pottery                      |
| Anvil                 | Dwight, John            | Jug                    | Protection of Surfaces       |
| Armour Plate          | Electrolier             | Kaolin                 | Raised Work                  |
| Arms and Armour       | Electroplating          | Kashl                  | Rake                         |
| Arretine Ware         | Electrum                | Kiln                   | Razor                        |
| Assaying              | Enamel Painting         | Kioto Ware             | Reaper                       |
| Auger                 | Etruscan Ware           | Knife                  | Repoussé                     |
| Awl                   | Faience                 | Kuang-Yao              | Roman Art                    |
| Axe                   | Fender                  | Kuft Work              | Rookwood Ware                |
| Barbed Wire           | File                    | Kutani Ware            | R o y a l Copenhagen<br>Ware |
| Banko Ware            | Finiguerra, Maso        | Lacquer                | Royal Worcester Ware         |
| Basin                 | Fireback                | La Farge, John         | Salt Glaze                   |
| Beaker                | Firing                  | Lang-Yao               | Salver                       |
| Bellececk Ware        | Fire-irons              | Latten                 | Samovar                      |
| Bidri Work            | Flint Glass             | Lead                   | Saracenic Glass              |
| Binocular Instrument  | Fork                    | Lens                   | Satsuma Ware                 |
| Biscuit               | Forging                 | Lighthouse Apparatus,  | Saw                          |
| Bismuth               | Founding                | Optical                | Scissors                     |
| Bizen Ware            | Fusible Metal           | Lock                   | Sconce                       |
| Bohemian Glass        | Galvanized Iron         | Lubricants             | Screen                       |
| Bottle                | German (or Nickel)      | Lustred Ware           | Screw                        |
| Bow Ware              | Silver                  | Majolica               | Scythe                       |
| Bradawl               | Gilding                 | Meissonier, J. A.      | Sèvres Porcelain             |
| Brass                 | Gimlet                  | Medal                  | Shears                       |
| Brasses, Monumental   | Girandole               | Metal                  | Sheet Glass                  |
| Brazier               | Glass                   | Metallography          | Sheffield Plate              |
| Brazing and Soldering | Glass, Ancient          | Metallurgy             | Shovel                       |
| Bronze                | Glass-blowing Machine   | Metal Work             | Shuttle                      |
| Byzantine Glass       | Glass Cutting and En-   | Mezza Majolica         | Sieve                        |
| Cafferi, Jacques      | graving                 | Minoan, or Kamares,    | Silver                       |
| Candlestick           | Glass, Painted          | Ware                   | Smith                        |
| Capo di Monte Ware    | Glass-press             | Mirror                 | Solder                       |
| Capronnier, J. B.     | Glass, Stained          | Monstrance             | Spade                        |
| Cast Work             | Glazes                  | Morel-Ladeuil, L.      | Spectacles                   |
| Cellini, Benvenuto    | Glazing                 | Mural Decoration       | Spit                         |
| Ceramics              | Goblet                  | Nail                   | Spoon                        |
| Chafing Dish          | Gold                    | Needle                 | Spade                        |
| Chalice               | Gold and Silver Thread  | Nickel                 | Stone Ware                   |
| Chelsea Ware          | Gold-beating            | Niello                 | Table-ware                   |
| China                 | Gouge                   | Ormolu                 | Takatori Ware                |
| China, <i>Art</i>     | Gombroon Ware           | Owari Ware             | Tanagra Figures              |
| Chinese Porcelain     | Gouthière, Pierre       | Painter-work           | Tankard                      |
| Chisel                | Graffito Ware           | Palissy, Bernard       | Tazza                        |
| Churn                 | Grate                   | Palissy Ware           | Telescopic Instruments       |
| Clay                  | Greek Art               | Painting               | Terracotta                   |
| Cookworthy, William   | Grille                  | Pen                    | Thrasher                     |
| Coperta               | Hall-marks              | Persian Pottery        | Tiffany, C. L.               |
| Copper                | Hammer                  | Pewter                 | Tiffany Glass                |
| Coppersmith's Work    | Harrow                  | Photographic           | Tiles                        |
| Crete                 | Hatchet                 | tives or Lenses        | Tin                          |
| Crown Glass           | Henri-Deux, Oiron, or   | Pin                    | Tinker                       |
| Cup                   | St. Porchaire Ware      | Pitcher                | Tin and Terne Plate          |
| Cutlery               | Hispano-M o r e s q u e | Plaque                 | Tongs                        |
| Cultivator            | Ware                    | Plate                  |                              |



|          |                    |                   |                 |
|----------|--------------------|-------------------|-----------------|
| Tool     | Tube-making, Glass | Vase              | Wire            |
| Torchère | Turkish Pottery    | Venetian Glass    | Wired Glass     |
| Tray     | Tweezers           | Wedgewood, Josiah | Yatoushiro Ware |
| Tripod   | Trowel             | Wedgewood Ware    | Yi-Hsing-Yao    |
| Trivet   | Vacuum Cleaner     | Whitefriars Glass | Zinc            |

## CHAPTER VIII

FOR MERCHANTS AND MANUFACTURERS OF  
FURNITURE

**W**HEN you think of your home, making a picture in your mind of the familiar surroundings associated in your memory with your greatest pleasures, you are really thinking of furniture. Tradition makes the dwelling itself the tangible symbol of home, because when a primitive tribe ceased to be wanderers, the walls that excluded wild beasts and inclement weather and gave privacy were conspicuous evidences of a change for the better. But in our higher civilization our way of thinking has changed. Nothing seems to us more desolate than the bleak surfaces and harsh angles of an unfurnished house. Colour and softness and the curved lines which we instinctively love because they suggest softness come into the dwelling with furniture, and culture has progressed so far that the chair or bed must be a delight to the eye as well as to the weary

**Art and Industry**

limbs, that the dinner table and the bookcase must be so designed as to enhance the satisfaction we find in refreshing body and mind. You would not get so much pleasure as you do from your Encyclopaedia Britannica if its paper and print and pictures and the colour and texture of the bindings did not make it one of the chief adornments of your home; the volumes might be just as useful in a less pleasing guise, but you would not feel the same affection for the book.

To satisfy the spirit of home-love and

house-pride in the making of furniture is an art, and the idea that furniture can only be artistic when it is made by hand, from a design that is to be used but once, is as nonsensical as it would be to say that a beautiful etching is not true art because a press produces it and others like it. "Fine art is everything which man does or makes *in one way rather than another . . . .* in order to express and arouse emotion . . . . with results independent of direct utility." These words from Sir Sidney Colvin's delightful *Britannica* article *FINE ARTS* (Vol. 10, p. 361), and another passage (p. 370), in which he speaks of "the artificers who produce wares primarily for use, in a form, or with embellishments, that have the *secondary virtue of giving pleasure*," might well be quoted to the supercilious

and superficial critic  
**Form and Embellishment** who condemns every product which machinery has brought

within the reach of the less fortunately situated. Furniture, made in one form rather than another, because that one form gives greater pleasure, is artistic furniture whether it is made of machined pine chemically stained or of hand-worked and hand-polished rosewood. The manufacturer and dealer who ingeniously minimize the cost of production and distribution are benefiting the public just as truly as did Thomas Chippendale, "at once an artist and a prosperous man of business," or Thomas Sheraton, "the great artistic genius who

lived in chronic poverty." The adaptation and variation of their ideas, under modern conditions of manufacture, have given pleasure to tens of thousands for every one whose home was enriched by the original products.

We have, then, in the furniture business, the combination of an art with an industry of the most practical and useful kind, and this art is one which does more than any other to "express and arouse" the home-cherishing emotions which solidify family life. The principles which underlie architecture, sculpture, painting, metal work, embroidery and the weaving of patterns all affect the design

**Related  
Subjects**

of furniture, since its contours and surfaces are obtained by the application of the structural and decorative laws of all of them, and it might therefore be said that the only course of reading in the Britannica which could fully justify the title of this chapter would be one which covered all these diverse fields. The reader can, however, with the assistance of other chapters of this Guide, easily find his way to the Britannica's articles on each of these allied subjects, and an indication of the articles dealing specifically with furniture will at any rate serve his primary purpose.

The keystone article FURNITURE (Vol. 11, p. 363) is by James Penderel-Brodhurst, one of the greatest of living authorities, to whom many of the subsidiary articles are also due. The 37 illustrations on plate paper include two large views of the most famous and resplendent piece of furniture ever constructed, the cylinder desk, now in the Louvre Museum in Paris, made for Louis XV by a number of "artist-artificers," the chief among them Oeben and Riesener, with bronze mounts by Duplessis, Winant and Hervieux. The article explains the scanty attention paid to furniture in ancient Egypt, Rome and Greece, and throughout the Middle Ages in West-

ern Europe, as due to the routine of life in centuries during which people spent their days in the open air, and went to bed as soon as it was dark, therefore needing but few household appliances. The Renaissance was the first era of sumptuous and elaborately varied furniture; and it was not until the 18th century that the art of the cabinet-maker was fully developed. The English periods of Queen Anne and early Georgian craftsmanship and the reigns of Louis XV and Louis XVI brought the development to its high-water-mark. Since then, there

has been no really  
"Art Nouveau" new departure  
School except the "art nouveau"

"veau" school, which professed to be free from all traditions and to seek inspiration from nature alone. The revolution which was thus attempted was not successful, and the permanent influence of the movement will, in all probability, be less notable for its effect upon style than for the very great service it rendered in reviving the use of oak. Lightly polished, fumed or waxed, this wood, which was so long neglected, is the most effective that can be employed at moderate cost.

The oldest and most indispensable of all furnishings is treated in the article BED (Vol. 3, p. 612). The Egyptians had high bedsteads to which they ascended by steps, and the Assyrians, Medes and Persians followed the same custom. The Greek bed had a wooden frame, with a board at the head, and bands of hide laced across, upon which skins were laid. At a later period, as vase-paintings show, the Greeks used folding beds. Another ancient application of an idea commonly supposed to be of modern origin is found in the Roman use of bronze beds, and metal is so much more sanitary than wood for this purpose that it seems strange it was afterwards discarded for many centuries. The bed of the Emperor Eliogabalus was of solid silver,

with counterpane and hangings of purple embroidered in gold. In Pompeii wall-niches for beds, like those still used in Holland, are found, and were apparently closed by sliding partitions as well as by curtains. To our modern ideas, this arrangement seems to have been disgustingly devoid of ventilation, but the four-poster, with its "tester" roof and its curtains, which was widely used until the middle of the 19th century, was not much better. Mattresses developed very slowly, for in the 18th century pea-shucks and straw were the stuffing materials employed in houses of prosperous people, and hair had not come into use. The article gives a full and interesting account of the quaint custom, instituted by Louis XI of France, and followed by many of his royal successors, of a sovereign remaining in bed while he received the visits of his ministers and courtiers.

The chair, to us the commonest of objects, did not come into general use until, as the articles **BENCH** (Vol. 3, p. 715) and

#### **Chests and Chairs**

**STOOL** (Vol. 25, p. 967) indicate, these two had long been the usual seats. The

**CHEST** (Vol. 6, p. 106) was also used as a seat, and was the original form of wardrobe before hanging space and drawers were provided. The ecclesiastical chests, of great length in order that they might contain, without folding, church vestments stiff with embroidery, are the most ornate of all the models of furniture which have been preserved from the 13th and 14th centuries. The article **CHAIR** (Vol. 5, p. 801) shows that chairs were everywhere uncommon until the middle of the 16th century; and it was not until the 17th was well advanced that upholstery began to be employed for them. The typical Louis XVI chair, with its oval back and ample seat, descending arms, round-reeded legs and gay tapestry was the most beautiful and elaborate model that has ever been devised. But it was the original Chippendale design

and the still lighter patterns of Hepplewhite, Sheraton and Adam that gave us the slender, compact and easily moved chairs which will always be the more numerous. It is interesting to observe that the revolving chair, commonly regarded as an office convenience of modern origin, has a pedigree of no less than four centuries.

It would seem that the old English makers of furniture went somewhat astray when they gave themselves the general designation, still surviving, of "cabinet-makers"; for we learn from the article **CABINET** (Vol. 4, p. 918) that the elaborate cabinets which have come down to us from the 16th, 17th and 18th centuries are almost invariably of Italian, Dutch and French origin, and it was in other branches of work that the English were most successful. The **CUPBOARD**

(Vol. 7, p. 634) was

#### **Bookcases and Desks**

used to contain books long before the **BOOKCASE** (Vol.

4, p. 221) had assumed a distinct form, and in the earlier bookcases the volumes were either placed on their sides, or, if upright, were ranged with their backs to the wall and their edges outwards. Until printing had cheapened books, it was not the custom to mark the title on the back, and the band of leather which closed the volume, like the strap on an old-fashioned wallet, bore the inscription. Sheraton's satinwood bookcases were among the most elegant of all his pieces. The **DESK** (Vol. 8, p. 95) about the year 1750 had assumed the form which is now described as a library table—a flat top with a set of drawers on each side of the writer's knees, when its vogue was interrupted by the invention of the cylinder-top desk. At first the cover was a solid piece of curved wood, but the "tambour," or series of slats mounted on canvas proved more serviceable; and the American roll-top desk is now exported to all parts of the world. Other articles dealing with individual pieces of furniture

are **WARDROBE** (Vol. 28, p. 323), **SIDEBOARD** (Vol. 25, p. 38), **DRESSER** (Vol. 8, p. 577), **CHEFFONIER** (Vol. 6, p. 22), **CRADLE** (Vol. 7, p. 360), **BUFFET** (Vol. 4, p. 757), and **MIRROR** (Vol. 18, p. 575).

Of the more technical articles **TIMBER** (Vol. 26, p. 978) shows the comparative advantages of all the varieties of wood

### Technical Articles

used for furniture; and, as the list at the end of this chapter shows, there is a separate article on each kind. **TOOL** (Vol. 27, p. 14), by J. G. Horner, is of great importance. It would fill 75 pages of this Guide, and contains 79 illustrations. The furniture maker will find in it complete information about all the hand tools and machine tools used in the industry. **JOINERY** (Vol. 15, p. 476), by James Bartlett, describes, with practical diagrams, every variety of joint and dovetail. Sound guidance for the workshop will be found in **GLUE** (Vol. 12, p. 143), **PAINTER-WORK** (Vol. 20, p. 457), **LAC** (Vol. 16, p. 35), **LACQUER** (Vol. 16, p. 53), in regard to which there is also information in the article **JAPAN** (Vol. 15, p. 188), **FRENCH POLISH** (Vol. 11, p. 154), **WEAVING**, *Industrial Technology* (Vol. 28, p. 440), **DYEING** (Vol. 8, p. 744), by Profs. J. J. Hummel and Edmund Knecht; **REP** (Vol. 23, p. 105), **TAPESTRY** (Vol. 26, p. 403), with numerous illustrations, by A. S. Cole; **SILK**, *Manufacture* (Vol. 25, p. 102); **PLUSH** (Vol. 21, p. 857), **VELVET** (Vol. 27, p. 979), **MARBLE** (Vol. 17, p. 676), by J. S. Flett; **ONYX** (Vol. 20, p. 118); and **ALABASTER** (Vol. 1, p. 466).

Although wood, ivory, precious stones, bronze, silver and gold have been used from antiquity for the decorations of

### Decoration and Ornament

furniture, the modern maker will be more concerned with **WOOD-CARVING** (Vol. 28, p. 791), illustrated, by F. A. Crallan, author of *Gothic Wood-carving*. In this article materials and methods are described, and there is much information

as to the domestic use of wood-carving. The article will be most valuable to manufacturers and dealers who have to do with church fittings. **GILDING** (Vol. 12, p. 13) and **CARVING AND GILDING** (Vol. 5, p. 438) impart knowledge of a practical nature as to these processes. The art of inlaying is described in **MARQUETRY** (Vol. 17, p. 751) and **BOMBAY FURNITURE** (Vol. 4, p. 185); see also **VENEER** (Vol. 27, p. 982). Materials other than wood used for inlaying are described, as, for example, **PEARL** (Vol. 21, p. 25) for pearl and mother of pearl; **IVORY** (Vol. 15, p. 92), **LAPIS LAZULI** (Vol. 16, p. 199), **TORTOISE-SHELL** (Vol. 27, p. 71), **BRASS** (Vol. 4, p. 433), etc. The mention of the last two

materials naturally suggests the name of **Biographical  
Articles** **BOULLE** and the

Britannica's biography of that artist. Such biographies, as anyone interested in the subject knows, are most difficult to find, and they are included in much detail in the new Britannica. **BOULLE** (Vol. 4, p. 321) was the most distinguished of modern cabinet-makers before the middle of the 18th century; and, beginning with that date, both France and England produced a number of men whose renown is scarcely less than that of the great painters, sculptors, architects or musicians of the period. The Britannica's accounts of their lives, ideas and work will be of much value and interest to those who make or deal in furniture. For the French schools we get the essential facts about, for example, **OEBEN** (Vol. 20, p. 11), to whom Louis XV's famous desk owes its general plan; **RIESENER** (Vol. 23, p. 324), his more celebrated pupil, who completed the desk; **RÖNTGEN**, **DAVID** (Vol. 23, p. 693), the maker of "harlequin furniture," several of whose ingenious mechanical devices are described; and **GOUTHIERE** (Vol. 12, p. 291), the metal-worker whose furniture mounts are among the most noted art products of the Louis XV and XVI periods. **CHIPPENDALE** (Vol. 6, p. 237),

with whom arose the marvellously brilliant school of English cabinet-makers, is the subject of a biography describing fully the characteristics of his designs; and the history of this school is continued under such headings as **HEPPLEWHITE** (Vol. 13, p. 305), whose taste at its best "was so fine and so full of distinction, so simple, modest and sufficient that it

amounted to genius"; **ADAM, ROBERT** (Vol. 1, p. 172), who left so deep and enduring a mark upon English furniture, and **SHERATON** (Vol. 24, p. 841), "the most remarkable man in the history of English furniture," whose extravagant creations marked the end of the great school. Many other biographies are included in the list appended.

ALPHABETICAL LIST OF ARTICLES, INCLUDING BIOGRAPHIES, IN THE ENCYCLOPAEDIA BRITANNICA WHICH ARE OF SPECIAL INTEREST  
TO FURNITURE MANUFACTURERS AND DEALERS

|                       |                     |                      |                     |
|-----------------------|---------------------|----------------------|---------------------|
| Acacia                | Cradle              | Juniper              | Riesener, J. H.     |
| Adam, Robert          | Crash               | Kauri Pine           | Rococo              |
| Agate                 | Cressent, Charles   | Lac                  | Röntgen, David      |
| Ailanthus             | Cretonne            | Lacquer              | Rosewood            |
| Alabaster             | Crunden, John       | Lampstand            | Rousseau de la Rot- |
| Alder                 | Cryptomeria         | Lapis Lazuli         | tière, J. S.        |
| Algum                 | Cupboard            | Larch                | Sabicu Wood         |
| Arabesque             | Curtain             | Leather              | Satin Wood          |
| Arbor Vitae           | Cushion             | Leather, Artificial  | Screen              |
| Armoire               | Cypress             | Le Pautre, Jean      | Sequoia             |
| Arts and Crafts       | Damask              | Lime, or Linden      | Settee              |
| Ash                   | Dammar              | Linen-press          | Settle              |
| Bahut                 | Date Palm           | Liquidambar          | Shearer, Thomas     |
| Bamboo                | Design              | Lock                 | Sheraton, Thomas    |
| Baroque               | Desk                | Lock, Matthias       | Sideboard           |
| Barry, Sir Charles    | Divan               | Lowboy               | Silk                |
| Basin-stand           | Dresser             | Mahogany             | Sofa                |
| Basket                | Dumb-Waiter         | Mammee Apple         | Spruce              |
| Bed                   | Duramen             | Manwaring, Robert    | Stall               |
| Beech                 | Dyeing              | Maple                | Stool               |
| Bérain, Jean          | Fbony               | Maple, Sir John B.   | Table               |
| Birch                 | Electroplating      | Marble               | Tallboy             |
| Bombay Furniture      | Elm                 | Marot, Daniel        | Tapestry            |
| Bonheur du Jour       | Embossing           | Marquetry            | Tea-caddy           |
| Bookcase              | Encoignure          | Mastic, or Mastich   | Teak                |
| Bouffe, André Charles | Etagère             | Mayhew, Thomas       | Tea-poy             |
| Box                   | Fir                 | Meissonier, J. A.    | Textile Printing    |
| Boxwood               | Footman             | Mirror               | Throne              |
| Brass                 | Frame               | Moreton Bay Chestnut | Ticking             |
| Brocade               | French Polish       | Morris, William      | Timber              |
| Buffet                | Furniture           | Nettle Tree          | Tortoiseshell       |
| Carving and Gilding   | Gilding             | Oak                  | Tray                |
| Casket                | Gillow, Robert      | Oeben, J. F.         | Triclinium          |
| Cassone               | Glue                | Olive                | Tripod              |
| Casuarina             | Gouthière, Pierre   | Onyx                 | Turpentine          |
| Cedar                 | Halfpenny, William  | Ormolu               | Upholsterer         |
| Chair                 | Hazel               | Ornament             | Varnish             |
| Cheffonier            | Hepplewhite, George | Osier                | Velvet              |
| Chenille              | Hickory             | Ottoman              | Velveteen           |
| Cherry                | Holly               | Overmantel           | Vernis Martin       |
| Chest                 | Huon Pine           | Painter-work         | Walnut              |
| Chéstrnut             | Ince, William       | Pearl                | Wardrobe            |
| Chintz                | Ingle-nook          | Pergolesi, M. A.     | Washstand           |
| Chippendale, Thomas   | Inlaying            | Pigments             | Weaving             |
| Coco-nut Palm         | Iron                | Pine                 | What-not            |
| Coffer                | Ivory               | Plane                | Willow              |
| Console               | Japan, Art          | Plush                | Window-cornice      |
| Copal                 | Japanning           | Prie-dieu            | Window-seat         |
| Copeland, Henry       | Jarraah Wood        | Rep                  | Wine Table          |
| Corduroy              | Johnson, Thomas     | Resin                | Wood-carving        |



## CHAPTER IX

### FOR MERCHANTS AND MANUFACTURERS OF LEATHER AND LEATHER GOODS

**T**HE purpose of the department of the Guide in which this chapter appears, addressed to persons engaged in certain important occupations, is not only to show them how Britannica-reading will enlarge their knowledge of some aspects and relations of their business, but also to show how Britannica-reading will help them to realize the importance of *educating the general public* in regard to that business. This education of the public is not necessarily confined to advertising, although the best form of advertising that can be used by anyone who sells a good article, or an article that is good at its price, is probably to tell the public what it really is and how it is really made. In the direct personal intercourse between salesman and purchaser there is opportunity for the imparting of information which, if it possesses genuine interest, will be gladly received and will stimulate trade. Mere praise of an article is uninteresting and unconvincing; while facts that explain *why* that article is adapted to a particular use, and *why* it is better than another article sold at a lower price will always receive attention.

All this is especially true of leather goods, for the public ignorance on the subject of leather is abysmal. Nothing is more universally

#### About Selling Leather Goods

used, yet ninety-nine out of a hundred who use it not only do not know what lies beneath the surface of it, but do not know that there is any difference in value between a natural grain surface and a mechanically grained false surface, and it is quite certain that nearly all the men and women who walk

out of a store after buying skiver would be nonplussed if they were asked whether the upper or lower part of a split skin was the best.

Both the leather merchant and the public would be delighted to hear some of the curious things that the Britannica tells about leather, which is, from any point of view, one of the most interesting of all commodities; although few of those who use it, and perhaps as few of those who deal in it, ever stop to think how curious a relation there is between the original nature of the material and the qualities of the finished product. In cattle and sheep, the hide is a garment that covers every part of the body but the feet. Adapted to our own use, its most important service as a garment is to cover our feet. It is so far a natural product that no imitation of it possesses any of its chief merits, and yet so far an artificial product that when the hide has been removed from an animal, it requires treatment in order that it may not lose the flexibility which makes it, for a thousand purposes, more valuable than wood or metal, and in order that it may not decay.

Skin is waterproof because its surface consists of scales, and although in most quadrupeds, as in man, these scales are so small as to be invisible, they will so resist the entrance of

#### What Skin Is

any tan liquor or other preservative fluid that they must be scraped away before the skin can be treated. Under these horny scales there is a layer of soft cells, and under this a membrane which makes the natural grain surface of leather. Under this, again, lies the "true" skin, in



two layers. In the upper of these two, the white fibres lie parallel with the grain. In the lower, the white fibres, which are here coarser, lie in bundles, bound together by yellow fibres, so that this layer is really a woven fabric. The spaces in the weave are filled with a soft jelly, and the fibres do not multiply among themselves, as cells do, but are developed, as they are needed, from this jelly. Tan liquor has the peculiar property of converting this jelly into a "leathery" substance, which although it does not then assume the shape of fibres, becomes nearly as tough as the fibres themselves, and thus makes leather more solid and stronger than the original skin; and the virtue of leather depends largely on the presence of this jelly. The body of an old bull will have absorbed it, just as fat

is absorbed in old age, so that the spaces in the weave of the fibre are left vacant, and (as the scaly outer surface of the skin has been scraped away to admit the tan liquor) any water with which the hide comes into contact will be soaked up. That is why old bull leather is not waterproof and is lacking in substance. Again, the weave of this innermost layer of skin, lying next to the flesh, varies in different animals. In sheepskin the fibres are very loosely woven, and for this reason great care is needed in preparing the leather, and when the skin is split, the under half is only fit for the light usage to which "chamois" leather is restricted. But however the quality, surface or thickness of the skin may differ, its true structure is the same in all animals used for leather, save the horse, which is exceptional in possessing, over the loins, a third skin, very closely woven and very greasy, which makes horsehide taken from this part of the body peculiarly waterproof, pliable and durable.

As you are in the leather business, you probably knew all these facts already, but perhaps they were not arranged in your

mind in a form in which you could explain them to others as clearly as you will be able to do after reading the articles in the Britannica from which this general statement is summarized. And when you are reading about any other business, or about any other subject of any kind, you will find that the Britannica goes to the root of the subject in the same thorough way in which it deals with the fibres and the jelly that make up the substance of leather. Now for the articles in detail—or the principal ones; the others are sufficiently indicated by the list at the end of this chapter.

SKIN (Vol. 25, p. 188), by Dr. F. G. Parsons, vice-president of the Anatomical Society of Great Britain and Ireland, with illustrations from microscopic enlargements, covers the comparative anatomy of the skin in all groups of animals, and the process of skin development in the embryo. The articles mentioned in the chapter *For Stock-Raisers* tell you about the domestic animals whose hides are chiefly used for leather. The chapter on *Zoology* in this Guide gives a list of the articles on the other animals whose skins are tanned for fancy leathers. The main article LEATHER (Vol. 16, p. 330), equivalent to 50 pages of this Guide, is by Dr. James G. Parker, principal of the Leather-sellers' Technical College, London, and author of *Principles of Tanning* and other standard trade text-books. After explaining the distinctions between tanned, tawed, and chamoised leathers, it takes up the subject of sources and qualities of hides and skins, and describes the structure of skin in relation to the finished product. The characteristics and peculiarities of hides and skins from different parts of the world are thoroughly explained. We learn why hides from animals bred in mountainous districts are the best, and where the finest sheep- and goat-skins come from.

*Tanning Materials* is the subject of the next section. These are classified into pyrogallols, catechols, and subsidiary ma-

terials; and the article describes their composition and preparation by grinding, with explicit directions for their

### Processes of Tanning

rections for their testing, including the latest official method of the International Association of Leather Trades Chemists. The processes of making heavy leathers are next discussed. We learn the many ways of cleaning, softening, depilating, and fellingmongering (or dewooling) by liming, rounding and scudding, and finally the process of actual tanning in its three steps of colouring, handling, and laying away. In connection with depilation, it is interesting to note that it has been discovered that it is not the lime but the action of bacteria in the lime which causes the hair to fall out. The finishing of sole leather, harness leather and other grades is explained, also the theory of the formation of the "bloom" and its removal, as well as the process of "scouring." The art of *Currying* has a section to itself, and the preparations for tanning or dressing hides for trunks and suit cases by bating, puering, scudding, plumping, drenching and splitting, receive detailed attention. The tanning of light leathers, and all the varieties of basils, skivers, Russia leather, seal, alligator, snake, frog and kangaroo leathers, Japan and enamel leathers are fully treated. *Tawing, Wooling, Dressing, Chrome Tanning, Combination Tannages, Oil Tanning* (Chamoising), *Preller's Helvetia or Crown Leather, Transparent Leather, Parchment, Tar and Peat Tanning, Dyeing, Staining and Finishing, Glove Leathers, and Bookbinding Leathers* are some of the other sections of this excellent treatise. LEATHER, ARTIFICIAL (Vol. 16, p. 345) is a separate article.

TANNIN, or TANNIC ACID (Vol. 26, p. 399) is a general account of the vegetable products which have the property of converting raw hide into leather. Specific information about the materials from which the pyrogallol tannins are obtained will be found under MYROBALANS (Vol.

19, p. 114), CHESTNUT (Vol. 6, p. 112), DIVIDIVI (Vol. 8, p. 332), SUMACH (Vol. 26, p. 70), OAK (Vol. 19, p. 931), GALLS (Vol. 11, p. 422) a full and interesting account of the insect-

produced vegetable excrescence which yields a high percentage of tannin, by Francis H. Butler, of the Royal School of Mines; and WILLOW (Vol. 28, p. 688). For the catechol tannins see HEMLOCK (Vol. 13, p. 262), CATECHU (Vol. 5, p. 507), MANGROVE (Vol. 17, p. 572), MIMOSA (Vol. 18, p. 500), LARCH (Vol. 16, p. 211), BIRCH (Vol. 3, p. 958), which yields the empyreumatic oil used in the preparation of Russia leather, to which the pleasant odor is due.

There are numerous articles in the Britannica on the chemicals used in the process of tawing, chrome tanning, etc., such as ALUM (Vol. 1, p. 766), ACETIC ACID (Vol. 1, p. 135), GLAUBER'S SALT (Vol. 12, p. 114), BICHROMATES AND CHROMATES (Vol. 3, p. 912).

The chief classes of dyes used for leather are the acid; basic, or tannic; direct, or cotton; and mordant dyes, and these are described at great length in a valuable article DYEING (Vol. 8, p. 744),

### Dyeing

equivalent to 20 pages of this Guide, by the late J. J. Hummel, professor of Dyeing, University of Leeds, and Dr. Edmund Knecht, professor of Technological Chemistry, University of Manchester. The section on the *Theory of Dyeing* shows how the dyeing property of a substance depends upon its chemical composition. Separate articles go more deeply into the chemistry of dyeing materials used with leather, and some of the more important of these are SULPHONIC ACIDS (Vol. 26, p. 60), SULPHURIC ACID (Vol. 26, p. 65), FORMIC ACID (Vol. 10, p. 668), ANTIMONY (Vol. 2, p. 127), TITANIUM (Vol. 26, p. 1017), IRON (Vol. 14, p. 796), LOGWOOD (Vol. 16, p. 922), FUSTIC (Vol. 11, p. 375), BRAZIL WOOD (Vol. 4, p. 463),

and TUMERIC (Vol. 27, p. 474). Comparatively few of the coal-tar colours have as yet been adapted to leather manufacture, but their characteristics are discussed in such articles as AZO-COMPOUNDS (Vol. 3, p. 81), ANILINE (Vol. 2, p. 47), INDULINES (Vol. 14, p. 507), FUCHSINE (Vol. 11, p. 273), and SAFRANINE (Vol. 23, p. 1000).

PARCHMENT (Vol. 20, p. 798), by Sir E. Maunde Thompson, Principal Librarian, British Museum, is an interesting historical account of the skins and their preparation. Their use as writing material was widespread at a very early period. "The Jews made use of them," says the article "for their sacred books, and it may be presumed for other literature also; and

the old tradition has been maintained down to our own day, requiring the Synagogue rolls to be inscribed on this time-honoured material." The difference between parchment and vellum is explained. SHAGRÉEN (Vol. 24, p. 769) tells about a species of untanned leather used for ornamental purposes. It is a

curious fact that the addition of the word "chagrin," for anxiety or annoyance, to the English language was due to the unpleasant sensation that came from touching the rasping surface of this leather. Stamped leather for wall hangings is described in the section *Stamped Leather* of the article MURAL DECORATION (Vol. 19, p. 19), by William Morris and Walter Crane. SHOE (Vol. 24, p. 992) contains an illustrated section on the *Manufacture of Leather Shoes*. SADDLERY AND HARNESS (Vol. 23, p. 988), by Cecil Weatherly, and GLOVE (Vol. 12, p. 135) are treated both from an historical and a practical point of view. BOOKBINDING (Vol. 4, p. 216), illustrated, by C. J. H. Davenport, of the British Museum, has a great deal of interesting information about the leathers used in this art. The flexible binding, which has been applied for the first time on a large scale in the new Britannica, originated when vellum instead of paper was used for books, and it possesses the great advantage that a volume sewed in this way can be opened flat, and lies flat without being held.

ALPHABETICAL LIST OF ARTICLES AND OF SUBJECTS IN THE ENCYCLOPAEDIA BRITANNICA OF SPECIAL INTEREST TO THOSE IN THE MANUFACTURE AND SALE OF LEATHER AND LEATHER GOODS

|                       |                         |                         |                       |
|-----------------------|-------------------------|-------------------------|-----------------------|
| Acetic Acid           | Bottle-tanning          | Dressing                | Handlers, or Floaters |
| Acid dyes             | Brazil Wood             | Drum Dyeing             | Heavy Leathers        |
| Aldehyde tanning      | Canalgre                | Dusting Material        | Hemlock               |
| Algarobilla           | Catechols               | Dyeing                  | Hide Mill, or Double- |
| Alligator Leather     | Catechu                 | Enamel Leather          | Acting Stocks         |
| Alum                  | Chamoising              | Erodiin                 | Hide-powders          |
| Angols                | Chestnut                | Fatliquoring            | Hides and Skins       |
| Aniline               | Chestnut Oak            | Fellmongering, or De-   | Indulines             |
| Antimony              | Chrome Box              | wooling                 | Iron                  |
| Azo Compounds         | Chrome Tanning          | Finishing               | Iron Tannage          |
| Barkometer            | Colouring Pits, or Sus- | Formic Acid             | Janus Colours         |
| Basic, or Tannin dyes | penders                 | Frog Skin               | Japan Leather         |
| Basils                | Combination Tannages    | Fuchsine                | Kangaroo Leather      |
| Bates                 | Crust Stock             | Fustic                  | Kaspine Leather       |
| Bating                | Currying Apparatus      | Galls                   | Klips                 |
| Bichromates and Chro- | Currying Processes      | Gambier                 | Larch                 |
| mates                 | Dash-wheel              | Glauber's Salt          | Leather               |
| Birch                 | Depilation              | Glazing (Glacé leather) | Levant, Artificial    |
| Bleaching             | Direct, or Cotton, Dyes | Glove                   | Levant Morocco        |
| Bloom                 | Dividivi                | Glove Leathers          | Liming                |
| Bookbinding           | Dongola Leather         | Grinding Machinery      | Logwood               |
| Bookbinding Leathers  | Drenching               | and Leaching            | Mangrove              |

|                              |         |                      |                        |                        |                              |
|------------------------------|---------|----------------------|------------------------|------------------------|------------------------------|
| Mimosa, or<br>Wattle         | Golden  | Preller's<br>Crown   | Helvetia or<br>Leather | Skivers                | Tawing                       |
| Mordant dyes                 |         | Puering              |                        | Snakeskin              | Tiffany Bate                 |
| Morocco Leather              |         | Pyrogallols          |                        | Splitting Machines     | Titanium                     |
| Myrobalans                   |         | Quebracho            |                        | Staining               | Transparent Leather          |
| Oak bark                     |         | Roans                |                        | Sulphonic Acids        | Tray Dyeing                  |
| Oak wood                     |         | Russia Leather       |                        | Sulphuric Acid         | Turmeric                     |
| Oil Tanning                  |         | Saddlery and Harness |                        | Sumach                 | Upper Leather                |
| Parchment                    |         | Safranine            |                        | Sweating               | Valonia                      |
| Payne and<br>Process         | Pullman | Sammying             |                        | Tan Liquors            | Vellum                       |
| Peat Tanning                 |         | Scudding             |                        | Tanner's Beam          | Vidal Colours                |
| Pigskin                      |         | Seal Leathers        |                        | Tanner's Hook          | Waxing                       |
| Portmanteau                  |         | Setting              |                        | Tanner's Knives        | Willow                       |
| Power Transmission,<br>Belts |         | Shagreen             |                        | Tannin, or Tannic Acid | Willow Calf                  |
|                              |         | Shoe                 |                        | Tannin Precipitation   | Wilson Scouring Ma-<br>chine |
|                              |         | Skin                 |                        | Tanning Materials      | Wool-rug Dressing            |
|                              |         |                      |                        | Tar Tanning            |                              |

## CHAPTER X

### FOR JEWELLERS, CLOCK AND WATCH MAKERS AND MERCHANTS

**B**Y long established custom, watches and the higher grade of clocks form part of the jeweller's stock, and he sells a few other articles of utility, such as purses and bags, but to all intents and purposes he shares with the artist and art-dealer the distinction of making a living by adding pleasure to the lives of others. The very word "jewelry" carries, in its root form, the idea of joy; and when a Senwosri princess, 43 centuries ago, smiled happily as she raised her brown arms to fasten the clasp of a new necklace, the jeweller of Memphis on the Nile no doubt took his little profit, as the jeweller of Memphis on the Mississippi takes his to-day, all the more gladly for being, in the oriental phrase, a "Distributor of delights." Sour philosophers have always sneered at women for loving jewels, and most of all for piercing their ears and noses to vary its display, but the nose-ring that overhangs a thick Nubian lip is an expression of the same charming instinct that makes a child diversify the arrangement of her daisy-

chains. And jewelry plays its part in the higher emotions as well as in the pretty vanities; witness the engagement ring, the marriage ring and all the uses, described in the Britannica, of jewels as religious symbols.

The article JEWELRY (Vol. 15, p. 364), by A. H. Smith, the official in charge of the great jewel collection in the British

Museum, contains nearly a hundred illustrations, half of them on plate paper, which include examples of every period and every variety of the jeweller's art, and these, with the illustrations in other articles mentioned in this chapter, are so full of interest to the jeweller's customers that he ought really to keep his Britannica at his place of business rather than at his house. It is, at any rate, amusing to recall that in a speech made by the Editor-in-chief of the Britannica, on the occasion of a banquet given to celebrate the completion of the new edition, he remarked that when he had chanced to



take home the proof sheets of this article, to read them at night, he carefully kept them out of his wife's sight lest they might suggest too tempting possibilities. The article divides modern jewelry into three classes:

(1) *objects in which gems and stones form the principal portions, and in which the work in silver, platinum or gold is really only a means for carrying out the design by fixing the gems or stones in the position arranged by the designer, the metal employed being visible only as a setting;*

(2) *when gold work plays an important part in the development of the design, being itself ornamented by engraving (now rarely used) or enamelling or both, the stones and gems being arranged in subordination to the gold work in such positions as to give a decorative effect to the whole;*

(3) *when gold or other metal is alone used, the design being wrought out by hammering in repoussé, casting, engraving, chasing or by the addition of filigree work, or when the surfaces are left absolutely plain but polished and highly finished.*

The second of these three classes includes the work which has completely revolutionized the theory of design, so far as the best class of trade is concerned, since the Paris International Exposition of 1900 first drew general attention to the exquisite creations of Lalique and his school. L. C. Tiffany, in the United States, and Philippe Wolfers, in Belgium, have done more than any designers other than the French to extend this new movement; but in England, Germany, Austria, Russia and Switzerland there has been a notable increase of individual effort and purpose, and a recognition of the possibilities of personal art as at any rate an important factor in the business. Side by side with this development new standards have been established in mechanical work. "Nearly every kind of gold chain now made is manufactured by machinery, and nothing like the beauty of design or perfection of workmanship could be obtained by hand at, probably, any cost." The article, equivalent in length to about 35 pages of this Guide, contains a full

review, amplified by the results of the most recent excavations (some of them undertaken expressly for the archaeological purposes of this edition of the Britannica) of the history of jewelry, Egyptian, Assyrian, Mycenaean, Greek, Etruscan, Roman, Merovingian, Oriental and Renaissance.

RING (Vol. 23, p. 349), of which Prof. Middleton, long art director of the South Kensington Museum, is the chief contributor, is another copiously illustrated article. Among the curious items of information it contains, there is the unromantic origin of the engagement ring (which may be cited by the jeweller to prove that it should always be a costly one), the ancient Romans regarding it as a pledge to assure the donor's fulfilment of his promise; the fact that the modern rheumatism ring had its medieval forerunner in the rings, blessed by the sovereign, which were worn as a preservative against cramp; and the description of the old poison rings, which were of two kinds: those merely affording, in the bezel, a secret receptacle so that the poison might

be always at hand for suicide, and those provided with a hollow point to which, on touching a spring, the venom ran as in a snake's fang, so that the murderer could give a fatal scratch while shaking hands with his victim. BROOCH (Vol. 4, p. 641) traces, with many illustrations of typical specimens, the "fibula" or safety pin from its origin in Central Europe during the Bronze Age, through the modifications which introduced the bow shape, providing space for thicker folds of cloth, to the modern ornament. The long brooch is not a new fashion, for silver brooches no less than 15 inches in length have been found in Viking hoards of the 7th, 8th and 9th centuries. EAR-RING (Vol. 8, p. 798) describes ear "ornaments" of the most grotesque size. In Borneo the hole in the ear lobe is stretched to a calibre of  $3\frac{3}{4}$  inches, but the Masai

tribes in equatorial Africa far outdo this, stretching the lobes, year after year, until they can wear stone ear-plugs weighing 2 lbs. 14 ozs. each, with a diameter of  $4\frac{1}{2}$  inches; and they thus achieve the supreme elegance of making the two long flaps of flesh meet above their heads. It is also curious to note the custom of some oriental tribes of wearing one earring only. BRACELET (Vol. 4, p. 359) describes the three distinct models worn by the Israelites, all of which the Authorized Version calls "bracelet," although the original Hebrew has separate names for them. Armlets have always been conspicuous in the regalia of Eastern kings, and the pair captured at Delhi and taken to Persia by Nadir Shah in 1739 contain jewels valued at more than \$5,000,000, including the famous "Sea of Light" diamond, which, although it weighs only 186 carats as against the  $516\frac{1}{2}$  of the largest fraction into which the Cullinan stone was cut, is unique as possessing the finest lustre of any known specimen. The 24 plate illustrations in the article SCANDINAVIAN CIVILIZATION (Vol. 24, p. 287), by Miss B. S. Phillpotts, show some exquisite designs of clasps, collars and pins exhumed in Denmark, Norway and Sweden, and supposed by some authorities to antedate the oldest Egyptian jewelry.

The article GOLD (Vol. 12, p. 192) is a thorough workshop treatise, as well as a detailed study of existing mines and of

Precious Metals production exerts upon the "price," if it can be so called, of a metal which is its own standard of value. SILVER (Vol. 25, p. 112) and PLATINUM (Vol. 21, p. 805) are treated with similar comprehensiveness. The articles ALLOYS (Vol. 1, p. 704), ASSAYING (Vol. 2, p. 776), METAL (Vol. 18, p. 198), METALLOGRAPHY (Vol. 18, p. 202), and METALLURGY (Vol. 18, p. 203), all by noted authorities, are full of information useful to the jeweller. METAL-WORK (Vol. 18, p. 205), fully illustrated, inci-

dentally touches upon the art of the silver- and gold-smith; and this branch of the subject is also treated in such articles as PLATE (Vol. 21, p. 789), with over 30 typical illustrations—a most interesting historical account, by several well-known experts, of works in gold and silver which belong to any class other than those of personal ornament and coins; and DRINKING VESSELS (Vol. 8, p. 580), illustrated, by Dr. Charles H. Read of the British Museum, which discusses gold and silver cups. Mention must also be made of the description of American work in precious metals before the time of Christopher Columbus, in the section *Archaeology* of the article AMERICA (Vol. 1, p. 812), by the late Dr. O. T. Mason, of the National Museum, Washington; also of MEXICO, *Ancient Civilization* (Vol. 18, p. 335), by the famous ethnologists, Dr. E. B. Tylor of Oxford and Dr. Walter Lehmann, of the Royal Ethnographical Museum, Munich; EGYPT, *Ancient Art* (Vol. 9, p. 73), by W. M. Flinders Petrie; GREEK ART (Vol. 12, p. 470), illustrated, by Dr. Percy Gardner, of Oxford; ROMAN ART, *Work in Precious Metals* (Vol. 23, p. 483), illustrated, by H. Stuart Jones, director of the British School at Rome; JAPAN, *Art, Sculpture and Carving* (Vol. 15, p. 176), by Capt. Frank Brinkley, author of *A History of the Japanese People*; and CHINA, *Bronzes* (Vol. 6, p. 215), by C. J. Holmes, formerly Slade professor of fine art at Oxford.

FILIGREE (Vol. 10, p. 343) describes the delicate jewel work of twisted gold and silver threads, and also the "granulated" work which consists of minute globules of gold soldered to form patterns on a metal surface. In India the filigree worker has retained the patterns used by the ancient Greeks and works in the same way they did. Wandering workmen are given so much gold, coined or rough. This is weighed, heated and beaten into wire, and worked in the courtyard or on the verandah of the customer's house. The worker reweighs the



complete work when finished and is paid at a specified rate for his labor. REPOUSSÉ (Vol. 23, p. 108), by M. H. Spielmann, editor *Magazine of Art*; CHASING (Vol. 5, p. 956) and INLAYING (Vol. 14, p. 574) are other articles dealing with certain processes in jewel work. The jeweller also must not overlook two superb articles, MEDAL (Vol. 18, p. 1), illustrated, by M. H. Spielmann, and NUMISMATICS (Vol. 19, p. 869), which is by three specialists, and is most fully illustrated by designs inviting practical use. ENAMEL (Vol. 9, p. 362), illustrated, by Alexander Fisher, author of *The Art of Enamelling on Metals*, goes very fully and practically into this interesting subject, which is further discussed in JAPAN, *Cloisonné Enamel* (Vol. 15, p. 189). MOSAIC (Vol. 18, p. 883), illustrated, by Professor Middleton and H. Stuart Jones, deals in part with the ornamentation of jewelry by this method. In BRAZING and SOLDERING (Vol. 4, p. 463) the composition of silver solder used for jewelry is described, and in CEMENT there is an account of *Jeweller's* or *Armenian Cement* (Vol. 5, p. 659).

The article GEM treats the subject in two sections, of which the first (Vol. 11, p. 560), by F. W. Rudler, of the Museum of Practical Geology, London, deals with *Mineralogy and General Properties*. Here

are discussed hardness, specific gravity, crystalline forms and cleavage, colour, refraction, chemical composition, etc., and there is an interesting section on superstitions in regard to gems, the medical and magical powers with which they were reputed to be endowed. These beliefs are very remarkable, and it has even been suggested by archaeologists that jewelry did not have its origin so much in a love for personal decoration, as in the belief that the objects used possessed magical virtue. The article MINERALOGY (Vol. 18, p. 509), by L. J. Spencer, of the British Museum, and editor of the *Min-*

*eralogical Magazine*, will be found especially valuable for reference in the workshop. It gives, among other things, the scale of hardness, and nomenclature and classification of minerals. The crystal formation of gems as well as their optical properties—characteristics by which the genuineness of precious stones may be tested—are discussed and explained in the article CRYSTALLOGRAPHY (Vol. 7, p. 569), with over 100 illustrations, also by L. J. Spencer. The cutting of gem stones is treated under LAPIDARY AND GEM CUTTING (Vol. 16, p. 195), by Dr. George F. Kunz, the famous gem expert to Tiffany & Co., New York,—an article of uncommon historical interest and practical value, in which diamond cutting is considered at much length.

The second section of the article GEM, *Gems in Art* (Vol. 11, p. 562), by Dr. A. S. Murray, the famous British archaeologist, and A. H. Smith, gives an account of precious stones engraved with designs. The illustrations show more than 90 examples, including Cretan and Mycenaean intaglios, Greek, Phœnician and Etruscan scarabs and scarabæoids, cameos, seals, Oriental, Christian, and modern gems. This subject is further discussed in separate articles, such as SCARAB (Vol. 24, p. 301), by Dr. F. Ll. Griffith, the Egyptologist, an account of the designs which, originating in Egypt during the Fourth Dynasty, have exercised a lasting influence on the design and shape of gems; CAMEO (Vol. 5, p. 104), INTAGLIO (Vol. 14, p. 680), SEALS (Vol. 24, p. 539), illustrated, by Sir E. Maunde Thompson, formerly principal librarian, British Museum, as well as in the articles on ancient and Oriental civilizations, already mentioned.

The artificial duplication of certain gems by chemical processes which yield products identical in composition and physical properties with the natural stones is a subject of growing import-

**Synthetic  
Stones**

ance to the jeweller, and the latest developments are described in GEM, ARTIFICIAL (Vol. 11, p. 569), by Sir William Crookes. This famous chemist and authority on precious stones does not hesitate to declare that although the artificial diamonds so far produced have been microscopic in size, scientists have now found the right method and that "there is no reason to doubt that, working on a larger scale, larger diamonds will result." The artificial production of rubies, sapphires, Oriental emeralds, amethysts, topazes and zircons is also discussed. Descriptions of the several gem stones are found under their respective headings, for example DIAMOND (Vol. 8, p. 158), illustrated, by H. A. Miers, principal of the University of London, and former editor of the *Mineralogical Magazine*. Here are given its scientific characters, its uses (especially for faceting softer precious stones), distribution, and mining, and the wonderful history of the most famous diamonds of the world. RUBY (Vol. 23, p. 812), the most valued of gem stones, is often called "Oriental ruby" to distinguish it from SPINEL (Vol. 25, p. 684), an aluminate stone of inferior hardness, density and value. It is interesting to note that many historic stones described as monster rubies were really spinels. The great ruby set in the Maltese Cross in front of the Imperial State Crown of England is a spinel. SAPPHIRE (Vol. 24, p. 201) was known to the Greeks as "hyacinthus," and the present name was formerly applied to lapis lazuli. ASTERIA or STAR STONE (Vol. 2, p. 792) tells how the luminous star comes to be seen in sapphires, rubies and topazes. The name EMERALD (Vol. 9, p. 332) is used for a number of stones, of which the most valued is not a true emerald at all; see CORUNDUM (Vol. 7, p. 207). The same is true of the TOPAZ (Vol. 27, p. 48), the more prized Oriental topaz being a yellow corundum, harder and denser than the stone from which it takes its name. "Scotch" or "Spanish" topazes are yel-

low or smoke-tinted quartz, or cairngorm. The AMETHYST (Vol. 1, p. 852) is violet or purple quartz, and the sapphire of a purple colour is often called an Oriental amethyst. The many varieties of the beautiful ZIRCON (Vol. 28, p. 989), such as HYACINTH (Vol. 14, p. 25) and JARGOON (Vol. 15, p. 276) are carefully described and distinguished. These valuable articles on the precious stones have been contributed by F. W. Rudler, of the Museum of Practical Geology, London. PEARL (Vol. 21, p. 24) discusses the results of the latest researches on the cause of pearl formation, and gives a graphic account of pearl-fishing.

The material in the Britannica on the semi-precious stones is as complete. There are many articles, specified in the

list at the end of this chapter. ALEXANDRITE (Vol. 1, p. 576) is remarkable

for its property of appearing dark green by daylight, and red by candle-light, which makes it especially popular in Russia where green and red are the military colors; CHRYSOBERYL (Vol. 6, p. 320), of which alexandrite is a variety; CHRYSOLITE (Vol. 6, p. 320), often mistaken for chrysoberyl; PERIDOT (Vol. 21, p. 147), like chrysolite, a variety of olivine; BERYL (Vol. 3, p. 817), much prized by the ancients as a gem stone, and of which the EMERALD (see above) and the AQUAMARINE (Vol. 2, p. 237) are the chief "precious" varieties; TOURMALINE (Vol. 27, p. 103), the remarkable stone of as much interest to the physicist as to the jeweller, on account of its optical and electrical properties; and RUBELLITE (Vol. 23, p. 804), its much prized red variety GARNET (Vol. 11, p. 470), together with ALMANDINE (Vol. 1, p. 712), which, when cut with a convex face is known as carbuncle; CINNAMON-STONE (Vol. 6, p. 376), the light red garnet, so easily mistaken for a variety of zircon (the article tells how to distinguish them); DEMANTOID (Vol. 7, p. 979), the green

garnet from the Urals, and PYROPE (Vol. 22, p. 695), usually known as Bohemian garnet; JADE (Vol. 15, p. 122), which occupies in China the highest place as a jewel, and whose many varieties are here clearly distinguished; JET (Vol. 15, p. 358); HAEMATITE (Vol. 12, p. 804); MOONSTONE (Vol. 18, p. 807); CAT'S-EYE (Vol. 5, p. 537), a term applied to several distinct minerals of which CROCIDOLITE (Vol. 7, p. 477) has recently become very popular; OPAL (Vol. 20, p. 120), an article in which the brilliant flashes of colour in this stone are explained; QUARTZ (Vol. 22, p. 715), with its many ornamental varieties such as AGATE (Vol. 1, p. 368), AMETHYST (Vol. 1, p. 852), AVENTURINE (Vol. 3, p. 54), BLOODSTONE (Vol. 4, p. 85), CAIRNGORM (Vol. 4, p. 952), CARNELIAN (Vol. 5, p. 365), CHALCEDONY (Vol. 5, p. 803), CHRYSOPRASE (Vol. 6, p. 320), HELIOTROPE (Vol. 13, p. 232), MOCHA STONE (Vol. 18, p. 637), ONYX (Vol. 20, p. 118), ROCK-CRYSTAL (Vol. 23, p. 433), SARD (Vol. 24, p. 209), and SARDONYX (Vol. 24, p. 218).

The article WATCH (Vol. 28, p. 362), illustrated, by Lord Grimthorpe, the great authority on watches and clocks,

### Watches and Clocks

and Sir H. H. Cunningham, vice-president of the British Institute of Electrical Engineers, is full of interest. There is a very valuable historical account beginning with the invention of portable time pieces in the 15th century. The parts of a modern watch are described, with details as to the mainspring, different types of escapement, the balance-wheel and hair-spring, compensation adjustments and secondary compensation. Methods of correcting temperature errors are discussed, and a simple means for demagnetizing a watch which has been near a dynamo is given. The proper materials used for jewelled bearings are described in the articles DIAMOND, CORUNDUM, etc. LUBRICANTS (Vol. 17, p. 88) contains a valuable paragraph on the

properties and preparation of the fluid oils used on the spindles of watches and clocks.

The article CLOCK (Vol. 6, p. 536) is by the same distinguished authorities as WATCH, with an additional section on *Decorative Aspects* (p. 552), by James Penderel-Brodhurst. It is equivalent to 55 pages of this Guide and is fully illustrated. Among the topics considered are the earliest clocks and their gradual improvement; the essential components of a clock; the mechanics of the pendulum; methods of compensation, including the use of the new nickel-steel alloy—described in the article INVAR (Vol. 14, p. 717)—the barometrical error, and methods of counteraction; suspension of pendulums; balance, anchor, dead, pin-wheel, detached or free, and gravity escapements; the remontoire systems for abolishing errors in the force driving the escapement; testing of clocks; clock wheels; striking mechanism; the watchman's clock, church and turret clocks, electrical clocks, miscellaneous clocks, including magical clocks and other curious designs. The section on *Decorative Aspects* tells about styles of cases and mountings, the origin and development of the "grandfather" clock, etc. In connection with long-period clocks, attention should be given to the new and ingenious, if not commercially practical, device invented by the Hon. R. J. Strutt. Electrified particles emitted by a radioactive substance separate two strips of gold leaf, and these, falling together after the charge has been conducted away upon contact with metal, are extended again, the process being constantly repeated. If some way could be found to utilize this motion to work an escapement, we should have a clock that would go on indefinitely, since 1000 years must elapse before even half the small amount of radium used has disappeared. A description of this so-called "radium" clock will be found in PERPETUAL MOTION (Vol. 21, p. 181).

ALPHABETICAL LIST OF ARTICLES IN THE ENCYCLOPAEDIA BRITANNICA OF  
SPECIAL INTEREST TO MANUFACTURERS OF AND DEALERS  
IN JEWELRY, CLOCKS, AND WATCHES

|                             |                           |                               |                        |
|-----------------------------|---------------------------|-------------------------------|------------------------|
| Agate                       | Chrysoptase               | Invar                         | Pearl                  |
| Aigrette                    | Cinnamon-stone            | Iolite                        | Peridot                |
| Alguillette                 | Clock                     | Ivory                         | Perpetual Motion       |
| Albite                      | Collar                    | Jade                          | Phenacite              |
| Alexandrite                 | Congreve, Sir William     | Japan, <i>Art</i>             | Phosphorescence        |
| Alloys                      | Coral                     | Jargoon                       | Plagioclase            |
| Almandine                   | Corundum                  | Jasper                        | Plate                  |
| Amazon-stone                | Costume                   | Jet                           | Plated Ware            |
| Amber                       | Cressent, Charles         | Jewelry                       | Platinum               |
| America, <i>Archaeology</i> | Crocidolite               | Knighthood and Chiv-          | Pollaiuolo             |
| Amethyst                    | Cross                     | alry                          | Prehnite               |
| Andalusite                  | Crown                     | Kunzite                       | Pyrope                 |
| Anhydrite                   | Crystallography           | Labradorite                   | Pyroxene               |
| Apatite                     | Cyanite                   | Lapidary and Gem              | Quartz                 |
| Apostle Spoons              | Demantoid                 | Cutting                       | Regalia                |
| Aquamarine                  | Diallage                  | Lapis Lazuli                  | Repoussé               |
| Arabesque                   | Diamond                   | Leucite                       | Ring                   |
| Arts and Crafts             | Dioptase                  | Line-engraving                | Rock-crystal           |
| Assaying                    | Drinking Vessels          | Lubricants                    | Roman Art              |
| Asteria, or Star-stone      | Dumortierite              | Malachite                     | Rubellite              |
| Aventurinæ                  | Ear-ring                  | Marot, Daniel                 | Ruby                   |
| Axinite                     | Egypt, <i>Ancient Art</i> | Meissonier, J. A.             | Sapphire               |
| Asurite                     | Electroplating            | Medal                         | Sard                   |
| Bead                        | Emerald                   | Metal                         | Sardonyx               |
| Benitoite                   | Emery                     | Metallography                 | Scandinavian Civiliza- |
| Beryl                       | Enamel                    | Metallurgy                    | tion                   |
| Beryllonite                 | Epidote                   | Metal-Work                    | Scarab                 |
| Biddery                     | Euclase                   | Mexico, <i>Ancient Civil-</i> | Seals                  |
| Bloodstone                  | Felspar                   | ization                       | Sheffield Plate        |
| Bort                        | Fillgree                  | Microcline                    | Silver                 |
| Bracelet                    | Finiguerra, Maso          | Mineral Deposits              | Sphene                 |
| Brasing and Soldering       | Fluorescence              | Mineralogy                    | Spinel                 |
| Britain, <i>Ornaments</i>   | Fluor-spar                | Miniature                     | Spodumene              |
| Bronzite                    | Franklin, Benjamin        | Mint                          | Staurolite             |
| Brooch                      | Galileo Galilei           | Mocha-stone                   | Sunstone               |
| Calngorm                    | Garnet                    | Monogram                      | Tassie, James          |
| Cameo                       | Gem                       | Monteith                      | Tiffany, C. L.         |
| Campani-Alimenis, M.        | Gem, Artificial           | Moonstone                     | Time, Measurement of   |
| Carbonado                   | Gold                      | Morel-Ladeull, Léonard        | Time, Standard         |
| Carnelian                   | Gold beating              | Mosaic                        | Topaz                  |
| Cat's-eye                   | Göthite                   | Nepheline                     | Tourmaline             |
| Collini, Benvenuto          | Gouthière, Pierre         | Niello                        | Turquoise              |
| Cement                      | Greek Art                 | Numismatics                   | Variscite              |
| Chain                       | Grimthorpe, 1st Baron     | Oligoclase                    | Vesuvianite            |
| Chalcedony                  | Haematite                 | Olivine                       | Watch                  |
| Chasing                     | Hiddenite                 | Onyx                          | Weighing Machines      |
| Chessylite                  | Hyacinth, or Jacinth      | Opal                          | Weights and Measures   |
| China, <i>Art</i>           | Hypersthene               | Orthoclase                    | Wyon, Thomas           |
| Chrysoberyl                 | Inlaying                  | Palladium                     | Zircon                 |
| Chrysolite                  | Intaglio                  | Paste                         | Zoisite                |

## CHAPTER XI

### FOR MERCHANTS AND MANUFACTURERS OF ELECTRICAL MACHINERY AND SUPPLIES

**E**LECTRICAL machinery and supplies include three main groups of appliances: The apparatus by which electricity is originally generated; the apparatus by which current is transmitted and, if necessary, modified before it is used; and the infinitely various appliances for its final employment. In connection with any one of the latter, information may be needed as to its structure and its mechanical or electrochemical method of operation, or as to its uses, and in the treatment of these two aspects of a vast number of subjects the advantages of the encyclopaedic plan of the Britannica are obvious. One article will explain the method by which the same principles are applied to a number of different machines. Another article will deal with a group of appliances all used for similar purposes; and a reference

**Construction and Operation** to the Index of 500,000 entries (Vol. 29) will at once guide the reader who turns to the name of any electrical appliance to either kind of information he desires at the moment, whether he wants to know how the machine is made and operated, or what kind of work it does and how efficiently it does it.

The reader to whom this chapter is addressed is already familiar with the general subject of electricity, but he may at any moment desire to review or to supplement his general knowledge in connection with some new appliance which, for the first time, applies to commercial use one of the many and intricate laws of electrical vibration. The whole sub-

ject of the nature and action of electricity is outlined in the article **ELECTRICITY** (Vol. 9, p. 179), by Prof. J. A. Fleming, of the University of London, one of the world's foremost authorities. In a space equivalent to hardly more than 30 pages of this Guide, the field covered in detail by many other articles is so concisely and clearly surveyed that you get a complete view of the theoretical and practical developments by which electrical science and industry have reached their present position. The same contributor then considers **ELECTROSTATICS** (Vol. 9, p. 240) and **ELECTROKINETICS** (Vol. 9, p. 210); and, in **CONDUCTION, ELECTRIC** (Vol. 6, p. 855), deals with metallic, non-metallic, dielectric and gaseous conductors. One section of this article is by Sir J. J. Thomson, winner, in 1906, of the Nobel Prize for Physics. The form in which metal is chiefly employed for the conduction of electricity is the subject of a separate article, **WIRE** (Vol. 28, p. 738); and the articles on the individual metals deal with their electrical properties.

The whole subject of the chemical production of electricity is discussed in **ELECTROLYSIS** (Vol. 9, p. 217), by W. C.

**Batteries and Dynamos** D. Whetham, of the technical staff of Cambridge University. **BATTERY** (Vol. 3, p. 531), fully illustrated, deals with all the forms of primary battery, and **ACCUMULATOR** (Vol. 1, p. 126), also illustrated, by Walter Hibbert, of the London Polytechnic, with all the secondary types. The alkaline accumulators, of which the Edison apparatus is a well known type,



are the subject of a special section. Turning to mechanically produced electricity, the first article to read is **ELECTROMAGNETISM** (Vol. 9, p. 226). This brings you naturally to the article **DYNAMO** (Vol. 8, p. 764), by C. C. Hawkins, author of one of the best practical textbooks on the subject. This copiously illustrated article, in length equivalent to 50 pages of this Guide, discusses *continuous current dynamos, lap-winding, commutators, field-magnets, forgings and castings for magnets, air-gaps, armature cores, carbon brushes, cooling surfaces and alternators*.

Having thus covered the subject of obtaining current, the group of articles next to be considered is that dealing with its measurement and the examination of resistances. The general article **UNITS, PHYSICAL** (Vol. 27, p. 740), contains a section on *electrical units*. Then come **POTENTIOMETER** (Vol. 22, p. 205); **METER, ELECTRIC** (Vol. 18, p. 291); **VOLTMETER** (Vol. 28, p. 206), illustrated; **AMPEREMETER** (Vol. 1, p. 879), illustrated; **OHMMETER** (Vol. 20, p. 34); **WATTMETER** (Vol. 28, p. 419); **GALVANOMETER** (Vol. 11, p. 428), illustrated; **ELECTROMETER** (Vol. 9, p. 234), illustrated; **ELECTROSCOPE** (Vol. 9, p. 239), illustrated; **WHEATSTONE'S BRIDGE** (Vol. 28, p. 584), illustrated; and **OSCILLOGRAPH** (Vol. 20, p. 347), illustrated.

The commercial supply of current is covered by a series of articles of which the first to be read is **ELECTRICITY SUPPLY** (Vol. 9, p. 193), to which Emile Garcke, the famous electrical engineer, contributes a section. **POWER TRANSMISSION, Electrical** (Vol. 22, p. 233), is by Louis Bell, chief engineer of the General Electric Co., Boston; and contains full details as to the use of both two-phase and three-phase generators in transmission.

**Lighting Appliances** **INDUCTION COIL** (Vol. 14, p. 502). and **TRANSFORMERS** (Vol. 27, p. 173) are both fully illustrated. **LIGHTING, Electric** (Vol. 16, p. 659) deals with arc, in-

candescent and vapour lamps, and with wiring. The section on household work gives excellent practical information about the best arrangements of lights. A special class of electric light supplies is discussed in **LIGHTHOUSE** (Vol. 16, p. 627), by W. T. Douglass, who erected the new Eddystone and the Bishop's Rock lights, and by N. G. Gedye, another practical expert.

The appliances used to convert current back again into the mechanical energy from which it had been derived are described in the article **MOTORS, ELECTRIC** (Vol. 18, p. 910). This article divides continuous current motors into five classes: *Separately excited; series-wound constant current; series-wound constant potential; series-wound interdependent current and potential; and shunt-wound constant potential*. Alternating current motors are similarly classified as *Synchronous constant potential; induction-polyphase constant potential; induction monophasic constant potential; repulsion commutating, and series-commutating*.

Machinery for applying electric power to transportation, both for trolley cars and heavy railroad traffic, is described in the article **Trolley Cars and Railroads** **TRACTION** (Vol. 27, p. 118), by Prof. Louis Duncan, who designed the first electric locomotives employed with large loads—those introduced in 1895 by the Baltimore & Ohio R.R. for its track in the tunnel under Baltimore. The article gives, with many mechanical diagrams, accounts of the appliances by which the current is taken from trolley wires, conduits and third rails, and of the types of motors and controllers employed. **CRANE** (Vol. 7, p. 368), by Walter Pitt, describes the peculiar type of "crane-rated" motor, by the aid of which steam and hydraulic cranes can be displaced. The electric furnaces used for the reduction of ores and for manufacturing processes in which exceptionally high temperatures are re-

quired, are treated in ELECTROMETALLURGY (Vol. 9, p. 232), by W. G. M'Millan, lecturer on metallurgy at Mason College, Birmingham. Electric machinery for the refining of metals is dealt with in the article ELECTROCHEMISTRY (Vol. 9, p. 208). Under SURGICAL INSTRUMENTS (Vol. 26, p. 133) there is a description of the apparatus used for cautery and for illuminating parts of the interior of the body. The appliances used in ELECTROTHERAPEUTICS are dealt with under that heading (Vol. 9, p. 249). Information as to other medical and surgical apparatus will be found under RÖNTGEN RAYS (Vol. 23, p. 694), X-RAY TREATMENT (Vol. 28, p. 887), by Dr. H. L. Jones, of St. Bartholomew's Hospital, London; and FLUORESCENCE (Vol. 10, p. 575), by Prof. J. R. Cotter, of Trinity College, Dublin.

TELEGRAPH (Vol. 26, p. 510), equivalent in length to 70 pages of this Guide, and fully illustrated, is by a number of

**Telegraph and Telephone**

instruments, by H. R. Kempe, electrician to the General Post Office, London, includes a full description of the transmitters and receivers employed in the various systems of wireless telegraphy. TELEPHONE (Vol. 26, p. 547) deals with the fixed and portable instruments, the batteries and switchboards, the new auto-

contributors, and discusses both land lines and submarine cables. The section on

matic exchange "selectors," and with special applications of the microphone.

A number of other electric appliances are discussed in separate articles, such as BELL (Vol. 3, p. 692), by H. M. Ross, in which burglar alarm devices are described; and VENTILATION, *Fan* (Vol. 27, p. 1011), by James Bartlett; while sparking plugs and other ignition appliances are treated under OIL ENGINE (Vol. 20, p. 35).

There are also a number of appliances used mostly in experimental and educational work. Such, for instance, are ELECTRICAL OR ELECTROSTATIC MACHINE (Vol. 9, p. 176), with many illustrations; ELECTROPHORUS (Vol. 9, p. 237), and LEYDEN JAR (Vol. 16, p. 528).

The metals, chemicals and other materials sold by dealers in electrical supplies, and their properties and uses, are described in COPPER (Vol. 7, p. 102), ZINC (Vol. 28, p. 981), LEAD (Vol. 16, p. 314), SULPHURIC ACID (Vol. 26, p. 65), SODIUM, *Compounds* (Vol. 25, p. 341); CHROMIUM (Vol. 6, p. 296); NITROGEN, *Compounds* (Vol. 19, p. 715); SAL AMMONIAC (Vol. 24, p. 59), BICHROMATES AND CHROMATES (Vol. 3, p. 912), CARBON (Vol. 5, p. 305), RUBBER (Vol. 23, p. 795), and GUTTA PERCHA (Vol. 12, p. 743).

The following is a partial list, in alphabetical order, of articles of peculiar interest to dealers in electrical supplies.

|                       |                         |                            |                                |
|-----------------------|-------------------------|----------------------------|--------------------------------|
| Accumulator           | Electrical, or Electro- | Leyden Jar                 | Surgical Instruments           |
| Amperemeter, or Am-   | static, Machine         | Lighting                   | Telegraph                      |
| meter                 | Electricity Supply      | Meter, Electric            | Telephone                      |
| Armature              | Electrokinetics         | Motors, Electric           | Thermometry, <i>Electrical</i> |
| Battery               | Electrolysis            | Nitrogen, <i>Compounds</i> | Traction, <i>Electric</i>      |
| Bell                  | Electromagnetism        | Ohmmeter                   | Tramway                        |
| Bichromates and Chro- | Electrometer            | Oil Engine                 | Transformers                   |
| mates                 | Electrophorus           | Oscillograph               | Units, Physical                |
| Carbon                | Electroscope            | Potentiometer              | Vacuum Tube                    |
| Chromium              | Electrotherapeutics     | Power Transmission         | Ventilation                    |
| Condenser             | Fluorescence            | Röntgen Rays, <i>Appa-</i> | Voltmeter                      |
| Conductor, Electric   | Fuze, or Fuse           | <i> ratus</i>              | Wattmeter                      |
| Copper                | Galvanometer            | Rubber                     | Wheatstone's Bridge            |
| Dielectric            | Gutta Percha            | Sal Ammoniac               | Wire                           |
| Dynamo                | Induction Coil          | Sodium, <i>Compounds</i>   | Zinc                           |
| Electricity           | Lead                    | Sulphuric Acid             |                                |

## CHAPTER XII

### FOR MERCHANTS AND MANUFACTURERS OF CHEMICALS AND DRUGS

**T**HE chemical and drug industry is not only in itself an enormous business, but it supplies essential materials for almost every branch of manufacturing. Chemical products are employed in our buildings, our clothing, our food; we come into the world and go out of the world with the odour of chemicals about us. The manufacturer or dealer cannot analyze all the influences that affect his market, and when he tries, as he must, to consider the future of the

#### A Factor in All Industries

trade, to reckon with the channels of demand that will arise in the course of new applications of chemical products, he is facing all the problems of all the industries.

The variety of raw materials from which chemical products are derived, and the activity with which new sources are discovered and developed, are almost as bewildering. Only a century has passed since coal-tar was first distilled, and to-day no chemist would venture to fix the limits of its industrial possibilities. Electrolysis has been in use since 1804, and yet the future of the world's wheat supply probably depends upon processes, as yet hardly beyond the experimental stage, of utilizing atmospheric nitrogen.

In connection with so comprehensive an industry, the uses of the Britannica are so manifold that this whole Guide might be devoted to them. Articles on every manufacturing process touch upon the use of chemicals. The articles on countries, states and cities are full of relevant information; and there is hardly a scientific article that would not be helpful. But the 40 general articles on chem-

istry, the 350 on chemical compounds, and the 75 on manufactured products call most immediately for attention; and, with the aid of other chapters in the Guide, the reader who desires to go further will easily find his way.

The article CHEMISTRY (Vol. 6, p. 33), equivalent to 135 pages of this Guide, is divided into 6

#### Articles on Chemicals

sections. The first, *History*, traces the general trend of the science from its infancy to the foundations of the modern theory. The second section, *Principles*, treats of nomenclature, formulæ, chemical equations and chemical changes. It provides a brief but complete introduction to the terminology and methods of the chemist, and there is not a line in it which will not prove of value in some way or other to the chemical manufacturer. Sections 3 and 4 are devoted to *Inorganic and Organic Chemistry*, giving a history of the subjects and the principles underlying the structure of compounds, with cross references to all articles dealing with their preparation and properties. Sections 5 and 6 deal, respectively, with *Analytical and Physical Chemistry*.

Dr. Walter Nernst, professor of physical chemistry, University of Berlin, is the author of CHEMICAL ACTION (Vol. 6, p. 26), which deals specifically with the nature of chemical forces and deduces the laws of chemical statics and kinetics. Of interest and importance in connection with the manufacture of chemicals is SOLUTION (Vol. 25, p. 368), by W. C. D. Whetham, of Cambridge University, author of *Theory of Solution*, etc. Another theoretical article which will be found

widely useful is THERMOCHEMISTRY (Vol. 26, p. 804), by Prof. James Walker, of Edinburgh University. For further details see the chapter on CHEMISTRY in this Guide.

It is possible here to mention only a small amount of the material dealing with the manufacture of chemicals. At the

### Manufacture of Chemicals

end of this chapter there is a fuller alphabetical list. It may be noted, however, that the articles on the elements, metallic and non-metallic, give much consideration to their compounds, how these are made and how used in the arts and in medicine. But in addition to this there are many noteworthy contributions dealing with chemical manufacture. For instance, ALKALI MANUFACTURE (Vol. 1, p. 674), by Dr. Georg Lunge, professor of technical chemistry, Zurich Polytechnic, 11 pages in length and with 10 illustrations. The chief processes described are the Leblanc, ammonia-soda; and electrolytic, together with others dependent upon them. The facts about the manufacture of the carbonate, hydrate, and sulphate of soda, chlorine, hydrochloric acid, etc., are fully given. POTASSIUM (Vol. 22, p. 197) treats of the commercial compounds of this metal in the same manner. NITROGEN (Vol. 19, p. 714) explains the new process for the commercial manufacture of nitric acid from atmospheric air—a matter of enormous industrial importance—and also the conversion of nitrogen into ammonia, which has been done successfully only within the past few years.

The manufacture of chemical products by the use of electricity is the subject of ELECTROCHEMISTRY (Vol. 9, p. 208), and a still larger field is covered by ELECTROMETALLURGY (Vol. 9, p. 232). Both of these valuable articles are by W. G. M' Millan, formerly secretary of the Institute of Electrical Engineers of Great Britain. SULPHURIC ACID (Vol. 26, p. 65), illustrated, by Dr. Lunge, describes the

properties, reactions and manufacture of the most important of all chemicals, including the more modern contact processes.

As a key to the subject of the origin and manufacture of drugs, the article PHARMACOLOGY (Vol. 21, p. 347), by Dr.

Ralph Stockman, professor of materia medica and therapeutics in the University of Glasgow,

presents a great amount of interesting and valuable information on the action of chemical substances (apart from foods) on all kinds of animals, from bacteria up to man. A short history of pharmacology is given and a large part of the article concerns the action of drugs. There is also a classification of drugs according to the latest and most scientific methods into twenty-eight groups, describing the effects of each group. An appendix to the article, by Dr. H. L. Hennessy, is entitled *Terminology in Therapeutics*, and is a general explanation of the common names used in the therapeutic classification of drugs.

Since therapeutics is concerned with the remedial power of drugs and the conditions under which they are to be used, the article THERAPEUTICS (Vol. 26, p. 793), by Dr. Sir Lauder Brunton, of St. Bartholomew's Hospital, London, and author of the well-known treatise, *Modern Therapeutics*, should not be overlooked, nor POISON (Vol. 21, p. 893), by Dr. Sir Thomas Stevenson, lecturer on chemistry and forensic medicine at Guy's Hospital, London, wherein all poisons are classified and their antidotes are indicated.

PHARMACY (Vol. 21, p. 355), by E. M. Holmes, of the Pharmaceutical Museum, London, is largely historical in its nature, and yields much interesting and valuable information about the pharmacist. We learn that an Egyptian papyrus of the date 2900 B.C. gives direction as to the preparation of prescriptions, and that diachylon plaster, invented by Mene-



crates in A.D.1, is used for the same purposes to-day. A great deal of curious knowledge about ancient remedies, such as the thigh bone of a hanged man, moss grown on a human skull, the ashes of the head of a coal-black cat, etc., renders this article especially entertaining. PHARMACOPŒIA (Vol. 21, p. 353), also by Mr. Holmes, tells about the pharmacopœias in use in different countries, the standardization of drugs, etc.

In the list at the end of this chapter are noted the numerous separate articles on drugs, their preparation and use that appear in the Britannica. Mention should be made of the articles on the elements, such as IRON (Vol. 14, p. 799), ARSENIC (Vol. 2, p. 653), MERCURY (Vol. 18, p. 158), IODINE (Vol. 14, p. 725), BROMINE (Vol. 4, p. 633), SODIUM (Vol. 25, p. 343), POTASSIUM (Vol. 22, p. 200), MAGNESIUM (Vol. 17, p. 321); BISMUTH (Vol. 4, p. 11). Separate sections dealing with pharmacology are found in the articles on very many plants, such as ALOE (Vol. 1, p. 720), ANISE (Vol. 2, p. 55), ARROWROOT (Vol. 2, p. 649), ICELAND MOSS (Vol. 14, p. 241), CINCHONA (Vol. 6, p. 369), COCA (Vol. 6, p. 614), COLCHICUM (Vol. 6, p. 661), DANDELION

(Vol. 7, p. 801), HOP (Vol. 13, p. 678), HOREHOUND (Vol. 13, p. 692), LOBELIA (Vol. 16, p. 837), MINT (Vol. 18, p. 557), MUSTARD (Vol. 19, p. 97), PEPPERMINT (Vol. 21, p. 128), etc.

The scientific biographies include not a few subjects which will be of interest, owing to familiarity with the names, to

### Biographies of Eminent Scientists

those engaged in the chemical and drug business. Among these are LISTER, BARON JOSEPH L.

(Vol. 16, p. 777), to whose work and teaching the present importance of the manufacture of antiseptics is largely due; PASTEUR, LOUIS (Vol. 20, p. 892); CURIE, PIERRE, and MME. MARIE CURIE (Vol. 7, p. 644), the physicists who first announced the existence of radium; LIEBIG, BARON J. VON (Vol. 16, p. 590), the great physiological chemist; LUNGE, GEORG (Vol. 17, p. 126), the noted expert in technical chemistry, already mentioned as a contributor to the Britannica, and GLAUBER, J. R. (Vol. 12, p. 114), the German chemist who made a living chiefly by the sale of secret chemical and medicinal preparations.

### ALPHABETICAL LIST OF ARTICLES IN THE ENCYCLOPAEDIA BRITANNICA OF SPECIAL INTEREST TO THOSE ENGAGED IN THE MANUFACTURE AND SALE OF CHEMICALS AND DRUGS

|                        |                     |                     |                    |
|------------------------|---------------------|---------------------|--------------------|
| Abel, Sir Frederick A. | Alembic             | Amygdalin           | Aristolochia       |
| Acacia                 | Algaroth, Powder of | Amyl Alcohols       | Arnica             |
| Acenaphthene           | Alizarin            | Amyl Nitrite        | Arrowroot          |
| Acetic Acid            | Alkahest            | Anaesthesia and An- | Arsenic            |
| Aceto-Acetic Ester     | Alkali              | aesthetics          | Asafetida          |
| Acetone                | Alkali Manufacture  | Analysis            | Asparagine         |
| Acetophenone           | Alkaline Earths     | Anatto              | Aspen              |
| Acetylene              | Alkaloid            | Andrews, Thomas     | Asphodel           |
| Achard, F. C.          | Alkanet             | Angelica            | Azo Compounds      |
| Acid                   | Allantoin           | Aniline             | Azoximes           |
| Acid Amides            | Alloxan             | Animé               | Baeyer, Adolf von  |
| Aconite                | Alloxantin          | Anise               | Balard, Antoine J. |
| Acorus Calamus         | Allyl Alcohol       | Anthracene          | Balsam             |
| Acridine               | Almond              | Anthraquinone       | Barium             |
| Adenine                | Aloe                | Antimony            | Base               |
| Adipocere              | Alum                | Antipyrine          | Baumé, Antoine     |
| Affinity, Chemical     | Aluminium           | Antiseptics         | Bdellium           |
| Albumin, or Albumen    | Amidines            | Apothecary          | Becher, J. J.      |
| Alcohol                | Amines              | Araroba Powder      | Bell, Jacob        |
| Alcohols               | Ammonia             | Archil              | Belladonna         |
| Aldehydes              | Ammoniacum          | Argol               | Benzaldehyde       |



|                            |                                |                           |                          |
|----------------------------|--------------------------------|---------------------------|--------------------------|
| Benzene                    | Cerium                         | Dewar, Sir James          | Fructose, or Fruit-sugar |
| Benzidine                  | Chamomile, or Camomile Flowers | Dextrine                  | Fuchs, Johann N. von     |
| Benzoic Acid               | Charcoal                       | Diazo Compounds           | Fulminic Acid            |
| Benzoin                    | Chemical Action                | Didymium                  | Fumaric and Maleic Acids |
| Benzophenone               | Chemistry                      | Digitalis                 | Fumitory                 |
| Benzyl Alcohol             | Chevreur, M. F.                | Dill                      | Furazanes                |
| Berberine                  | Chloral                        | Diphenyl                  | Furfurane                |
| Bergman, Torbern Olof      | Chlorates                      | Disinfectants             | Fusel Oil                |
| Berthelot, M. P. E.        | Chlorine                       | Distillation              | Gadolinium               |
| Berthollet, C. L.          | Chlorine                       | Dividivi                  | Galangal                 |
| Beryllium, or Glucinum     | Chloroform                     | Döbereiner, J. W.         | Galbanum                 |
| Berzelius, J. J.           | Chloropicrin                   | Dragon's Blood            | Gallic Acid              |
| Betaine                    | Chromium                       | Drug                      | Gallium                  |
| Betel Nut                  | Chrysene                       | Dulong, Pierre Louis      | Gamboge                  |
| Bhang                      | Cimicifuga                     | Dumas, J. B. A.           | Gannal, J. N.            |
| Bibirine or Bebeerine      | Cinchona                       | Durene                    | Garlic                   |
| Bichromates and Chromates  | Cinnamic Acid                  | Earth                     | Gay-Lussac, J. L.        |
| Bismuth                    | Cinnamon                       | Ecgonine                  | Geber                    |
| Bittern                    | Cinnolin                       | Elaterium                 | Gelatin                  |
| Black, Joseph              | Citric Acid                    | Elecampine                | Gelsemium                |
| Borage                     | Clark, Thomas                  | Electrochemistry          | Gentian                  |
| Borax                      | Cloves                         | Electrolysis              | Geoffroy, E. F.          |
| Boric Acid or Boracic Acid | Coal-tar                       | Electrometallurgy         | Gerhardt, Charles F.     |
| Boron                      | Cobalt                         | Element                   | Germanium                |
| Boussingault, J. B. J. D.  | Coca, or Coca                  | Elixir                    | Gibbs, Oliver Wolcott    |
| Brande, William Thomas     | Cocaine                        | Elm                       | Gilbert, Sir Joseph H.   |
| Bromine                    | Coco-nut Palm                  | Epsom Salts               | Ginger                   |
| Brown, S. M.               | Cod-liver Oil                  | Equivalent                | Ginseng                  |
| Brucine                    | Colchicum                      | Erbium                    | Gladstone, John Hall     |
| Buchu                      | Colcothar                      | Erdmann, Otto Linné       | Glaser, Christopher      |
| Bunsen, P. W. von          | Collodion                      | Ergot, or Spurred Rye     | Glauber, Johann R.       |
| Butyl Alcohols             | Colocynth                      | Erythrite                 | Glauber's Salt           |
| Butyric Acid               | Colt's-Foot                    | Esters                    | Glucinum                 |
| Cadmium                    | Columbium                      | Ether                     | Glucose                  |
| Caesium                    | Combustion                     | Ethers                    | Glucoside                |
| Caffeine                   | Condenser                      | Ethyl                     | Glutaric Acid            |
| Cajuput Oil                | Conine                         | Ethyl Chloride            | Glycerin, or Glycerol    |
| Calabar Bean               | Copalba                        | Ethylene                  | Glycols                  |
| Calcium                    | Copal                          | Eucalyptus                | Gmelin (family)          |
| Calomel                    | Copper                         | Eugenol                   | Gold                     |
| Calvert, F. Crace          | Copperas                       | Euphorbium                | Graham, Thomas           |
| Camphors                   | Coriander                      | Eupion                    | Grains of Paradise       |
| Cannizzaro, Stanislaw      | Corrosive Sublimate            | Europium                  | Greenheart               |
| Cantharides                | Coumarin                       | Fehling, Hermann von      | Guaco, Huaco, or Guao    |
| Capsicum                   | Coumarones                     | Fennel                    | Guaiacum                 |
| Capsule                    | Creosote                       | Fenugreek                 | Guandine                 |
| Caraway                    | Cresols                        | Fig                       | Guarana                  |
| Carbazol                   | Crookes, Sir William           | Filter                    | Guelder Rose             |
| Carbide                    | Crotonic Acid                  | Fir                       | Guimet, Jean B.          |
| Carbohydrate               | Croton Oil                     | Fischer, Emil             | Gum                      |
| Carbolic Acid              | Crystallisation                | Fittig, Rudolf            | Guyton de Morveau, Baron |
| Carbon                     | Cubebs                         | Flamel, Nicolas           | Harcourt, W. Vernon      |
| Carbonates                 | Cumin                          | Flavin                    | Hartshorn, Spirits of    |
| Carbon Bisulphide          | Curie, Pierre                  | Fluoranthene              | Hashish                  |
| Carbonic Acid              | Cyanamide                      | Fluorene                  | Hellebore                |
| Cardamon                   | Cyanic Acid and Cyanates       | Fluorescein               | Helmont, Jean B. van     |
| Carvacrol                  | Cyanide                        | Fluorine                  | Hemp                     |
| Cassa                      | Cyanogen                       | Formalin, or Formaldehyde | Henbane                  |
| Castor Oil                 | Cytisine                       | Formic Acid               | Henna                    |
| Catalysis                  | Dalton, John                   | Formula                   | Henry, William           |
| Catechu                    | Danmar                         | Fourcroy, A. F., Comte de | Herb                     |
| Caustic                    | Dandelion                      | Foxglove                  | Hippuric Acid            |
| Cavendish, Henry           | Daniell, John F.               | Frankland, Sir Edward     | Hofmann, A. W. von       |
| Cayenne Pepper             | Davy, Sir Humphry              | Frémy, Edmond             | Homburg, Wilhelm         |
| Cellulose                  | Decolourizing                  | Fresenius, Karl R.        | Homoeopathy              |
|                            | Depilatory                     | Friedel, Charles          |                          |
|                            | Dessication                    |                           |                          |

|  |                         |                         |                                |
|--|-------------------------|-------------------------|--------------------------------|
| Hop                                    | Litmus                  | Olefine                 | Pyridine                       |
| Horehound                              | Lobelia                 | Oleic Acid              | Pyrimidines                    |
| Houseleek                              | Lunge, Georg            | Opium                   | Pyrocatechin                   |
| Hydantoin                              | Madder                  | Orcin                   | Pyrogallol                     |
| Hydracrylic Acid                       | Magnesium               | Orpiment                | Pyrones                        |
| Hydrastine                             | Magnus, H. G.           | Orris-root              | Pyrophorous                    |
| Hydrate                                | Malic Acid              | Oxalic Acid             | Pyrrrol                        |
| Hydrazine                              | Mallow                  | Oxazoles                | Pyruvic Acid                   |
| Hydrazone                              | Malonic Acid            | Oxide                   | Quassia                        |
| Hydrocarbon                            | Malt                    | Oximes                  | Quercitron                     |
| Hydrochloric Acid                      | Mammee Apple            | Oxygen                  | Quinazolines                   |
| Hydrogen                               | Mandelic Acid           | Oxyhydrogen Flame       | Quinine                        |
| Hydroxylamine                          | Mandrake                | Palladium               | Quinoline                      |
| Hyposulphite of Soda                   | Manganese               | Palmitic Acid           | Quinones                       |
| Hyssop                                 | Mangosteen              | Paraffin                | Quinoxalines                   |
| Iatrochemistry                         | Manna                   | Paraldehyde             | Radium                         |
| Iceland Moss                           | Marggraf, Andreas S.    | Pasteur, Louis          | Ramsay, Sir William            |
| Imidazoles, or Glyoxalines             | Marignac, Jean C. G. de | Pelouze, T. Jules       | Raoult, François M.            |
| Indazoles                              | Mastic                  | Pennyroyal              | Rare Earths                    |
| Indene                                 | Mayow, John             | Peppermint              | Regnault, H. V.                |
| Indicator                              | Medical Jurisprudence   | Pepsin                  | Resorcin                       |
| Indigo                                 | Medicine                | Perfumery               | Retene                         |
| Indium                                 | Mellitic Acid           | Perkin, Sir W. H.       | Rhamnus Purshiana              |
| Indole                                 | Mandeléeff, Dmitri I.   | Pettenkofer, Max J. von | Rhatany, or Krameria Root      |
| Indulines                              | Mercaptans              | Pharmacology            | Rhodium                        |
| Inulin                                 | Mercury                 | Pharmacopoeia           | Rhubarb                        |
| Iodine                                 | Mesoxalic Acid          | Pharmacy                | Richter, J. B.                 |
| Iodoform                               | Methyl Alcohol          | Phenacetin              | Roebuck, John                  |
| Ipecacuanha                            | Meyer, J. Lothar        | Phenanthrene            | Roscoe, Sir H. E.              |
| Iron                                   | Meyer, Victor           | Phenazine               | Rose                           |
| Isatin                                 | Microcosmic Salt        | Phenol                  | Rouelle, G. F.                 |
| Isomerism                              | Mineral Waters          | Phenolphthalein         | Rouge                          |
| Isoxazoles                             | Mint                    | Phosphates              | Rubidium                       |
| Jaborandi                              | Mitscherlich, E.        | Phosphorus              | Ruthenium                      |
| Jalap                                  | Mohr, K. Friedrich      | Phthalazines            | Saccharic Acid                 |
| Juniper                                | Moissan, Henri          | Phthalic Acids          | Saccharin                      |
| Kámalá                                 | Molybdenum              | Picene                  | Safflower                      |
| Kekulé, F. August                      | Mond, Ludwig            | Picric Acid             | Saffron                        |
| Kelp                                   | Morphine                | Picrotoxin              | Safranine                      |
| Kermes                                 | Mucic Acid              | Pilocarpine             | Sainte - Claire Deville, E. H. |
| Ketenes                                | Murexide                | Pimento                 | Sal Ammoniac                   |
| Ketones                                | Murray, John            | Pine                    | Salep                          |
| Kino                                   | Musk                    | Piperazin               | Salicin, Salicinum             |
| Klaproth, M. H.                        | Muspratt, J. and J. S.  | Piperine                | Salicylic                      |
| Kolbe, A. W. Hermann                   | Mustard                 | Piperonal               | Salt                           |
| Kopp, Hermann F. M.                    | Mustard Oils            | Platinum                | Saltpetre                      |
| Kousoo                                 | Myrrh                   | Plattner, K. F.         | Samarium                       |
| Kunkel, or Kunckel von Lowenstjern, J. | Myrtle                  | Podophyllin             | Sandalwood                     |
| Lactic Acid                            | Naphtha                 | Poison                  | Sandarach                      |
| Lactones                               | Naphthalene             | Polymethylenes          | Santonin                       |
| Laevulinic Acid                        | Naphthols               | Pomade                  | Sarsaparilla                   |
| Lanolin                                | Naphthylamines          | Potashes                | Scammony                       |
| Lanthanum                              | Nepenthes               | Potassium               | Scandium                       |
| Laudanum                               | Newlands, John A. R.    | Priestley, Joseph       | Scheele, K. W.                 |
| Lavender                               | Nickel                  | Primuline               | Schlippe's Salt                |
| Lavoisier, A. L.                       | Nightshade              | Propiolic Acid          | Schönbein, C. F.               |
| Lead                                   | Niobium                 | Propyl Alcohols         | Schützenberger, P.             |
| Le Blanc, Nicolas                      | Nitre                   | Proust, Joseph Louis    | Senega                         |
| Lemery, Nicolas                        | Nitric Acid             | Prout, William          | Senna                          |
| Lemon                                  | Nitrobenzene            | Prussic Acid            | Sesame                         |
| Liebig, Baron J. von                   | Nitro Compounds         | Pumice                  | Silica                         |
| Lime                                   | Nitrogen                | Purin                   | Silicon                        |
| Linseed                                | Nitroglycerin           | Purslane                | Silliman, Benjamin             |
| Liquorice                              | Nobel, Alfred B.        | Pyrazines               | Silver                         |
| Lister, Baron                          | Nux Vomica              | Pyrazoles               | Snake-root                     |
| Lithium                                | Official Oils           | Pyrene                  | Soap                           |
|  |                         | Pyrethrum               |                                |

|                     |                       |                    |                      |
|---------------------|-----------------------|--------------------|----------------------|
| Soap-bark           | Talc                  | Tincture           | Veronal              |
| Sodium              | Tamarisk              | Titanium           | Viburnum             |
| Solution            | Tannin or Tannic Acid | Toilet Powders     | Vitriol              |
| Spectroscopy        | Tantalum              | Toluene            | Weighing Machines    |
| Spikenard, or Nard  | Tar                   | Tonqua Bean        | Weights and Measures |
| Spirits             | Taraxacum             | Tooth Powders and  | Weldon, Walter       |
| Sponges             | Tartar                | Pastes             | Wenzel, K. F.        |
| Squill              | Tartaric Acid         | Triazines          | Williamson, A. W.    |
| Stahl, G. E.        | Tellurium             | Triazoles          | Wine                 |
| Stas, J. S.         | Tennant, Charles      | Triphenylmethane   | Wintergreen          |
| Stearic Acid        | Tennant, Smithson     | Trophine           | Winter's Bark        |
| Stereochemistry     | Terbium               | Tungsten           | Wislicenus, J.       |
| Stero-isomerism     | Terpenes              | Turmeric           | Witch-hazel          |
| Stoichiometry       | Tetrazines            | Upas               | Wöhler, Friedrich    |
| Stramonium          | Tetrazoles            | Uranium            | Wollaston, W. H.     |
| Strontium           | Thénard, L. J.        | Urea, or Carbamide | Wormwood             |
| Strophanthus        | Therapeutics          | Urethane           | Wurtz, C. A.         |
| Strychnine          | Thermochemistry       | Urotropin          | Xanthic Acid         |
| Styrolene           | Thiazines             | Valency            | Xanthone             |
| Succinic Acid       | Thiazoles             | Valerian           | Xylene               |
| Sugar               | Thiophen              | Valeric Acid       | Yew                  |
| Sulphonal           | Thomsen, Julius       | Vanadium           | Young, James         |
| Sulphonic Acids     | Thomson, Thomas       | Vanilla            | Ytterbium            |
| Sulphur             | Thorium               | Van't Hoff, J. H.  | Yttrium              |
| Sulphuric Acid      | Thymol                | Vaseline           | Zinc                 |
| Sumbul, or Sumbal   | Thyroid               | Vauquelin, L. N    | Zirconium            |
| Supra-renal extract | Tin                   | Veratrum           |                      |

## CHAPTER XIII

### FOR MERCHANTS AND MANUFACTURERS OF FOOD PRODUCTS

**T**HE manufacturer of or dealer in food products must of necessity be interested in questions of transportation by land and sea, of taxation, of agriculture, stock-raising and fishing, for example. For all such subjects as these he is referred to other chapters of this Guide. Here he will find only the chief articles on the subjects most closely related to the study of food products. But on these he may glean a wealth of information that will be of greatest value to him, and from them he can turn readily and with profit to a survey of the larger area covered by other chapters.

As a general introduction to the subject the student should read *DIETETICS* (Vol. 8, p. 214), by the late Dr. W. O. Atwater, who was in charge of the Nutrition Investigation of the U. S. Department of Agriculture, and R. D. Milner,

also of that Department. This article deals with the composition and nutritive values of foods, their fuel value, quantities of nutriment needed, hygienic and pecuniary economy of foods (with tables showing the percentage composition of common food materials), conditions of digestibility, and other matters of equal importance. *NUTRITION* (Vol. 19, p. 920), by Prof. D. N. Paton and Dr. E. P. Cathcart, both of the University of Glasgow, discusses more particularly digestion and the utilization of the different food constituents.

After establishing the value and relative importance of the various substances used as food, it is of great interest to everyone in the business to consider the subject of *FOOD PRESERVATION* (Vol. 10, p. 612), an article by Otto Hehner, formerly president of the Society of Pub-

lic Analysts, in which there are separate sections on *Preservation by Heat* (which includes all canning processes); *by Chemicals*; *by Drying*;

**Food Preservation** *by Refrigeration*; *by Pickling*. The sterilization of milk, condensed milk and milk powder all fall within the scope of this article. The preservation of food by cold is described in fuller detail in the article REFRIGERATING AND ICE MAKING (Vol. 23, p. 30), by T. B. Lightfoot, author of the standard technical book on that subject. Among the separate articles on preservative materials are VINEGAR (Vol. 28, p. 96), ACETIC ACID (Vol. 1, p. 135), CITRIC ACID (Vol. 6, p. 397), OILS (Vol. 20, p. 43), SALT (Vol. 24, p. 87), SALTPETRE (Vol. 24, p. 93), SUGAR (Vol. 26, p. 32), BORAX (Vol. 4, p. 243), FORMALIN OR FORMALDEHYDE (Vol. 10, p. 667), BENZOIC ACID (Vol. 3, p. 756), SALICYLIC ACID (Vol. 24, p. 69), SULPHUR, *Compounds* (Vol. 26, p. 63), ALCOHOL (Vol. 1, p. 525).

The objections to the use of some of these chemicals are discussed in ADULTERATION (Vol. 1, p. 218), by Otto Hehner. This article is about as long as 50 pages of this Guide. There is an interesting historical introduction, from which we learn that the first legal statute in which the adulteration of food is noticed dates from the reign of King John in England (1203). There is an elaborate account of all the subsequent legislation in Great Britain, the United States, and Germany. The effects upon digestion of the chemical preservatives mentioned above are shown in the light of the very latest investigations. There is a section on colouring matter in food, with information about harmless and harmful dyes; and the last part of the article considers adulteration as recently applied to the more important articles of food, such as milk (with tests for borax and formaldehyde), cream,

butter, cheese, lard, oils, flour and bread, sugar, marmalade and jams, tea, coffee, cocoa and chocolate, wine, beer, spirits, non-alcoholic drinks, and vinegar. The properties of adulterants and colouring matters are described in separate articles, such as GLUCOSE (Vol. 12, p. 141); SACCHARIN (Vol. 23, p. 970); PARAFFIN (Vol. 20, p. 752), which is sometimes added to coffee when it is roasted; ALUM (Vol. 1, p. 766), often used with weak and unstable flours in bread making, and unwholesome, although not strictly speaking an adulterant; SAGO (Vol. 23, p. 1008) and ARROWROOT (Vol. 2, p. 649), which provide adulterants of cocoa; CHICORY (Vol. 6, p. 131), which many consumers insist upon using in their coffee; COPPER, *Compounds* (Vol. 7, p. 109), which describes the copper salts used for colouring canned vegetables; ANATTO (Vol. 1, p. 943) and TURMERIC (Vol. 27, p. 474), two harmless vegetable colouring matters, much employed; and ANILINE (Vol. 2, p. 47). A full list of the various other colouring matters will be found in the article DYEING (Vol. 8, p. 744).

Another group of articles will be found particularly useful in connection with the manufacture of certain classes of food products. Among these are FERMENTATION (Vol. 10, p. 275), by J. L. Baker, the noted English analytical and consulting chemist; FUNGI (Vol. 11, p. 333), illustrated, with its information about molds; BACTERIOLOGY (Vol. 3, p. 156), illustrated, especially for the material relating to the nature of toxins (p. 174)—both of these articles by the late Professor Ward of Cambridge and Professor Blackman of the University of Leeds; MEDICAL JURISPRUDENCE, *Food Poisoning* (Vol. 18, p. 29), by Prof. H. H. Littlejohn, of the University of Edinburgh, and T. A. Ingram; and POISON (Vol. 21, p. 893), by the late Dr. Sir Thomas Stevenson, of Guy's Hospital, London.

The diseases of animals which affect meat are described in the article VETER-

butter, cheese, lard, oils, flour and bread, sugar, marmalade and jams, tea, coffee, cocoa and chocolate, wine, beer, spirits, non-alcoholic drinks, and vinegar.

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INARY SCIENCE (Vol. 28, p. 2), by George Fleming, author of *Animal Plagues*, and Prof. John MacQueen of the London Veterinary College, which contains sections on diseases of cattle, sheep and pigs as well as on the principal parasites of domestic animals; and there are separate articles on ANTHRAX (Vol. 2, p. 106); FOOT AND MOUTH DISEASE (Vol. 10, p. 617), PLEURO-PNEUMONIA, or LUNG PLAGUE (Vol. 21, p. 838), and RINDERPEST (Vol. 23, p. 348).

The article FLOUR AND FLOUR MANUFACTURE (Vol. 10, p. 548), by George F. Zimmer, not only describes the processes

**Special Foods** of milling and of dressing and bleaching the flour, but also gives the history of milling from the earliest times, and deals with the special customs of different countries. There is a very full article BREAD (Vol. 4, p. 465), by the same contributor. It is not generally known that there are in existence remains of cakes made by the Swiss lake-dwellers in the Stone Age. The author says that, in all probability, they were baked on hot stones. The machine bakeries of the present day are described; and there are sections on sanitation of bakehouses, quality, flavour and colour of flour, baking powders, methods of dough making (the ferment-and-dough, the sponge-and-dough, and other systems), leavened, unleavened and aerated bread, and the recently invented Apostolov process, which among other advantages, permits the utilization of about  $87\frac{1}{2}\%$  of the wheat berry in bread making. A complete modern bread-making plant is described, together with the latest types of machine kneaders, dough dividers and mixers, and baking ovens. There are also articles on BISCUIT (Vol. 3, p. 992), MACARONI (Vol. 17, p. 192), VERMICELLI (Vol. 27, p. 1024), and GLUTEN (Vol. 12, p. 145).

The article STARCH (Vol. 25, p. 794) treats of the manufacture of this most important alimentary substance. The

materials from which the chief food starches are made are described in MAIZE (Vol. 7, p. 448), ARROWROOT (Vol. 2, p. 649), with illustrations showing the appearance under the microscope of the substances which pass commercially under the name of arrowroot or farina; SAGO (Vol. 23, p. 1003), TAPIOCA (Vol. 26, p. 413), and CASSAVA (Vol. 5, p. 457). OAT (Vol. 19, p. 938) has information about the manufacture of oatmeal.

The article SUGAR (Vol. 26, p. 35) is by two practical experts, Alfred and Valentine W. Chapman. It deals with the chemistry, manufacture, history and statistics of this important food product as well as with the cultivation of the sugar cane and beet.

Among articles on the products in the manufacture of which sugar is employed is JAMS AND JELLIES (Vol. 15, p. 150), by Otto Hehner. The author points out many things of interest, for example why starch-glucose is an ingredient and not an adulterant of these products, and he shows the baselessness of the prejudice against the use of beet sugar in their manufacture. The manufacturer of jellies and preserves will find separate articles on all the fruits employed, and other information in GELATIN (Vol. 11, p. 554); in IRISH MOSS (Vol. 14, p. 795) as to the properties of vegetable gelatin; and in ISINGLASS (Vol. 14, p. 872), which, besides its gelatinous qualities, possesses the property of clarifying wines, beers, and other liquids. CONFECTIONERY (Vol. 6, p. 898) describes an important industry—which until the middle of the 19th century was part of the druggist's business. See also CHOCOLATE (Vol. 6, p. 259) and JUJUBE (Vol. 15, p. 546).

SALT (Vol. 24, p. 87) covers the manufacture of salt very fully. It is curious to note that the termination "wich" in English place-names points to localities of ancient salt manufacture, for "wich" is an old English word meaning salt-spring. This article contains an interesting section on the *Ancient History and*



*Religious Symbolism of salt* (p. 90), by the late Dr. William Robertson Smith. The preservative qualities of salt were held to make it a peculiarly fitting symbol of any enduring compact, and in more than one part of the world cakes of salt have been used as money.

Butter and cheese manufacture fall under the article **DAIRY AND DAIRY FARMING** (Vol. 7, p. 737), illustrated, by

### Dairy Products

the late Dr. William Fream, of Edinburgh University.

There are sections on *Milk Production; Cheese and Cheese-making*, including Canadian and American factory practice and the Babcock and Russell investigations in Wisconsin which have opened up a new field for commercial exploitation (the varieties of English, French, German, and Italian cheeses being also described); *Butter and Butter-making, Dairy Factories, Adulteration of Dairy Produce; The Milk Trade, American Dairying*, etc. **MARGARINE**, the "perfectly wholesome butter substitute" is the subject of a separate article (Vol. 17, p. 704).

There is an article on **LARD** (Vol. 16, p. 214), showing what real leaf lard is, and how the term is applied in commerce. **OILS** (Vol. 20, p. 43), by Dr. Julius Lewkowitsch, author of *Chemical Technology and Analysis of Oils, Fats, and Waxes*, deals with the fixed oils and fats, and essential, ethereal or volatile oils. Some of these are among the most important articles of food, and the oil and fat industry may be considered as old as the human race itself. The three processes of oil extraction are described, also refining and bleaching, methods of testing, etc. A list of all oils and fats, including those that are edible, is given. For the chief oils used as food see **OLIVE** (Vol. 20, p. 85), **COTTON**, *Cotton-seed* (Vol. 7, p. 260), **SESAME** (Vol. 24, p. 701), **SUNFLOWER** (Vol. 26, p. 102), **POPPY OIL** (Vol. 22, p. 91).

Other articles on foods deal with the

preparation for the market of such products as **GINGER** (Vol. 12, p. 27), **MUSTARD** (Vol. 19, p. 97), **PEPPER** (Vol. 21, p. 127), with the different varieties distinguished, **CAYENNE PEPPER** (Vol. 5, p. 589), **VINEGAR** (Vol. 28, p. 96), **PIMENTO** (Vol. 21, p. 614), **CLOVES** (Vol. 6, p. 562), **CINNAMON** (Vol. 6, p. 376), **CURRY** (Vol. 7, p. 649), **CAVIARE** (Vol. 5, p. 582), from which we learn that the finer grades rarely find their way out of Russia; **KETCHUP** (Vol. 15, p. 761), **CHUTNEY** (Vol. 6, p. 350), **PICKLE** (Vol. 21, p. 584), **VANILLA** (Vol. 27, p. 894), **RAISIN** (Vol. 22, p. 864), **CURRENT** (Vol. 7, p. 648), **PRUNE** (Vol. 22, p. 518), **FIG** (Vol. 10, p. 332), and **GUAVA** (Vol. 12, p. 665).

The same completeness is displayed in the Britannica articles on beverages. **TEA** (Vol. 26, p. 476), by John McEwan, has

**Beverages,** an admirable historical introduction.  
**Tea and Coffee** It was not until the middle of the 17th

century that the English began to use tea. It is a curious fact that whereas 35 years ago China practically supplied the world with tea, to-day Russia alone takes half of her export. The reason for this is explained. The characteristics of all varieties of tea are given and the main facts about the cultivation and manufacture. *Tea Adulteration and Effects on Health* are other sections of this valuable article.

**COFFEE** (Vol. 6, p. 646) is treated in very similar fashion by A. B. Rendle and W. G. Freeman. This beverage, in spite of fierce religious opposition, became the national beverage of the Arabians, and finally appeared in Europe in the 17th century. The physiological action of coffee has a section all to itself. Coffee consumption, roasting and adulteration are also discussed. It is of interest to note that while one branch of the Anglo-Saxon race, namely the people of the United States, is near the head of the list of coffee consumers, others, especially Great Britain, Canada and Australia "are almost at the foot, using only about

1 lb. of coffee per head each year." In the United States "the average consumption per head is about 11 or 12 lbs. per annum."

**COCOA** (Vol. 6, p. 628) is an interesting and valuable article on "the food of the gods"—the great beverage and dietary substance which America has given the world. Modern lovers of chocolate as a beverage (which is the same as cocoa save that the fat has not been extracted) will envy the digestive powers of the Emperor Montezuma of Mexico who had, each day, 50 jars of chocolate prepared for his personal consumption.

**BEER** (Vol. 3, p. 642), by Dr. Philip Schidrowitz, member of the Institute of Brewery Council, confines itself to the history of this important beverage, the chemical composition of beers of different types, and information in regard to production and consumption. In **BREWING** (Vol. 4, p. 506) this same author enters very fully into the manufacturing operations. The English and foreign systems are described and there are many illustrations. It is curious to note that Pliny, who is the earliest writer to mention beer, describes it as scorned by the Romans, who looked upon it as only fit for barbarians, and he thought it a more sinful drink than wine. "So exquisite," he says, "is the cunning of mankind in gratifying their vicious appetites, that they have invented a method to make water itself produce intoxication." The section on *Brewing Chemistry* is very valuable. In connection with Brewing there is an article on **MALT** (Vol. 17, p. 499), illustrated and very complete in its treatment, by Arthur R. Ling, editor *Journal of the Institute of Brewing*, and

one on **HOP** (Vol. 13, p. 677), by the late Dr. Wm. Fream. Dr. Schidrowitz also contributes the article **WINE** (Vol. 28, p. 716). The art of wine-making is thoroughly described, and there are most interesting sections on the wines of France, Spain, Portugal, Germany, Italy, Austria-Hungary, United States, classifying the different varieties and affording a full survey of the industry.

**SPIRITS** (Vol. 25, p. 694), illustrated, and also by Dr. Schidrowitz, is a general article covering the subject of the distillation of fermented saccharine and starchy liquids. The account is both historical and technical, and there are separate and more specific articles on **BRANDY** (Vol. 4, p. 428), **RUM** (Vol. 23, p. 825), **ARRACK** (Vol. 2, p. 642), **WHISKY** (Vol. 28, p. 591), in which the difference between three main types—Scotch, Irish and American—is carefully explained; **VODKA** (Vol. 28, p. 170), **GIN** (Vol. 12, p. 26). The many flavoured and sweetened forms of alcohol are described in the article **LIQUEURS** (Vol. 16, p. 744), where we also learn the difference between a "cordial" and a "liqueur." There are separate articles on **ABSINTHE** (Vol. 1, p. 75), **BENEDICTINE** (Vol. 3, p. 721), **CHARTREUSE** (Vol. 5, p. 954), **CURAÇOA** (Vol. 7, p. 636), **KIRSCH** (Vol. 15, p. 834), and **VERMOUTH** (Vol. 27, p. 1029).

**MINERAL WATERS** (Vol. 18, p. 517) classifies all the great springs according to their mineral constituents, and discusses the effects upon digestion of their use, and their value in medical treatment.

The appended list includes a large number of articles of interest to the food producers, including chemical compounds and flavouring extracts.

ALPHABETICAL LIST OF ARTICLES IN THE ENCYCLOPÆDIA BRITANNICA OF SPECIAL INTEREST TO THOSE ENGAGED IN THE MANUFACTURE OR SALE OF FOOD PRODUCTS

Absinthe  
Acetic Acid  
Acorus Calamus  
Adulteration

Aerated Waters  
Alcohol  
Aldehydes  
Ale

Almond  
Alum  
Anatto  
Anchovy

Angelica  
Aniline  
Anise  
Anthrax

|                                |                                  |                       |                                |
|--------------------------------|----------------------------------|-----------------------|--------------------------------|
| Apple                          | Citric Acid                      | Iris                  | Pig                            |
| Apricot                        | Citron                           | Irish Moss            | Pilchard                       |
| Arrack                         | Claret                           | Isinglass             | Pimento                        |
| Arrowroot                      | Cloves                           | Jams and Jellies      | Pine-apple                     |
| Artichoke                      | Cocoa                            | Jujube                | Pistachio-nut                  |
| Asparagus                      | Coco-nut Palm                    | Juniper               | Plants, <i>Pathology</i>       |
| Aspic                          | Cod                              | Junket                | Pleuro Pneumonia               |
| Avocado Pear                   | Coffee                           | Kava                  | Plum                           |
| Bacon                          | Confectionery                    | Ketchup               | Poison                         |
| Bacteriology                   | Cookery                          | Kipper                | Pomegranate                    |
| Bael Fruit                     | Copper                           | Kirsch                | Poppy Oil                      |
| Banana                         | Cotton                           | Koumloss              | Potato                         |
| Bannock                        | Crab                             | Kvass, or Kwass       | Poultry and Poultry<br>Farming |
| Barley                         | Cranberry                        | Lactic Acid           | Prune                          |
| Barm                           | Cucumber                         | Lard                  | Pudding                        |
| Bean                           | Curaçoa                          | Lemon                 | Puff-ball                      |
| Bee, <i>Bee-keeping</i>        | Currant                          | Lentil                | Pulque                         |
| Beef                           | Curry                            | Liqueurs              | Pumpkin                        |
| Beer                           | Date Palm                        | Loaf                  | Punch                          |
| Beet                           | Dietary                          | Lobster               | Quince                         |
| Benedictine                    | Dietetics                        | Macaroni              | Radish                         |
| Benzoic Acid                   | Dyeing                           | Mackerel              | Raisin                         |
| Bilberry, or Whortle-<br>berry | Eel                              | Maize                 | Raspberry                      |
| Biltong                        | Enzyme                           | Malmsey               | Ratafia                        |
| Birch                          | Esters                           | Malt                  | Rice                           |
| Biscuit                        | Extract                          | Maple                 | Rinderpest                     |
| Bisque                         | Fennel                           | Marchpane             | Rum                            |
| Bitters                        | Fenugreek                        | Margarine             | Rye                            |
| Blackberry                     | Fermentation                     | Marmalade             | Saccharin                      |
| Bohea                          | Fig                              | Maté                  | Sago                           |
| Boletus                        | Fisheries                        | Meal                  | Saké                           |
| Borax                          | Flour and Flour Manu-<br>facture | Mealie                | Salicylic Acid                 |
| Brandy                         | Food                             | Meat                  | Salmon                         |
| Brazil Nut                     | Food Preservation                | Medical Jurisprudence | Salsify                        |
| Bread                          | Foot and Mouth Dis-<br>ease      | Medlar                | Salt                           |
| Bread Fruit                    | Formalin, or Formalde-<br>hyde   | Melon                 | Saltpetre                      |
| Brewing                        | Fructose                         | Milk                  | Scone                          |
| Buckwheat                      | Fruit                            | Mineral Waters        | Sea Kale                       |
| Butter                         | Fruit and Flower<br>Farming      | Mint                  | Sea Kale                       |
| Butter-nut                     | Fungi                            | Molasses              | Sesame                         |
| Cabbage                        | Furfurane                        | Mulberry              | Shaddock                       |
| Caffeine                       | Garlic                           | Mulligatawny          | Sheep                          |
| Candle                         | Gelatin                          | Mushroom              | Sherbet                        |
| Capers                         | Gentian                          | Mustard               | Sherry                         |
| Caraway                        | Ghee                             | Nasturtium            | Shrimp                         |
| Cardamon                       | Gin                              | Negus                 | Sorghum                        |
| Carrot                         | Ginger                           | Nut                   | Spirits                        |
| Cassava                        | Glucose                          | Nutmeg                | Sprat                          |
| Cassia                         | Gluten                           | Nutrition             | Starch                         |
| Cattle                         | Gooseberry                       | Oat                   | Steak                          |
| Caviare                        | Grain Trade                      | Oils                  | Stearic Acid                   |
| Cayenne Pepper                 | Ground Nut                       | Okra                  | Strawberry                     |
| Celery                         | Gumbo                            | Oleic Acid            | Sturgeon                       |
| Chanterelle                    | Guava                            | Olive                 | Suet                           |
| Chartreuse                     | Haddock                          | Onion                 | Sugar                          |
| Chasse                         | Herring                          | Orange                | Sulphur                        |
| Cheese                         | Hippocras                        | Oyster                | Sunflower                      |
| Cherry                         | Honey                            | Palmitic Acid         | Syrup                          |
| Chestnut                       | Hop                              | Paraffin              | Tamarind                       |
| Chicory                        | Horseradish                      | Pea                   | Tapioca                        |
| Chive                          | Huckleberry                      | Peach                 | Tart                           |
| Chocolate                      | Hyssop                           | Pear                  | Tea                            |
| Chupatty                       | Indian Corn                      | Pemmican              | Terpenes                       |
| Chutney                        |                                  | Pepper                | Thyme                          |
| Cider                          |                                  | Pepsin                | Tomato                         |
| Cinnamon                       |                                  | Perry                 | Treacle                        |
|                                |                                  | Pickle                | Trichinosis                    |

Truffle  
Tunny  
Turmeric  
Vanilla  
Venison

Vermicelli  
Vermouth  
Veterinary Science  
Vine

Vinegar  
Vodka  
Walnut  
Wheat

Whisky  
Wine  
Wintergreen  
Wormwood  
Yeast

## CHAPTER XIV

### FOR INSURANCE MEN

**F**OR the insurance man, whether veteran or tyro, the new **ENCYCLOPAEDIA BRITANNICA** has much of value and importance, and it has it in quickly available form so that the desired information may be readily found, whether the experienced student wants an authoritative statement on a difficult point, or the beginner wishes an outline course of the subject. This availability, whether for the expert or the novice, is secured by the Index (the 29th volume), which guides the reader immediately to desired information, if he does not find it in the alphabetically arranged articles in the body of the book upon first turning up the article in which he expects the subject to be treated.

To be more concrete—if you want to know something about insurance, turn first to the article **INSURANCE** in Volume 14, beginning on p. 656. You find an elaborate article, which would occupy about 75 pages if printed in type and on a page like this Guide.

In other encyclopaedias you would have no clue to the whereabouts of any information about insurance except what would be given in the article **INSURANCE** or in articles to which it might refer you in that article. For anything else you would have to guess how the editor's mind had worked to find where in the book he had put other information about insurance; and to guess how each contributor's mental processes have been related to his interest in insurance so that you might know whether in some article, on a topic apparently not related to insurance at all,

the contributor had put in some interesting and important fact about insurance.

But in the Britannica you have one entire volume, the 29th, which was made for the sole purpose of increasing the practical efficiency of the other 28 volumes. Under the heading *Insurance* in this index, you will find references to many articles and cross references to Title Insurance and to Title Guarantee Companies.

Apart from the fact that he has the initial assurance that what he gets from the Britannica in the first place is fuller and better than he would get from another work of reference, what are the advantages offered by the index in this particular instance?

*First:* Instead of having a reference to volume 14 only he has references to volumes 2, 3, 4, 9, 10, 11, 12, 14, 15, 16, 18, 19, 20, 22, 24, 25, 26, 27 and 28,—nineteen volumes in all,—say a gain of 1800% in efficiency.

*Second:* Instead of having one article Insurance to refer to, he has reference to specific information in the following articles:

|                                  |                                   |
|----------------------------------|-----------------------------------|
| <i>Annuity,</i>                  | <i>Lloyds,</i>                    |
| <i>Austria,</i>                  | <i>Mensuration,</i>               |
| <i>Average,</i>                  | <i>Novation,</i>                  |
| <i>Barratry,</i>                 | <i>Old Age Pensions,</i>          |
| <i>Bonus,</i>                    | <i>Post Office,</i>               |
| <i>Employers' Liability,</i>     | <i>Probability,</i>               |
| <i>Fire and Fire Extinction,</i> | <i>Shipbuilding,</i>              |
| <i>Friendly Societies,</i>       | <i>Socialism,</i>                 |
| <i>Gaming and Wagering,</i>      | <i>Switzerland,</i>               |
| <i>Guarantee,</i>                | <i>Title Guarantee Companies,</i> |
| <i>Income Tax,</i>               | <i>Tontine,</i>                   |
| <i>Infanticide,</i>              | <i>Underwriter,</i>               |
| <i>Japan,</i>                    | <i>Unemployment,</i>              |
| <i>Land Registration,</i>        | <i>Warranty.</i>                  |

That is, to 28 new articles,—say 2800% additional gain.

Observe, too, that this is a gain that cannot be expressed in figures. The index references are classified. First there is a main head *Insurance*; then subheads, *Fire, Life, Marine, Title, Workmen's*; and under the subheads special topics arranged alphabetically.

In brief, the Index facilitates and accelerates reference to anything in the Britannica that bears on any desired topic.

The article *INSURANCE* opens with a definition of that word and with drawing a distinction between it and "assurance." The general history of insurance traces marine insurance back to Greek commerce in the 4th century B.C., but shows that modern methods of marine insurance were unknown until the 14th century; that fire insurance dates from the 17th century and especially from the Great Fire of London in 1666; and that, although there were a few instances of life insurance in the 16th and 17th centuries, it did not become a regular business until the 18th century and was not widely extended until the 19th century. Separate sections of the article deal with *Casualty* (or accident) and *Miscellaneous Insurance, Fire Insurance, Life Insurance, British Post Office Insurance, and Marine Insurance*.

The section on British Post-Office Insurance will give to the American insurance man a knowledge of this innovation in the post-office to which the American

post-office seems to be tending, if one may judge by the introduction of postal savings-banks and the adoption of the parcels-post system.

In the same way the article *OLD AGE PENSIONS* will make you acquainted with another radical measure which has been adopted in Great Britain, Germany, France, Denmark, Victoria and notably New Zealand, with fuller description in the article *NEW ZEALAND*. The importance of the subject to the American insurance man lies in the fact that similar schemes are under consideration or actual operation in Massachusetts, New Jersey, and other states of the United States. In the same way the article on *EMPLOYERS LIABILITY and WORKMEN'S INSURANCE* will give him a wider grasp of the subject of state insurance, mandatory or elective, for workmen.

The principal articles on insurance topics have already been mentioned. It is to be noted, however, that the actuary will find important information in the mathematical articles *MENSURATION and PROBABILITY*; that the article *FRIENDLY SOCIETIES* is supplemented by such special articles as *FREE MASONRY, B'NAI BRITH, BUILDING SOCIETIES, BURIAL SOCIETIES, ODD FELLOWS*, etc.

In the *Classified List of Articles* in the Index Volume the student of insurance will find on page 893 a list of articles in the field of economics and social science, many of which will bear more or less directly on the subject. Among these articles and sub-articles are:

|                     |                          |                      |                    |
|---------------------|--------------------------|----------------------|--------------------|
| Abandonment         | Charity                  | F. P. A. Liabilities | Labour Legislation |
| Accident            | Co-insurance             | Friendly Societies   | Land Registration  |
| Actuary             | Combination              | Gaming and Wagering  | Liability          |
| Annuity             | Communism                | General              | Life Insurance     |
| Assets              | Conflict of Insurance    | Guarantee            | Lloyd's            |
| Austria             | Laws                     | Halley's Table       | Maritime Insurance |
| Average             | Co-operation             | Housing              | Mendicancy         |
| Baby-Farming        | Emigration               | Illegitimacy         | Mensuration        |
| Barratry            | Employers' Liability     | Income Tax           | Mutual Insurance   |
| Boarding-out System | Eugenics                 | Industrial Insurance | Mortality Rates    |
| Bonus               | Fire and Fire Extinction | Infanticide          | Negative Values    |
| Bounty              | Fire Insurance           | Insurance            | Net Liability      |
| Casualty Insurance  | Fire Insurance           | Interest factor      | Net Premium        |
| Census              | Foundling Hospitals      | Japan                | Non-forfeiture     |



|                   |                    |                           |              |
|-------------------|--------------------|---------------------------|--------------|
| Northampton Table | Probability        | Subrogation               | Tontine      |
| Novation          | Production         | Suicide                   | Trade Unions |
| Old Age Pensions  | Profit Sharing     | Sumptuary Laws            | Tramp        |
| Pauperism         | Rates of Mortality | Surplus                   | Trusts       |
| Pawnbroking       | Reserve            | Surrender Values          | Underwriter  |
| Policy            | Salvage            | Switzerland               | Unemployment |
| Poor Law          | Selection          | Tariff                    | Usury        |
| Population        | Shipbuilding       | Taxation of Insurance     | Wages        |
| Post Office       | Socialism          | Title Guarantee Companies | Warranty     |
| Premium           | Social Settlements |                           | Wealth       |

## CHAPTER XV

## FOR ARCHITECTS

**A**LTHOUGH architecture is more and more coming to be recognized as one of the fine arts, it is at the same time so largely practical and utilitarian that its theory and methods may to a great extent be gathered from systematic reading. In the article FINE ARTS in the Britannica, by Sir Sidney Colvin, it is well said that "The original or rudimentary type of the architect, considered not as a mere builder but as an artist, is the savage, who, when his tribe had taken to live in tents or huts instead of caves, first arranged the skins and timbers of his tent or hut in one way because it pleased his eye, rather than in some other way which was as good for shelter." Whether the architect wishes to learn how the eye may be pleased, to study critically the history of architecture, or, like the less imaginative savage who failed of being the first inspired architect, to consider comfort and shelter rather than beauty and charm, he will find much to help him in the Britannica. If his interest is chiefly practical, he should consult the chapter *For Builders* in this Guide.

The architect should read first—and he will constantly be referring to it afterwards—the article ARCHITECTURE (Vol. 2, p. 369), equivalent in length to 235 pages of this Guide and illustrated by 140 figures, about one-third of which

are photogravures. The article is historical in the main and a brief outline of it is as follows:—

Egyptian  
 Assyrian  
 Persian  
 Greek  
 Parthian  
 Sassanian  
 Etruscan  
 Roman  
 Byzantine  
 Early Christian  
 Coptic Church in Egypt  
 Romanesque and Gothic in  
 Italy  
 France  
 Spain  
 England  
 Germany  
 Belgium and Holland  
 Renaissance: Introduction  
 Italy  
 France  
 Spain  
 England  
 Germany  
 Belgium and Holland  
 Mahomedan  
 Modern  
 Classical Revival in British Architecture  
 Classical Revival in Germany  
 French Classicism  
 Barry's "Common-sense" Style  
 Gothic Revival in England

Gothic Revival in France  
 Queen Anne Style  
 "Free Classic" Style  
 Arts allied to Architecture  
 Craftsmanship Ideal  
 Architecture in United States  
 (Figures 97, 98, 99, 181, 182,  
 183, 184, 185, 186, 187, 188)  
 English Churches  
 English Public Buildings  
 English Domestic and Street Ar-  
 chitecture  
 Recent French Architecture  
 Germany  
 Other Countries

The part of the article dealing with Modern Architecture is by H. H. Statham author of a well-known book on the subject. Earlier sections are by R. Phené Spiers, late master of the Royal Academy's Architectural School, with sections on the Romanesque and Gothic in France by W. R. Lethaby, principal of the Central (London County) School of Arts and Crafts.

Before continuing his more systematic historical readings the student may well read the article HOUSE (Vol. 13, p. 810), illustrated with 12 figures (3 plates), including four particularly fine examples of "half timbered buildings," and one English house, the Jew's House at Lincoln, dating from the 12th century. An interesting article on MURAL DECORATION (Vol. 19, p. 16) is by a remarkably distinguished trio: William Morris, poet, craftsman and painter, John Henry Middleton, late Slade professor of fine art, Cambridge, and Walter Crane, the well-known illustrator and decorator. This is illustrated with 16 figures in black and white and with a reproduction in colours of a wall-painting from a Roman villa of the early Empire. The article deals with: reliefs in marble and stone; marble veneer; glazed bricks or tiles; hard stucco; sgraffito; stamped leather; painted cloth; printed hangings and wall-papers; and painting.

If the student of architecture would

know about the buildings of prehistoric times, in which there was little architecture in the sense of a fine art, he should read the articles ARCHAEOLOGY, (Vol. 2, p. 344), LAKE DWELLINGS (Vol. 16, p. 91), STONEHENGE (Vol. 25, p. 961) and STONE MONUMENTS, PRIMITIVE (Vol. 25, p. 962), —the last two of particular interest to the building engineer because it is so puzzling a problem how these great blocks could have been brought such distances and set in place without modern appliances.

Engineering problems will be the most interesting in a large part of the student's reading about Egyptian architecture.

Supplementing the  
**Early Oriental** 4,000 or 5,000 words  
**Architecture** on this subject under ARCHITECTURE,

accompanied by seven illustrations, there is much information in the articles EGYPT (Vol. 9, p. 21); ABYDOS (Vol. 1, p. 81) and KARNAK (Vol. 15, p. 680); and in the articles PYRAMID (Vol. 22, p. 683), (by W. M. Flinders Petrie) and SPHINX (Vol. 25, p. 662) by Francis Llewellyn Griffith, another well-known Egyptologist. In the former article the author points out that the outside and inside work on all the pyramids was excellent and that the casings were not a mere veneer but were "of massive blocks, usually greater in thickness than in height, and in some cases (as at South Dahshur) reminding the observer of horizontal leaves with sloping edges." The massive character of the roofing of the sepulchral chambers is indicated by Prof. Petrie's estimate that "in Pepi's pyramid it is of three layers of stone beams, each deeper than their breadth, resting one on another, the thirty stones weighing more than 30 tons each." But neither Stonehenge nor the pyramid was really an engineering problem. Here, and as in all his studies of early architecture, artist or engineer will find religion and worship the aim and the reason of the building even more, if that is possible,

than in the great European cathedrals of comparatively recent times.

In the article **BABYLONIA AND ASSYRIA** there is a brief section (Vol. 3, p. 108) on *Art*, supplementing the treatment under **ARCHITECTURE**. It is interesting to note that even in Assyria architecture was trammelled, reactionary, governed by Babylonian styles and using brick and clay because Babylon did, although there was stone in Assyria, and none in Babylonia; and keeping the heavy brick platform foundation which the Babylonian architects had adopted because of the marshy character of their country, although there was no need of such construction in Assyria. Here too the function of architecture was largely as an aid to religion: as shown in the article **NIPPUR** (Vol. 19, p. 707), with its description of the "ziggurat" or artificial mountain in the shrine, built probably 40 or 45 centuries B. C. One temple was 272 ft. square, with seven storeys, each smaller than the one below and thus surrounded by a terrace, each dedicated to a planet, each coloured a separate tint, the first probably 45 ft. high, and the total height 160 ft.

In Assyria great palaces of the 9th, 8th and 7th centuries B. C. have been found, and these are probably the earliest large buildings of any architectural importance not religious in their purpose; but this distinction must not be carried too far, for the king was sacrosanct, half priest and half god, and his palace was a shrine.

Although the main treatment of Greek and Roman architecture is in the article **ARCHITECTURE**, the student should read

the articles **GREEK ART** (Vol. 12, p. 470; equivalent to 70 pages in this Guide; written by Percy Gardner, author of *Grammar of Greek Art*) and **ROMAN ART** (Vol. 23, p. 474; equivalent to 40 pages of this Guide; written by H. Stuart Jones, director of the British School at Rome).

The article on **GREEK ART** contains 82 illustrations, many of them half-tones. It makes clear the dependence of the other fine arts in Greece on architecture—and on religion—in showing that the greatest sculptures were adjuncts to temples, and (p. 471-472) in a discussion of the architecture of Greek temples calls attention to four basal principles of Greek architecture:

(1) Each member of the building has one function and only one, and this function controls even the decoration of that member. Pillars support architraves; their perpendicular flutings emphasize this. Moulding at a column's base suggests the support of a great weight.

(2) Simple and natural relations prevailed between various members of a construction.

(3) Rigidity of simple lines is avoided; scarcely any outline is actually straight. Columns are not equidistant.

(4) Elaborate decoration is reserved for those parts of the temple which have, or seem to have, no strain laid upon them.

The article **TEMPLE** (Vol. 26, p. 603) gives plans and general information about Greek and Roman sacred architecture, as well as Hebrew, Egyptian and Assyrian temples; and the reader should study the article **PARTHENON** (Vol. 20, p. 869) and the diagram in that article, and the article **PERGAMUM** (Vol. 21, p. 142) and the two plates which accompany it.

The article **ROMAN ART** (Vol. 23, p. 474) is probably the first brief and authoritative treatment of a topic long overshadowed in popular interest by the earlier art of Greece and the later art of Italy. It begins with a history of recent research. Architecture, pre-eminently the most Roman of the arts as combining utility with beauty, is outlined (pp. 476-477 especially) and the main point in regard to Roman architecture is brought out as follows: "the specific

achievement of the Roman architect was the artistic application of a new set of principles—those which are expressed in the arch, the vault and the dome," as contrasted with the rectilinear buildings of the Greeks. The arch, particularly the triumphal arch, is specifically a Roman product and is specifically Roman besides in being an expression of reverence for governmental authority,—which, it should, however, be remembered, cannot be separated from religion. Among the most important of Roman sculptures and particularly reliefs are those of the arches, described in the articles ARCH (Vol. 2, p. 342) and TRIUMPHAL ARCH (Vol. 27, p. 297), the latter with eight figures. The part of the article AQUEDUCT which deals with Roman aqueducts (Vol. 2, pp. 241-243, with 2 plates, 6 illustrations) will interest the architect as well as the contractor or engineer. And he should read the article on the Roman architect and writer on architecture, VITRUVIUS (Vol. 28, p. 150), whose book so strongly affected the Renaissance.

Before taking up modern architecture as distinguished from ancient, the student will do well to examine the architecture of some more remote peoples—for instance,

- Aztec* (Vol. 5, p. 441 and p. 677)
- Abyssinian* (Vol. 12, p. 232)
- Hittite* (Vol. 13, p. 537)
- Indian* (Vol. 14, p. 428, with 4 plates)
- Japanese* (Vol. 15, pp. 181-182)
- Chinese* (Vol. 6, p. 214)
- Byzantine* (Vol. 4, p. 906, with 2 plates), and the article **CONSTANTINOPLE** (Vol. 7, p. 3)

The last topic will serve as a transition to the modern architecture of Europe, especially because the influence of the Byzantine was so strong in the early church.

### Modern Architecture

The study of the Italian Romanesque and Gothic in an elaborate section of ARCHITECTURE (Vol. 2, p. 391) may well

be supplemented by reading the articles on the Italian cities in which this art is preserved. The following list is roughly chronological, the cities named first being those in which there are the oldest churches.

RAVENNA, PISA and VENICE, for Byzantine Romanesque.

MILAN  
PAVIA  
BRESCIA  
BERGAMO  
PIACENZA  
PARMA  
MODENA } for Lombard Romanesque

BARI  
MOLFETTA } for Southern Romanesque

PALERMO  
MESSINA  
MONREALE  
CEFALU } for Sicilian Romanesque

WÜRZBURG, for Romanesque in Germany

GENOA  
ASSISI  
ORVIETO  
VERONA  
PERUGIA  
SIENA } for Italian Gothic

In the same way, for Gothic in other countries, the student should read:

AIX-LA-CHAPELLE  
LE PUY  
ANGOUËME  
ARLES  
NIMES  
ST. DENIS  
NOYON  
SENLIS  
SENS  
REIMS  
LE MANS } for French Gothic

OVIEDO  
LEON  
AVILA  
SEGOVIA  
LERIDA  
TOLEDO  
BURGOS  
SEVILLE  
SALAMANCA } for Spanish Gothic

DURHAM  
LINCOLN  
SALISBURY  
GLOUCESTER, etc. } for English Gothic

AIX  
MAINZ  
WORMS  
SPIRES  
COLOGNE } for German Gothic

TOURNAI, LOUVAIN, etc., for Belgian,

and in general, the articles CATHEDRAL, NAVE, AISLE, CHOIR, APSE, CHEVET, LADY-CHAPEL, VAULT, FLYING BUTTRESS, PINNACLE, CLERESTORY and TRIFORIUM. The article CATHEDRAL has plans of Canterbury, Salisbury, Durham, Ely, Chartres, Sens and Angoulême and a perspective of Amiens cathedral.

In the same way the student of the Renaissance architecture may supplement the section in the article ARCHITECTURE (p. 408, etc.) by reference to the articles on the cities in which the great Renaissance buildings stand. But now "the career of the individual has to be taken into consideration," so true is it that the Renaissance in architecture as in scholarship was intensely individualistic. The article ARCHITECTURE points this out and in this section is largely biographical in its treatment. The reader should study the following separate articles also

#### *For Italian Renaissance*

FILIPPO BRUNELLESCHI  
FLORENCE  
LEONE BATTISTA ALBERTI  
MICHELOZZO DI BARTOLOMMEO  
BRAMANTE  
ROME (for St. Peters: see Fig. 51  
in ARCHITECTURE)  
BORGOGNONE  
BACCIO D'AGNOLO  
SANGALLO  
POLLAIULO  
MICHELANGELO

JACOPO SANSOVINO  
MICHELE SANMICHELE  
ANDREA PALLADIO  
BAROCCHIO DA VIGNOLA  
GALEAZZO ALESSI  
LOMBARDO  
DOMENICO FONTANA  
BALDASSARE PERUZZI

#### *The French Renaissance*

For this period, less individual than in Italy, the reader will find it best to study the geographical articles. Let him read

BLOIS (noting Plate VIII, fig. 84,  
in the article ARCHITECTURE)  
TOURS  
CHAMBORD  
ORLEANS  
CHENONCEAUX  
FONTAINEBLEAU  
PARIS

#### *Spanish Renaissance*

GRANADA  
VALLADOLID  
SARAGOSSA  
MALAGA  
SALAMANCA (Plate V., fig. 78 in  
*Architecture*)  
SEVILLE (Plate V., fig. 74 in *Architecture*)  
ESCORIAL (with plan)  
MADRID (Palacio Royal)

#### *English Renaissance*

JOHN THORPE  
INIGO JONES  
SIR CHRISTOPHER WREN  
ST. PAUL'S CATHEDRAL (see Fig. 58  
in ARCHITECTURE)  
GREENWICH (for Hospital)  
NICHOLAS HAWKSMOOR  
SIR JOHN VANBRUGH  
DEAN HENRY ALDRICH  
GEORGE and JAMES DANCE  
WILLIAM KENT  
ROBERT ADAM  
SIR WILLIAM CHAMBERS



*German Renaissance*

ROTHENBURG (town-hall)  
 AUGSBURG (town-hall)  
 HEIDELBERG (see Plate VII in ARCHITECTURE)

*Renaissance in Belgium and Holland*

ANTWERP  
 AMSTERDAM  
 ROTTERDAM  
 HAARLEM

On *Mahomedan Architecture* the student should read not only the section (Vol. 2, pp. 422-427) in the article ARCHITECTURE, with eight illustrations, but the separate articles

INDIAN ARCHITECTURE (with 4 plates, 17 figures)

MOSQUE (with 8 diagrams)

MINARET

CAIRO

CONSTANTINOPLE

DAMASCUS

JERUSALEM

MECCA

KAIRAWAN

CORDOVA

ALHAMBRA

TABRIZ

ISFAHAN

On the more recent period, the 19th century, roughly, the student should supplement the last part of the article ARCHITECTURE by reading the following articles

*For the Classical Revival in the British Isles*

DUBLIN (see also Fig. 85 in ARCHITECTURE)

EDINBURGH

SIR JOHN SOANE

*English Gothic Revival*

A. W. N. PUGIN

SIR GEORGE GILBERT SCOTT

GEORGE S. STREET

WILLIAM BUTTERFIELD

JOHN LOUGHBOROUGH PEARSON

ALFRED WATERHOUSE

France (Figs. 122-129 in article ARCHITECTURE)

L. P. BALTARD

J. L. C. GARNIER

*The Last 50 Years*

|   |           |
|---|-----------|
| GEORGE FREDERICK BODLEY                 | } England |
| R. NORMAN SHAW                          |           |
| WILLIAM MORRIS                          |           |
| HARVEY L. ELMES                         |           |
| CHARLES R. COCKERELL                    |           |
| LIVERPOOL (and Fig. 86 in ARCHITECTURE) |           |

|                    |   |
|--------------------|---|
| H. H. RICHARDSON   | } United States (and see Plates XV and XVI, and Figs. 97, 98, 99 in article ARCHITECTURE) |
| RICHARD M. HUNT    |   |
| CHARLES F. MCKIM   |   |
| STANFORD WHITE     |   |
| WILLIAM R. MEAD    |   |
| RUSSELL STURGIS    |   |
| STEEL CONSTRUCTION |   |

*Classical Revival in Germany*

KARL FRIEDRICH SCHINKEL  
 BERLIN (and Fig. 87 in ARCHITECTURE)

POTSDAM (and Fig. 88 in ARCHITECTURE)

MUNICH (and Fig. 89 in ARCHITECTURE)

GOTTFRIED SEMPER

*French Classicism*

ADOLPHE THEODORE BRONGNIART  
 JACQUES IGNACE HITTORFF (Plate XII in ARCHITECTURE)

*English "Commonsense"*

SIR CHARLES BARRY

HALIFAX (Fig. 90 in ARCHITECTURE)

WESTMINSTER (Houses of Parliament; see Fig. 91 in ARCHITECTURE)

BUDAPEST (Fig. 92 in ARCHITECTURE)

The sections of the article ARCHITECTURE dealing with France and Germany in the last two generations may best be supplemented by a study of the articles PARIS, BERLIN, VIENNA, and BUDAPEST.

The following is a brief alphabetical list of architectural articles and topics in the *Britannica*, including topics for the builder and contractor.

|                        |                        |                      |                       |
|------------------------|------------------------|----------------------|-----------------------|
| Abacus                 | Battlement             | Chevron              | Dodecastyle           |
| Abated                 | Bay                    | Chimney              | Dog-tooth             |
| Abbey                  | Bed-mould              | Chimney-piece        | Dome                  |
| Abutment               | Belfry                 | Choir                | Donjon                |
| Acroterium             | Bell-cot               | Chresmographion      | Door                  |
| Adam, Robert           | Belvedere              | Cinque Cento         | Doorway               |
| Aedicula               | Bema                   | Cleithral            | Dormer                |
| Aisle                  | Bench-table            | Clerestory           | Dormitory             |
| Aiwan                  | Bevel                  | Cloaca               | Dosseret              |
| Leone Battista Alberti | Bezantée               | Cloister             | Dovetail              |
| Alcove                 | Sir A. W. Blomfield    | C. R. Cockerell      | Dowels                |
| Galeazzo Alessi        | G. W. Bodley           | Coenaculum           | Drafted masonry       |
| Alley                  | Bonding                | Coffer, and Coffer   | Dredging              |
| Almery                 | Giuseppi Bonomi        | Dams                 | Dripstone             |
| Almonry                | Francesco Borromini    | Cogging              | Dromos                |
| Almshouse              | Bowtell                | Colonnade            | Dungeon               |
| Alure                  | Bracket                | Placido Columbani    | Early English Period  |
| Ambo                   | Bramante               | Column               | Eaves                 |
| Ambulatory             | Brattishing            | Compluvium           | Echinus               |
| Amphiprostyle          | Sir Reginald Bray      | Composite Order      | Eiffel Tower          |
| Amphitheatre           | Brick, and Brickwork   | Compound pier        | Elevator              |
| Andron                 | Bridges                | Conch                | Elizabethan Style     |
| Angel-lights           | Broach                 | Concrete, Concrete   | H. L. Elmes           |
| Antae                  | Sir I. M. Brunel       | Piers, etc.          | James Elmes           |
| Ante-chapel            | Filippo Brunelleschi   | Consisterium         | Embrasure             |
| Ante-choir             | Building               | Construction         | Engaged Column        |
| Ante-fixae             | Charles Bulfinch       | Coping               | Entablature           |
| Anthemion              | Bungalow               | Corbel               | Entasis               |
| Apophyge               | William Butterfield    | Corbie               | Ephebeum              |
| Apollodorus of Da-     | Buttress               | Cornice              | Epi                   |
| mascus                 | Cable moulding         | Counterfort          | Epinaos               |
| Apsæ                   | Luigi Cagnola          | Coursed Rubble       | Epistyle              |
| Apteral                | Caissons               | Cramps               | Estrade               |
| Aqueduct               | Camber                 | Crenelle             | Eupalinus             |
| Araeastyle             | Campanile              | Crest                | Eustyle               |
| Araeosystyle           | N. le Camus de Mé-     | Crocket              | Exedra                |
| Arcade                 | zières                 | Crossing             | Extrados              |
| Arch                   | Canal                  | Cross springer       | Façade                |
| Architrave             | Canalis                | Crypt                | Facing                |
| Archivolt              | Cancelli               | Crypto-porticus      | Fan Vault             |
| Arcosolium             | Candelabrum            | Cubicle              | Femerell              |
| Arena                  | Canephoræ              | Cuneus               | Fenestration          |
| Arris                  | Canopy                 | Cupola               | Feretary              |
| Ashlar                 | Cantilever Foundations | Curvilinear          | James Fergusson       |
| Astragal               | Capital                | Cusp                 | Festoon               |
| Astylar                | Carpentry              | François de Cuvilles | Fillet                |
| Atrium                 | Cartouche              | Cyclopean Masonry    | Finial                |
| Attic                  | Caryatides             | Cyclostyle           | Flamboyant Style      |
| Attic Base             | Casement               | Cyma                 | Flèche                |
| Baccio d'Agnolo        | Castle                 | Cyrto-style          | Floor                 |
| Back-choir             | Cathedral              | Cyzicenus            | Flue                  |
| Bailey                 | Cathetus               | Daedalus             | Flying Buttress       |
| Balcony                | Cauliculus             | Dais                 | Pierre F. L. Fontaine |
| Ball-flower            | Cavaedium              | Dance (family)       | Domenico Fontana      |
| L. P. Baltard          | Cavea                  | Decastyle            | Footing               |
| Balustrade             | Cavetto                | Decorated Period     | Foot-stall            |
| Banker-marks           | Ceiling                | Dentil               | Formeret              |
| Baptistery             | Cella                  | Diaconicon           | Foundation            |
| Barbican               | Cements                | Diastyle             | Fountain              |
| Bargeboard             | Chalcidicum            | Diaulos              | Charles Fowler        |
| Giacomo Barocchio      | Sir William Chambers   | Diazomata            | Frater                |
| Bartizan               | Chamfer                | Dikka                | Free-stone            |
| Base                   | Chancel                | Dinocrates           | Fret                  |
| Basement               | Chapter-house          | Dipteral             | Frieze                |
| Basilica               | Charnel-house          | Philibert De l'Orme  | Frigidarium           |
| Batement-lights        | Chateau                | Discharging Arch     | Frontispiece          |
| Baths                  | Chersiphron            | Distyle              | Gable                 |
| Batter                 | Chevet                 | Docks                | Gablets               |

|                                 |                      |                      |                       |
|---------------------------------|----------------------|----------------------|-----------------------|
| Galilee                         | Joggles              | Ordinance            | Philon                |
| Gallery                         | Inigo Jones          | Oriel                | A. W. N. Pugin        |
| Gargoyle                        | Owen Jones           | Orientation          | Pulpit                |
| J. L. C. Garnier                | Jubé                 | Orthostatae          | Purlin                |
| Garret                          | Keel-moulding        | Orthostyle           | Pycnostyle            |
| Garretting                      | Keep                 | Oubliette            | Pyramid               |
| Gate                            | Keystone             | Ovolo                | Pyramidion            |
| Gatehouse                       | Label                | Pagoda               | Pythis                |
| Gazebo                          | Labrum               | Painter-work         | Quadriga              |
| Girder                          | Laconicum            | Palace               | Quatrefoll            |
| Glazing                         | Lacunar              | Palaestra            | Quoins                |
| Glyph                           | Lady-Chapel          | Andrea Palladio      | Rag-stone             |
| Glyptothek                      | Lancet               | Palladian            | Random                |
| Godroon                         | Lantern              | Panel                | Rear vault            |
| Gothic                          | Lanterns of the Dead | Pantheon             | Refectory             |
| Grange                          | Lectern              | Parament             | Regula                |
| Granite                         | Libon                | Parapet              | Reredos               |
| Griffe                          | Lighting             | Parascenium          | Respond               |
| Groin                           | Lightning Conductor  | Parclose             | Rib                   |
| C. G. Guarini                   | Limestone            | Pargetting           | George Richardson     |
| Guilloche                       | Lintel               | John Henry Parker    | H. H. Richardson      |
| Gutta                           | Loft                 | Parquetry            | Thomas Rickman        |
| Gutter                          | Louver (Louvre)      | Parthenon            | River Engineering     |
| Joseph Gwilt                    | Lucarne              | Parvis               | Road                  |
| Gynaeceum                       | Lunette              | Patera               | Rood                  |
| Hagioscope                      | C. F. McKim          | Patio                | Rough Cast            |
| Half-timber Work                | Machicolation        | Pavement             | Rubble                |
| Hall                            | Maksoora             | Pavilion             | Rustication           |
| Halving                         | Manor-house          | J. L. Pearson        | Sacristy              |
| Hammerbeam Roof                 | Marble               | Paruzzi              | Saddle                |
| J. A. Hansom                    | Mastaba              | Pedestal             | Sangallo (family)     |
| Nicholas Hawksmoor              | Mausoleum            | Pediment             | Sanmichele            |
| Heating                         | Megaron              | Pendant              | Scabbling             |
| K. A. von Heideloff             | Merlon               | Pendentive           | Scaffold              |
| Helix                           | Meshrebiya           | Pergamum             | Scamilli impares      |
| Hemicycle                       | Meta                 | Peripteral           | K. F. Schinkel        |
| Herring-bone                    | Metope               | Peristyle            | Sir G. G. Scott       |
| Hexastyle                       | Mezzanine            | Perpendicular Period | Scotia                |
| Hip-knob                        | Mihrab               | Perpent Stones       | Sedilia               |
| Hipped roof                     | Minaret              | Perron               | Gottfried Semper      |
| Hippodamus                      | Minbar               | Philon               | Sepulchre, Easter     |
| Hippodrome                      | Minster              | Piazza               | Severy                |
| J. I. Hittorff                  | Modillion            | Pier                 | Sewerage              |
| Hôtel-de-Ville                  | Module               | Pilaster             | Sexpartite vault      |
| Hôtel-Dieu                      | Monotriglyph         | Pile Foundations     | Shaft                 |
| Hot-water Heating and<br>Supply | Mortar               | Pillar               | R. Norman Shaw        |
| House                           | Mortice              | Pinacotheca          | Shoring               |
| Hypaethros                      | Mosque               | Pinnacle             | Sill                  |
| Hypocaust                       | Mouldings            | Piscina              | Skeleton Construction |
| Hypostyle                       | Moving Stairs        | Plan                 | Slaking               |
| Hypotrachelium                  | Mullion              | Planceer             | Slip Joints           |
| Ichnography                     | Mural Decoration     | Plaster              | Slype                 |
| Iconostasis                     | Mutule               | Plinth               | Sir John Soane        |
| Ictinus                         | Narthex              | Podium               | Soffit                |
| Imbrex                          | Nave                 | Poppy Heads          | Solar (Soller)        |
| Impluvium                       | W. E. Nesfield       | Porch                | Sommer                |
| Impost                          | Newel                | Porticullis          | Spandril              |
| In-antis                        | Niche                | Portico              | Sphaeristerium        |
| Indian Architecture             | Notching             | Postern              | Spina                 |
| Intercolumniation               | Nymphaeum            | Presbytery           | Spire                 |
| Interlaced arches               | Obelisk              | Prick Posts          | Spire light           |
| Intrados                        | Octastyle            | Propylaea            | Springer              |
| Jacobean Style                  | Odeum                | Proscenium           | Squinch               |
| Jamb                            | Oecus                | Prostyle             | Squint                |
| Jesse                           | Ogee                 | Prothesis            | Stag Bars             |
| Joinery                         | Ogive                | Pseudo-dipteral      | Stage                 |
| Joints                          | Oillets              | Pseudo-peripteral    | Stained Glass         |
|                                 | Order                | Pteron               | Staircase             |

|                    |                  |                  |  |
|--------------------|------------------|------------------|--|
| Stairn             | Tabularium       | Sir William Tite | Vault                                    |
| Stall              | Taenia           | Toran            | Ventilation                              |
| Stanchion          | Talar            | Torus            | Verandah                                 |
| Steam-Heating      | Talus            | Tower            | Verge                                    |
| Steel Construction | Tambour          | Trabeated        | Vesica Piscis                            |
| Steeple            | Taper            | Tracery          | Vestibule                                |
| Stele              | Tas-de-charge    | Trachelium       | Vignette                                 |
| Stereobate         | Tegula           | Transept         | Villa                                    |
| Stillicidium       | Telamones        | Transom          | Viollet-le-Duc                           |
| Stilted            | Temenos          | Transverse Rib   | Vitruvius                                |
| Stoa               | Temple           | Trapezophoron    | Volute                                   |
| Stone, Stone Wash  | Tenon            | Trefoil          | Vousoir                                  |
| Storey             | Tepidarium       | Trial Boring     | Wall, and Walling, and<br>Wall Coverings |
| G. E. Street       | Terminal Figures | Tribune          | Alfred Waterhouse                        |
| Russell Sturgis    | Terrace          | Triforium        | Water Spray Ventila-<br>tion             |
| Style              | Tessellated      | Triglyph         | Wattle and dab                           |
| Stylobate          | Tetrastōra       | Triumphal arch   | Wedging                                  |
| Bartolommeo Suardi | Tetrastyle       | Tudor flower     | Well Foundations                         |
| Sudatorium         | Thatch           | Tudor period     | Wind braces                              |
| Surbase            | Theatre          | Tunnel           | Window                                   |
| Surveying          | Thesaurus        | Tunnel-vault     | Sir Christopher Wren                     |
| Suspensura         | Tholobate        | Turning-piece    | James Wyatt                              |
| Systyle            | Tholos           | Turret           | Xystus                                   |
| Tabernacle         | John Thorpe      | Under-croft      |  |
| Tablinum           | Timber           | Vane             |  |

## CHAPTER XVI

## FOR BUILDERS AND CONTRACTORS

**T**HE rapid increase in population, and especially in its density, the congestion in great cities, with the consequent building up of suburbs; and the equally rapid upward tendency in the scale of comfort, are factors of modern civilization which make the work of the builder and contractor increasingly complex. The good builder is probably much

### The Builder's Problems

commoner than ever before, in spite of the popular impression that building materials are poorer and that construction work is more often "scamped" than they used to be. Increased transportation facilities make the builder much less dependent on local and often inadequate materials. And there has been a change in the theory and practice of government: the old easy-going policy has been abandoned, and new laws, strictly enforced, have resulted in such inspection and control of building operations as would

have seemed tyranny to the builder of a generation ago and as make modern buildings, especially in cities, much safer than ever before. Insurance companies have done much to the same end.

There is a general prejudice against the modern builder on the part of the temperamental "praiser of the past." Occasionally similar complaints are made even against the builders of the past. Kipling sings:

Who shall doubt the secret hid  
Under Cheops' pyramid  
Was that a contractor did  
Cheops out of several millions?  
Or that Joseph's sudden rise  
To Comptroller of Supplies  
Was a fraud of monstrous size  
On King Pharaoh's swart civilians?

The mere duration of the pyramids, undamaged except by the hand of man, is an answer to such a charge; and in the Britannica article PYRAMID the reader will find (Vol. 22, p. 683) that even where the hidden material was rubbish or of mud

bricks, "the casings were not a mere veneer, but were of massive blocks, usually greater in thickness than in height"—in other words, that the construction was of the best character.

But the builder must be a far better-informed man under present conditions than ever before. To give him the necessary information there is a large and growing literature ranging from builders' and contractors' pocket manuals to special periodicals. This literature is expensive, and like all special literature puts the intending purchaser in a difficult position, for *if he buys it all*, he must pay much more than the returns from his purchase warrant, and he will then have to *read it all* and use his own judgment in deciding what is best. If he does not buy all, he must be an expert, not merely in every branch of his business but in the bibliography of his business, to make a wise selection,—and if he is sufficiently expert for this he will probably need no such library. But he will find, to a remarkable degree, the best of all that there is in such special literature in the Encyclopaedia Britannica, with the strongest assurance of its being authoritative, and with the certainty that for an outlay, small in comparison with what he would make for such special information elsewhere, he will get the guidance that he needs for his work and also information as excellent on any other subject that he or any member of his family may wish to pursue.

The key or foundation article for the builder or contractor is BUILDING (Vol. 4, p. 762), by James Bartlett, lecturer on construction, etc., King's College, London, who has contributed other articles on related topics. The article deals with:

The relation of building to architecture and with building laws and special types of plans according to local governmental requirements

The conditions necessary for a successful building, namely—ease of

access, good light, good service, pleasing environment and approaches, minimum cost with true economy, and, for office buildings, ease of arrangement to suit tenants

Construction, its general principles  
Materials of construction, especially stone and brick

Particular objects of construction

Foundation walls

Footings to walls

General procedure for an intended building

Builder's sphere

American building acts

Fire-resisting construction.

This general article is supplemented by the following articles:

FOUNDATION, containing 18 diagrams and paragraphs on: load on foundation; trial boring; construction; types—concrete piers, pile foundations, concrete piles, plank foundations, caissons, well foundations, coffer dams, dock foundations, cantilever foundations, building on sand (at Cape Henlopen, Delaware)

#### CAISSON

MASONRY, with 18 diagrams, and with special treatment of tools, including hammers, mallets, saws, chisels, setting tools, hoisting appliances; of seasoning stone; of setting stones; of use of mortar; of bonding; slip joints; footings; walling; random; coursed rubble, ashlar, etc.; backing to stone work; pointing and stonewash. There is also a brief vocabulary of technical terms and a discussion of methods of facing; joints; cramps; dowels; joggles; stone arches; tracery and carving; and the articles ASHLAR, RAG-STONE, RANDOM

CEMENT, with 8 figures; description and analysis of Pozzuolanic and Portland cement; mixing; loading of kilns; types of kilns; cement clinker; testing; hydraulic



- lime; Roman cement; natural cements; Passow cement; uses of hydraulic cement; calcium sulphate cements
- CONCRETE**, with 16 illustrations and paragraphs on constituents; proportions; mixing; moulds; depositing; strength; durability; convenience and appearance; resistance to fire; cost; artificial stones; steel concrete, including columns, piles, beams, floor slabs, etc.; concrete arches
- MORTAR**, with sections on slaking; hardening; magnesia in mortar; strengths; adhesion, decay, effects of salt and frost; legal restrictions; limes and cements for mortar
- LIME**
- BRICK**, with sections on brick-clays and brick-making
- BRICKWORK**, with 15 diagrams; sections on hollow walls; materials and labor; varieties of bricks; strength of brickwork; mortar; pointing; footing; binding; prevention of damp; arches and plates; chimneys and flues; brick paving
- BASEMENT**
- HOUSE**, with 17 illustrations
- BUNGALOW**
- CARPENTRY**, with 36 diagrams showing joints, notching, cogging, dovetail, housing, halving, mortise, tenons, wedging, dowelling, turning-piece, lintel, floors, strutting, partition, half timber construction, braced frame; and descriptive text on these and other topics
- STEEL CONSTRUCTION**, with 4 illustrations; sections on skeleton and steel-cage construction; local laws; protection from corrosion; columns; girders; floors; wind-bracing; materials; floor-filling; partitions; time and cost of construction
- STONE**, with sections on constitution, colour, testing, preservatives, natural bed, seasoning, varieties, artificial stone
- MARBLE**, a descriptive article, about 4000 words long
- GRANITE**, with descriptions and analyses of typical granites
- LIMESTONE**, about 2500 words
- TIMBER**, with paragraphs on: felling timber, conversion of timber—with diagram of bastard and quarter sawing; seasoning; defects; decay; preservation of timber; varieties, with description of the principal coniferous and hard woods—and separate articles on PINE, FIR, LARCH, CEDAR, BIRCH, BEECH, CHESTNUT, WALNUT, ELM, TEAK, MAHOGANY, MAPLE, etc.
- HALF-TIMBER WORK**
- CHIMNEY-PIECE**
- SCAFFOLD**, with 4 figures; sections on bricklayers' and masons' scaffolds, material, erection, gantries, derrick towers, cradles, chimney scaffolds, accidents
- SHORING**, with 8 figures; sections on raking shores; braces, horizontal or flying shores; needle, vertical and dead, shoring; rules and sizes for all shores
- STAIRCASE**, divided into architecture and construction, the latter having 4 diagrams, description of dog-legged or newel stair, open newel stair, geometrical stair, circular stair, spiral stairs; a defining vocabulary of technical terms; concrete and stone; moving inclines; local building laws
- BALUSTER**
- BALUSTRADE**
- ELEVATOR**, with 3 illustrations; paragraphs on history; construction, essentials of design; safety devices; traveling staircases; freight elevators
- PARQUETRY**
- CEILING**
- ROOFS**, with 28 figures and two plates; with sections on forms of roof, trusses, open timber roofs, mansards; iron roofs, covering materials—felt corrugated iron, zinc, lead, copper, "tin," slate, tiles, miscellaneous—weight of roofs, building laws; and sepa-

rate articles on **SLATE, TILE, TIN, TIN PLATE**, etc.

**PLASTER WORK**, with paragraphs on lathing, metal lathing, limes, hair, substitutes for hair, sand, external work, rough stucco, rough-cast or pebble-dash, sgraffito, internal work, three coats, moulding, cracks, slabs, fibrous plaster.

**JOINERY**, with 18 illustrations, and treating such topics as: tools and materials; joints, mitre, dovetail, etc.; warping; moulding; flooring, including wood block and parquet; skirting, dados; picture rails; windows, bay windows; shutters; shop-fronts; doors; church work; ironmongery, including hinges, locks, etc.

**DOOR**  
**DOORWAY**  
**CASEMENT**  
**WINDOWS**  
**GLAZING**  
**STAINED GLASS**

**WALL COVERINGS**, with sections on marble wall-lining, mosaic, tiles, metal sheeting, tapestry, wall-papers—and see **MURAL DECORATION**.

**PAINTER-WORK**, dealing with paint bases, vehicles, thinners, driers, pigments, enamel, paints, wood-work paints, varnish, gums, French polishes, putty, tools, workmanship, graining, marbling, painting on plaster and on iron, repainting on old work, blistering and cracking, distemper, gilding, etc.

**SEWERAGE**

**LIGHTING**, with sections on oil, gas and electric lighting

**LIGHTNING CONDUCTOR**

**HEATING**, with sections on open fires, closed stoves, gas fires, electrical heating, oil stoves, low pressure hot water, high pressure hot water, steam heating, hot water supply, safety valves, geysers, incrustation, Lockport central steam supply

**VENTILATION**, with sections on rate of air consumption, ventilation of buildings, with table; chimney draught; other outlets; inlets; window and door ventilation; arrangements in barracks, in public buildings, exhaust cowls; extraction of vitiated air; fans; water spray ventilation; extraction by hot-air shaft; measurement of air; systems in public buildings

Both the builder and contractor will find valuable information to govern their financial relations with their clients in the article **BUILDING SOCIETIES**, of which the American part is by Carroll D. Wright, late United States Commissioner of Labor.

The contractor will find the following articles of importance to him, in addition to those of more particular interest for the builder:

**SURVEYING**  
**GEODESY**  
**BRIDGES**  
**CANTILEVER**  
**CAISSON**  
**COFFERDAM**  
**RIVER ENGINEERING**  
**HARBOUR**  
**DIVERS AND DIVING APPARATUS**  
**DOCKS**  
**DREDGES**  
**BREAKWATER**  
**TUNNEL**  
**CANAL**  
**ROAD**  
**LIGHTHOUSE**  
**IRRIGATION**  
**RECLAMATION OF LAND**

and the article **RAILWAY**, with the other articles on railway construction listed in the chapter *For Railroad Men* in this Guide.

For an alphabetical list of the principal articles and topics of interest to builders and contractors, see the end of the chapter *For Architects* in this Guide.

## CHAPTER XVII

### FOR DECORATORS AND DESIGNERS

**T**HE decorator and designer is a specialist in his purposes rather than in his methods, and his taste and judgment must be based upon a wide range of information. His selection and combination of decorative factors call for a knowledge of architectural design, of painting, sculpture, furniture, textiles, pottery, enamels, embroideries, laces and all the other arts, crafts and products that contribute to the perfecting of "the house beautiful." The variety of the materials at his command offers him infinite possibilities of successful achievement, and as many temptations to incoherence and exuberance. The highest success in decoration can be attained only

#### All the Arts in One

when the designer possesses the resources of all these arts and crafts, and failure perhaps comes oftenest through too exclusive a use of one medium of expression because it is the one with which the designer feels he can most competently deal. The ideal should be not only to employ, but to enlarge, the scope of every contributory medium of form or colour, as Wagner found new possibilities in the use of every musical instrument in one orchestra. This practical usefulness of versatility is clearly indicated in one of the articles, characteristic of the Britannica, where one great expert writes about the work of another. William Morris and Walter Crane have been the leaders of the modern revival of artistic interest in the daily accessories of life; and Crane in the Britannica (Vol. 2, p. 701) says of Morris that his influence is to be attributed to his having "*personally mastered the working details and handling of each craft he took up in turn, as well as to his power of inspiring his helpers and*

*followers. He was painter, designer, scribe, illuminator, wood-engraver, dyer, weaver and, finally, printer and paper-maker; and, having effectively mastered these crafts he could effectively direct and criticize the work of others.*" Obviously, few men can afford to devote forty years, as Morris did, to the close study and actual practice of all these pursuits, and still fewer could hope to develop so many manual dexterities. But any earnest student can become a competent critic in all these varied fields, and can retain an equal appreciation of all the materials and methods employed, if he will enlarge and refresh his knowledge by constant reading of the best authorities. The comprehensiveness of the Britannica makes it, for such purposes, invaluable to the designer and decorator, no matter how many technical books his working library may contain.

Since harmony of proportion, the essence of architecture, is also the primary law of interior decoration, the reader of the present chapter  
**The Influence of Architecture** may well begin his reading with a number of the articles described in the chapter *For Architects*, of which only those dwelling most upon the use of ornament and colour need be separately mentioned in this connection. The article ARCHITECTURE (Vol. 2, p. 369) is by R. Phené Spiers, formerly master of the Architectural School of the English Royal Academy, with sections on special periods and schools of architecture by other famous authorities. Oriental architecture, with its elaboration of detail, is peculiarly suggestive to the decorator, who may be surprised to find, in the Britannica, treatises so highly specialized as INDIAN ARCHITECTURE (Vol. 14, p.

428), by Dr. James Burgess, editor of the standard book on the subject, the *History of Indian Architecture*; the architectural part of CHINA, *Art* (Vol. 6, p. 214), by Lawrence Binyon, whose work in the great British Museum collection has made his reputation as one of the foremost modern critics; and JAPAN, *Art* (Vol. 15, p. 181), by Capt. Frank Brinkley, whose many years of study in Japan have given him an exceptional mastery of the subject. Among other articles dealing with the decorative aspects of architecture are ORDER (Vol. 20, p. 176), CAPITAL (Vol. 5, p. 275), and HOUSE (Vol. 13, p. 810), with its exquisite full page plates.

The article DESIGN (Vol. 8, p. 95), by W. R. Lethaby, principal of the Central School of Arts and Crafts, London, contains a passage which

**Design and  
Mural  
Painting**

the decorator may well bear in mind when he has to contend against the typical client's unreasoning demand for the sensationalism which, for the moment, is accepted as an evidence of originality, but is always the cause of subsequent dissatisfaction and complaint. "Modern use has tended to associate design with the word 'original' in the sense of new or abnormal. The end of design, however, is properly utility, fitness and delight. *If a discovery, it should be a discovery of what seems inevitable*, an inspiration arising out of the conditions, and parallel to invention in the sciences." These fifty words are but a millionth part of the contents of the Britannica; but alone they show that the work can practically serve the designer. MURAL DECORATION (Vol. 19, p. 16), with its delightful reproduction in colour of a wall painting preserved in the National Museum at Rome, and its other illustrations, is by William Morris and Walter Crane, with a section on classical wall paintings by Prof. J. H. Middleton, Slade professor of fine art at Cambridge University. The "furnishing"

point of view is considered under other headings (see below). Here the distinguished contributors give an interesting account of marble and stone reliefs, the oldest method of wall decoration; marble veneer, especially appropriate to 14th and 15th century Italian style; wall-linings of glazed brick or tiles; coverings of hard stucco; the recently revived sgraffito method; stamped leather, much used in rooms of the 16th-18th century period; painted cloth; printed hangings and wall-papers, of great antiquity among the Hindus and Chinese but not common in Europe until the 18th century; wall-painting, with description of the characteristic schemes of mural art in ancient and modern times, and methods of execution.

In further connection with this subject the reader should turn to EGYPT, *Art and Archaeology* (Vol. 9, p. 65), by the noted Egyptologist, W. M. Flinders Petrie; GREEK ART (Vol. 12, p. 470), by Percy Gardner; ROMAN ART (Vol. 23, p. 474), by H. Stuart Jones; PAINTING (Vol. 20, p. 459), by Prof. G. B. Brown, of Edinburgh University, and other authorities; SCULPTURE (Vol. 24, p. 488), by Professor Middleton and other authorities; MOSAIC (Vol. 18, p. 883), by Professor Middleton and H. Stuart Jones, with a practical section on *Modern Mosaic* (p. 888), by Sir William Blake Richmond, noted for his accomplishments in decorative art. All of these articles are richly illustrated. See further, the chapters on *Fine Arts, Painting and Sculpture*.

WALL-COVERINGS (Vol. 28, p. 279), by James Bartlett, of Kings College, London, deals with the subject in its practical relation to house furnishing, with reference to the conditions of the room, the use to which it is to be put, its lighting aspect, and its outlook. There is much information about the employment of marble, mosaic, tiles, metal sheeting, tapestry, and wall-papers; and

**The Wall and  
the Floor**

separate articles will be found on the following materials: **MARBLE** (Vol. 17, p. 676), by J. S. Flett; **TILE, Wall and Floor** (Vol. 26, p. 971), illustrated, by William Burton; **LEATHER** (Vol. 16, p. 330), illustrated, by Dr. J. G. Parker; **TAPESTRY** (Vol. 26, p. 403), by A. S. Cole, an admirable historical account, fully illustrated, and giving information on varieties of design, indications of date, the marks of makers, modern tapestry weaving, etc. **BAYEUX TAPESTRY** (Vol. 3, p. 555) is an interesting historical account by the antiquarian, J. H. Round, of this venerable relic executed by order of the half-brother of William the Conqueror; it is illustrated with two plates containing 11 views of the tapestry.

In the matter of Floor-coverings there are the articles **FLOOR-CLOTH** (Vol. 10, p. 527), **PARQUETRY** (Vol. 20, p. 861), and **CARPET** (Vol. 5, p. 392), illustrated, by A. S. Cole, devoted to descriptions of carpets and rugs as designed and manufactured in Europe and Oriental countries.

The next group of topics begins with the article **FURNITURE** (Vol. 11, p. 363) with 36 illustrations by J. G. Penderel-

**Furniture** Brodhurst. The classified Table of Articles in the Britannica (Vol. 29, p. 888) indicates over 75 articles on separate pieces of furniture, but in this general treatise we have a concise history, describing periods and styles, with many interesting facts about the origin and use of different pieces of furniture from the earliest time to the "art nouveau" of very recent date. Some of the noteworthy separate articles, which have been written by Mr. Penderel-Brodhurst, are **CHAIR** (Vol. 5, p. 801); **DESK** (Vol. 8, p. 95); **TABLE** (Vol. 26, p. 325), and **BED** (Vol. 3, p. 612). See also **MARQUETRY** (Vol. 17, p. 751). For those who wish to preserve unity of style in furnishing a room, these articles will prove of the highest value. A full list is appended to this chapter;

and the reader should consult the chapter in this Guide *For the Manufacturer of Furniture*.

The decorator and designer must be familiar with all manner of fabrics, and the Britannica contains an immense fund of information in regard to the nature, manufacture and use of textiles.

### Textile Fabrics

For purposes of study a beginning would perhaps here be made with the article **WEAVING**, which is in two parts. The first, *Industrial Technology and Machinery* (Vol. 28, p. 440) with 28 illustrations, is by T. W. Fox, professor of textiles in the University of Manchester. Very useful will be found the classification of weaving schemes into groups, from which we learn the distinctive weaves of plain cloth, twills, satins, damasks, compound cloths, repps, piled fabrics, chenille, velvets and plushes, gauze, etc. All weaving machinery is described. The second part, *Archaeology and Art*, is written by A. S. Cole. It is a most interesting and valuable account of the origin of various textiles, and the periods to which they are appropriate. There are many illustrations of typical designs of silk, brocade and flax weavings.

The investigation of woven fabrics reveals the fact that the almost endless variety of effects obtained is due in part only to the method of weaving. Consequently, it is necessary for the student, in order to acquire an expert knowledge of the character and effect on any textile product which he wishes to employ, to have access to the information in the articles **BLEACHING** (Vol. 4, p. 49) illustrated; **MERCERIZING** (Vol. 18, p. 150); **DYEING** (Vol. 8, p. 744) illustrated, and with an elaborate classification of colouring matters—acid, direct, and developed colours; **FINISHING** (Vol. 10, p. 378) illustrated, and **TEXTILE PRINTING** (Vol. 26, p. 694), illustrated. The fact that this fine series of articles has been prepared



by Dr. Edmund Knecht, professor of technological chemistry, University of Manchester, assisted by noted authorities like the late J. J. Hummel, professor of dyeing, University of Leeds, and A. S. Cole, is a guarantee of their great interest and value.

In the matter of the fabrics themselves, under **COTTON**, *Cotton Goods and Yarn* (Vol. 7, p. 275) will be found descriptions of many cotton fabrics, and see also **SILK** (Vol. 25, p. 96) illustrated, by Arthur Mellor and other authorities; **WOOL, WORSTED, AND WOOLEN MANUFACTURES** (Vol. 28, p. 805) illustrated, by Prof. A. F. Barker of Bradford Technical College; **LINEN AND LINEN MANUFACTURES** (Vol. 16, p. 724) by Thomas Woodhouse, head of the weaving and textile designing department, Technical College, Dundee. Those who desire a closer scientific knowledge of fibres may obtain it from **FIBRES** (Vol. 10, p. 309), illustrated, by the well-known English analytical chemist, C. F. Cross. There are separate articles on **BROCADE** (Vol. 4, p. 620); **MUSLIN** (Vol. 19, p. 93); **CANVAS** (Vol. 5, p. 223); **CHINTZ** (Vol. 6, p. 235); **CRETONNE** (Vol. 7, p. 431); **GAUZE** (Vol. 11, p. 357) and other textiles. A full list of these materials is appended.

The article **LACE** (Vol. 16, p. 37) is one of the most notable contributions to the Britannica. It is written by A. S. Cole, author of *Embroidery and Lace, Ancient Needle Point and Pillow Lace*, etc., and has over 60 illustrations. A full history of lacemaking is given, and the article is of the highest interest throughout. There exists no better manual on the subject than this, and the pictures alone will enable the student to distinguish the different varieties. **EMBROIDERY** (Vol. 9, p. 309) by A. F. Kendrick, keeper of the Victoria and Albert Museum, and A. S. Cole, has 18 illustrations and describes the characteristics of the art as practised by different nationalities. **GOLD AND SILVER THREAD** (Vol. 12, p. 200), also by A. S.

Cole, is a general and historical account of the gold and silver strips, threads and gimp used in connection with varieties of weaving, embroidery and twisting and with plaiting or lace-work.

Before taking up the specific objects of art used in interior decoration and furnishing, attention must be called to

the many articles of  
great value to those  
engaged in all arts  
and crafts-work.

whose success depends upon a sound knowledge of methods and the principle of design. In **ARTS AND CRAFTS** (Vol. 2, p. 700) Mr. Walter Crane gives an account of the recent movement in the arts of decorative design and handicraft that has for its object the adornment of the house. Handicraft workers will find valuable material, discussing designs, methods and tools, in **NEEDLEWORK** (Vol. 19, p. 339); **WOODCARVING** (Vol. 28, p. 791) fully illustrated, by F. A. Crallan, author of *Gothic Wood-carving*; **CARVING AND GILDING** (Vol. 5, p. 438); **METALWORK** (Vol. 18, p. 205) illustrated, by Professor Middleton of Cambridge University, with sections on *Modern Art Metal-work* by John S. Gardner, and on *Industrial Metal Work* by J. G. Horner, author of *Practical Metal Turning*; **MEDAL** (Vol. 18, p. 1) illustrated, by M. H. Spielmann, formerly editor of *The Magazine of Art*; **GLASS, STAINED** (Vol. 12, p. 105) illustrated, by Lewis Foreman Day, late vice-president of the Society of Arts; **SPINNING** (Vol. 25, p. 685) by Professor Fox; **BASKET** (Vol. 3, p. 481) with an account of the basket-making industry and methods employed, by Thomas Okey, examiner in basket-work for the City of London Guilds and Institute; **EMBOSSING** (Vol. 9, p. 308); **CHASING** (Vol. 5, p. 956); **REPOUSSÉ** (Vol. 23, p. 108); **ENAMEL** (Vol. 9, p. 362) a very complete historical and technical article, fully illustrated, by Alexander Fisher, author of *The Art of Enamelling on Metals*; **JAPAN, Cloisonné**

*Enamel* (Vol. 15, p. 189); *INLAYING* (Vol. 14, p. 574). Much knowledge about primitive shapes and designs may be obtained from *ARCHAEOLOGY* (Vol. 2, p. 344) by Dr. Charles H. Read of the British Museum, *AEGEAN CIVILIZATION* (Vol. 1, p. 245) by D. G. Hogarth, the explorer, *SCANDINAVIAN CIVILIZATION* (Vol. 24, p. 287), and *AMERICA, Archaeology* (Vol. 1, p. 810) by the late O. T. Mason, of the National Museum, Washington. These articles are beautifully illustrated.

Some of the articles on art objects have already been mentioned; in addition to them there is *CERAMICS* (Vol. 5, p. 703), equivalent

**Portable  
Ornaments** to 133 pages of this Guide, with over 100 illustrations includ-

ing 10 full-page plates, six of which are colour. This magnificent article is the joint contribution of six special authorities and describes the art of pottery and porcelain manufacture, potter's marks, etc., in all countries and at all periods, with the exception of Japanese ceramics, for which see *JAPAN, Art, Ceramics* (Vol. 15, p. 183). *GLASS* (Vol. 12, p. 86) has a section on the *History of Glass Manufacture* (p. 97) in which glassware from the primitive vessels of ancient Egypt to modern wares is discussed and illustrated. The authors of this valuable account are Alexander Nesbitt, who wrote the descriptive catalogue of glass vessels for the South Kensington Museum, and H. J. Powell, of the Whitefriars Glass Works, London. *PLATE* (Vol. 21, p. 789) illustrated, is the joint product of H. Stuart Jones, formerly director of the British School at Rome; H. R. H. Hall, of the British Museum, and E. Alfred Jones, author of *Old English Gold Plate*. It contains unusually full information about hall-marks. There are also separate articles on *PEWTER* (Vol. 21, p. 338) and *SHEFFIELD PLATE* (Vol. 24, p. 824) by Malcolm Bell, author of *Pewter Plate*, etc.

*CLOCK* has a section *Decorative Aspects* (Vol. 6, p. 552), by J. G. Penderel-Brodhurst. *FAN* (Vol. 10, p. 168) by the late J. H. Pollen, author of *Ancient and Modern Furniture and Woodwork*, devotes special attention to styles of fan painting. *IVORY* has a well-illustrated section on *Ivory Sculpture and the Decorative Arts* (Vol. 15, p. 95) by A. O. Maskell, author of *Ivories*, etc. *MIRROR* (Vol. 18, p. 575); *FRAME* (Vol. 10, p. 773), and *SCREEN* (Vol. 24, p. 477) are likewise useful articles for the decorator and furnisher. *TERRACOTTA* (Vol. 26, p. 653) illustrated, by H. B. Walters of the British Museum, and William Burton, deals with the use of this material in architecture and sculpture, describes its manufacture, and contains an historical and critical discussion of subjects and types. *BYZANTINE ART* by W. R. Lethaby contains a section, *Metal Work, Ivories, and Textiles* (Vol. 4, p. 910).

The subject of *LACQUER* (Vol. 16, p. 53) is further treated under *JAPAN, Lacquer* (Vol. 15, p. 188), a part of a very elaborate discussion of all forms of Japanese art, including especially *Painting and Engraving* (Vol. 15, p. 172), which, as well as *CHINA, Art* (Vol. 6, p. 213), will be referred to constantly by all who are interested in Oriental handiwork and design.

A great number of the biographies in the Britannica will possess much interest for the decorator and designer. Some

**Biographies** of the noteworthy names of modern times are *MORRIS, WILLIAM* (Vol. 18, p. 871); *CRANE, WALTER* (Vol. 7, p. 366); *TIFFANY, LOUIS C.* (Vol. 26, p. 966); *LA FARGE, JOHN* (Vol. 16, p. 64); *RICHMOND, SIR WILLIAM BLAKE* (Vol. 23, p. 307); *CHIPPENDALE, THOMAS* (Vol. 6, p. 237); *HEPPLEWHITE, GEORGE* (Vol. 13, p. 305); *SHERATON, THOMAS* (Vol. 24, p. 841); *GIBBONS, GRINLING* (Vol. 11 p. 936).

ALPHABETICAL LIST OF ARTICLES IN THE ENCYCLOPAEDIA BRITANNICA OF  
SPECIAL INTEREST TO THOSE ENGAGED IN DECORATING, DESIGNING,  
INTERIOR FURNISHING AND ALL FORMS OF ART HANDICRAFT

- |                            |                       |                          |                        |
|----------------------------|-----------------------|--------------------------|------------------------|
| Abbey, E. A.               | Buckram               | Corner Coplae            | Enamel                 |
| Acroliths                  | Buffet                | Cornice                  | Encaustic Painting     |
| Adam, Robert               | Bunting               | Corregio                 | Encoignure             |
| Aegean Civilization        | Byzantine Art         | Cosmati (family)         | Engraving              |
| Ainmuller, M. E.           | Cable-moulding        | Costume                  | Etagère                |
| Alb                        | Caffieri, Jacques     | Cotton                   | Etching                |
| Alexander, J. W.           | Calender              | Cotton Manufacture       | Faience                |
| Almuce                     | Calico                | Cotton - spinning Ma-    | Fan                    |
| Alto-Rellevo               | Cambric               | chinery                  | Felt                   |
| America, <i>Archæology</i> | Cameo                 | Cowl                     | Fender                 |
| Amice                      | Candelabrum           | Cox, Kenyon              | Festoon                |
| Amphora                    | Candle                | Cradle                   | Fibres                 |
| Andiron                    | Candlestick           | Crane, Walter            | Filigree               |
| Angerstein, J. J.          | Canopy                | Crape                    | Fine Arts              |
| Antimacassar               | Canvas                | Crash                    | Finiguerra, Maso       |
| Apostle Spoons             | Capital               | Cressent, Charles        | Finishing              |
| Aquarelle                  | Capronnier, Jean Bap- | Crest                    | Fireback               |
| Aquatint                   | tiste                 | Cretonne                 | Fire-irons             |
| Arabesque                  | Carding               | Cross                    | Flag                   |
| Arch                       | Carpet                | Crozat, Pierre           | Flamboyant Style       |
| Archæology                 | Cartoon               | Crunden, John            | Flannel                |
| Architecture               | Cartouche             | Cupboard                 | Flannelette            |
| Armoire                    | Carving               | Curtain                  | Flock                  |
| Art                        | Carving and Gilding   | Cushion                  | Floor                  |
| Arts and Crafts            | Caryatides            | Dais                     | Floorcloth             |
| Art Teaching               | Casket                | Dalmatic                 | Footman                |
| Bagging                    | Cassock               | Damascening, or Dam-     | Frame                  |
| Bahut                      | Cassone               | askeneing                | French Polish          |
| Baize                      | Ceiling               | Damask                   | Fresco                 |
| Ball-flower                | Cellaret              | Darly, Matthias          | Frieze                 |
| Baroque                    | Cellini, Benvenuto    | Decorated Period         | Furniture              |
| Basin-stand                | Ceramics              | Delacroix, F. V. E.      | Fustian                |
| Basket                     | Chair                 | Della Robbia             | Ganté                  |
| Basso-relievo              | Chandelier            | Denim                    | Gargoyle               |
| Bead                       | Chasing               | Design                   | Gauze                  |
| Beaker                     | Chasuble              | Desk                     | Gem                    |
| Bed                        | Chatelaine            | Diaper                   | Gem, Artificial        |
| Bérain, Jean               | Cheese-cloth          | Die                      | Gesso                  |
| Bezel                      | Cheffonier            | Dimity                   | Ghiberti, Lorenzo      |
| Biretta                    | Chenille              | Diptych                  | Ghirlandajo            |
| Bleaching                  | Chest                 | Dog-tooth                | Gibbons, Grinling      |
| Blondel, J. F.             | Chevron               | Domenichino, Zampieri    | Gilding                |
| Blum, R. F.                | Chimere               | Doulton, Sir Henry       | Gillow, Robert         |
| Bombay Furniture           | Chimney-piece         | Dowlas                   | Gimp                   |
| Bombazine or Bomba-        | China, <i>Art</i>     | Drawing                  | Gingham                |
| sine                       | Chintz                | Dresser                  | Giotto                 |
| Bonelace                   | Chippendale, Thomas   | Drill                    | Girandole              |
| Bonheur du Jour            | Cimabue, Giovanni     | Drinking Vessels         | Girdle                 |
| Bookbinding                | Cinque Cento          | Duck                     | Glass                  |
| Bookcase                   | Cloth                 | Dumbwaiter               | Glass Cloth            |
| Book-plates                | Coffer                | Dwight, John             | Glass, Stained         |
| Boulle, André Charles      | Column                | Dyeing                   | Glue                   |
| Box                        | Composite Order       | Early English Period     | Gobelin                |
| Bracelet                   | Console               | Ear-ring                 | Goblet                 |
| Bracket                    | Cookworthy, William   | Egypt, <i>Archæology</i> | Gold                   |
| Brasses, Monumental        | Cope                  | Electrolier              | Gold and Silver Thread |
| Brazier                    | Copeland, Henry       | Electroplating           | Goldbeating            |
| Brocade                    | Copper                | Embossing                | Gouache                |
| Brooch                     | Corduroy              | Embroidery               | Gouthière, Pierre      |

- Graffito  
 Grate  
 Greco, El  
 Greek Art  
 Grille  
 Grisaille  
 Grotesque  
 Guéridon  
 Guido Reni  
 Gunny  
 Halfpenny, W.  
 Hallstatt  
 Hamerton, P. G.  
 Hepplewhite, George  
 Heraldry  
 Hessian  
 Hiroshige  
 Hokusai  
 Holland  
 Honeycomb  
 Horn  
 Hosier  
 House  
 Huckaback  
 Icon  
 Illuminated M a n u -  
   scripts  
 Illustration  
 Impressionism  
 Ince, William  
 India, *Costume*  
 Indiān Architecture  
 Ingle-work  
 Inlaying  
 Intaglio  
 Iron-work  
 Ivory  
 Jack  
 Jacobean Style  
 Japan, *Art*  
 Japanning  
 Jewelry  
 Johnson, Thomas  
 Jug  
 Jute  
 Kashi  
 Knitting  
 Lac  
 Lace  
 Lacquer  
 Lacrymatory  
 La Farge, John  
 Lampstand  
 Lantern  
 Lawn  
 Leather  
 Leather, Artificial  
 Lectern  
 Leonardo da Vinci  
 Le Pautre, Jean  
 Line Engraving  
 Linen, and Linen Man-  
   ufactures  
 Linen-press  
 Lithographing  
 Lock, Matthias  
 Longcloth  
 Lowboy  
 Macabre  
 Majolica  
 Manwaring, Robert  
 Marble  
 Marot, Daniel  
 Marquetry  
 Matting  
 Mayhew, Thomas  
 Mazer  
 Medal  
 Meissonier, J. A.  
 Mercerizing  
 Metal-work  
 Mezzotint  
 Michelangelo  
 Miniature  
 Mirror  
 Mohair  
 Molekin  
 Monogram  
 Monteith  
 Morel-Ladeuil, L.  
 Mosaic  
 Mouldings  
 Mull  
 Mural Decoration  
 Museums of Art  
 Muslin  
 Nankeen  
 Needlework  
 Net  
 Niello  
 Numismatics  
 Oeben, F. F.  
 Order  
 Ormolu  
 Ornament  
 Osnaburg  
 Ottoman  
 Overdoor  
 Overmantel  
 Padding  
 Pagoda  
 Painting  
 Palissy, Bernard  
 Pantograph  
 Papier Maché  
 Parchment  
 Parquetry  
 Pastel  
 Pearl  
 Pedestal  
 Pediment  
 Pendant  
 Pergolesi, M. A.  
 Perpendicular Period  
 Perugino, Pietro  
 Pewter  
 Photography  
 Phylactery  
 Pigments  
 Plaque  
 Plate  
 Plated Ware  
 Platinum  
 Plumbago Drawings  
 Plush  
 Poplin or Tabinet  
 Popp,-heads  
 Porcelain  
 Portière  
 Poster  
 Pot-hook  
 Prie-Dieu  
 Print  
 Process  
 Puvis de Chavannes,  
   P. C.  
 Raphael Sanzio  
 Relief  
 Rep  
 Repoussé  
 Reredos  
 Ribbons  
 Richmond, Sir W. B.  
 Riesener, J. H.  
 Ring  
 Robes  
 Rococo  
 Roman Art  
 Röntgen, David  
 Rousseau de la Rot-  
   tiere, J. S.  
 Rubens, Peter Paul  
 Rug  
 Sacking and Sack Man-  
   ufacture  
 Salt cellar  
 Salver  
 Samovar  
 Sampler  
 Sargent, J. S.  
 Scandinavian Civiliza-  
   tion  
 Scarab  
 Scarf  
 Sconce  
 Screen  
 Scrim  
 Sculpture  
 Seals  
 Servan, J. N.  
 Settee  
 Settle  
 Shagreen  
 Shawl  
 Shearer, Thomas  
 Sheffield Plate  
 Sheraton, Thomas  
 Sideboard  
 Silk  
 Silver  
 Sofa  
 Soutane  
 Spinning  
 Spilt  
 Spoon  
 Stencil  
 Stole  
 Stool  
 Sun Copying or Photo-  
   Copying  
 Surplice  
 Table  
 Tallboy  
 Tankard  
 Tapestry  
 Tarpaulin  
 Tartan  
 Tassie, James  
 Tazza  
 Tea-caddy  
 Tea-poy  
 Tempera  
 Terracotta  
 Textile-printing  
 Throne  
 Ticking  
 Tiepolo, G. B.  
 Tiffany, C. L.  
 Tile  
 Tintoretto  
 Titian  
 Tool  
 Torchère  
 Torque  
 Tortoiseshell  
 Tracery  
 Tray  
 Triclinium  
 Tripod  
 Triptych  
 Trivet  
 Tudor Period  
 Tulle  
 Twill  
 Uniforms  
 Utamaro  
 Varnish  
 Vase  
 Velvet  
 Velveteen  
 Veneer  
 Vernis Martin  
 Vestments  
 Walker, H. O.  
 Wall-coverings  
 Wardrobe  
 Washstand  
 Wax Figures  
 Weaving  
 Wedgwood, Josiah  
 What-not  
 Window-cornice  
 Window-seat  
 Wine Table  
 Wood-carving  
 Wood Engraving  
 Wyon, Thomas  
 Yarn

## CHAPTER XVIII

### FOR RAILROAD MEN

**T**H**ERE** are no less than six distinct classes of articles in the new Encyclopædia Britannica which contain information of peculiar interest to railroad men:—

1. Articles on continents contain authoritative and original accounts of trans-continental routes and traffic. For example the article **EUROPE** has a table in which the 19 chief avenues of trade are analyzed, showing the direct distance, the distance by sea and the distance by rail from point to point; another table comparing railroad developments in the various parts of Europe, and also an account of the contour of Europe from the railroad man's point of view, discussing the mountain ranges pierced by tunnels and the passes over which lines have been carried wholly or largely in the open.

2. The articles on separate countries, on the individual states of the Union, and on colonies contain detailed accounts of the railway systems.

#### Six Classes of Articles

For example, the article **FRANCE** describes the six great French railroads, traces their lines and explains the financial system by which they were constructed, the concessions granted to them by the French government, and the extent to which direct state ownership and management has been adopted.

2. The articles on cities show the relation of each centre to the general railroad system of the country and describe the terminals and the methods of urban communication. For example, in the article **BERLIN** there is an account of the *Stadtbahn*, carried through the heart of the city, 20 feet above the street, provid-

ing for through traffic as well as for suburban service.

4. The maps as well as the many plans of cities, all of which were specially prepared for the Britannica, show much more clearly than does an ordinary atlas, the present development of railroads in all parts of the world.

5. The articles on various branches of engineering and mechanics, described in other chapters of this Guide, are complete treatises on the technical subjects connected with railroad construction and management.

6. The articles devoted exclusively to the subject, of which a brief account is given in the present chapter, are those to which railroad men will naturally first turn.

The key article is **RAILWAYS** (Vol. 22, p. 819), equivalent in length to more than 120 pages of this Guide. It is written by the foremost authorities on the subject both in the Old World and in the New, including:

**ARTHUR TWINING HADLEY**, president of Yale University, and author of *Railroad Transportation*.

**HUGH MUNRO ROSS**, author of *British Railways* and editor of the *Engineering Supplement* of the *London Times*.

**RAY MORRIS**, formerly managing editor of the *Railway Age Gazette* of New York and author of *Railroad Administration*.

**LT. COL. H. A. YORKE, C.B.**, chief inspecting officer of railways of the English Board of Trade.

**PROF. FRANK HAIGH DIXON**, of



Dartmouth College, author of *State Railroad Control*.

BRAMAN BLANCHARD ADAMS, associate editor of *New York Railway Age Gazette*.

WILLIAM ERNEST DALBY, professor of engineering in the South Kensington Central Technical College, and author of *The Balancing of Engines*, etc.

WILLIAM BARCLAY PARSONS, formerly chief engineer to the New York City Rapid Transit Commission and advisory engineer of the Royal Commission on London Traffic.

MAJ. GEN. C. E. WEBBER, founder of the Institute of Electrical Engineers.

EMILE GARCKE, managing director of the British Electric Traction Co., Ltd., author of *Manual of Electrical Undertakings*.

The article opens with an introductory historical summary which describes the use of railways or tramways before the invention of the steam locomotive in mining districts in England (just as in the article MAUCH CHUN, Vol. 17, p. 903, early mine transportation in America is described) and the way in which their use induced the development of high speed locomotives and how the first American trans-continental railroads were built. The student will find next a section of general statistics of railway mileage for the world, with a summary of American railway building, especially in the Far West since 1896. The following section is on economics and legislation in general, followed by separate treatment of British railway legislation and of American railway legislation. The great problem of government control and operation of railways as practised in various European countries is also discussed and is of interest in connection with contemporary American tendencies. The safety of railway transportation is treated in a section containing in compact form the

most valuable classified statistics. A section on *Financial Organization* compares American and British conditions in a most illuminating way.

Of even greater importance to the technical student are the remaining sections of this great article, namely:

(1) CONSTRUCTION, with subsections on *Location, Cuttings and Embankments, Gradients, Curves, Gauge, Permanent Way* (including ballast, ties, fish-plates and other rail joints, and rails), *Bridges, Rack (or cog) Railways, Cable Railways, Mono-Rail Systems, Switches and Cross-overs, Railway Stations* (for passengers and for freight), *Round Houses for Locomotives*, and *Switching Yards*. This treatise on construction is equivalent to 22 pages of the type and size of this Guide, and is in itself an adequate brief manual for the use of the construction engineer, with valuable illustrations in the text.

(2) LOCOMOTIVE POWER, including sub-sections on *Fundamental Relations, Methods of Applying Locomotive Power, General Locomotive Efficiency, Analysis of Train Resistance, Vehicle Resistance, Engine Resistance, Maximum Boiler Power, Draught, The Steam Engine, Tractive Force, Engine Efficiency, Piston Speed, Compound Locomotives, Balancing of Locomotives, Classes of Locomotives, Current Developments*. This section of the article is a little longer than the preceding,—it would fill 25 pages of this Guide,—and has illustrations, tables, and formulae. It is written by Prof. Dalby, the principal British authority on locomotives.

(3) ROLLING STOCK, dealing with dining, sleeping, passenger and vestibule cars, wood and metal, their heating and lighting and their weight and speed; with freight cars, their weight and speed; and with car-couplers and brakes.

(4) INTRA-URBAN, or city street railways, elevated and underground, by W. B. Parsons, formerly chief engineer of the New York Rapid Transit Commission.

(5) LIGHT RAILWAYS for rural and in-

terurban service and portable railways.

The next article to be read is **TRAMWAY** (Vol. 27, p. 159), dealing with the earliest railways used in coal mines, American and English, without locomotive power; and with modern street railways,—surface lines, steam, cable and electric, the

**Other Major Articles** last being subdivided into three classes, overhead or trolley, open conduit and closed conduit. The different types of street cars are discussed, and there are summaries of legislation and of commercial results, with general statistics.

The article **TRACTION** (Vol. 27, p. 118, equivalent to more than 20 pages of this Guide) is by Louis Duncan, formerly head of the department of electrical engineering in the Massachusetts Institute of Technology. It deals principally with electric traction and thus supplements the article **TRAMWAY**. *Steam* traction, as treated in the section on *Locomotive Power* in the article **RAILWAYS**, by Prof. Dalby, may be studied further in the article **STEAM-ENGINE** (Vol. 25, p. 818), and especially that part of the article which deals with locomotives (§ 104, p. 841).

The civil engineer engaged in railway work will profit by reading, besides the articles already mentioned: Professor W. C. Unwin's article (Vol. 4, p. 533) on **BRIDGES**, especially pp. 545 and 547 seq., dealing with railway bridges; and the article **TUNNEL** (Vol. 27, p. 399), by H. A. Carson, engineer-in-charge of the Boston Subway and of the East Boston Tunnel, which would make about 30 pages if printed in the form of this Guide. This article classifies tunnels into river, mountain and town (subway) tunnels, and gives special information about rail corrosion and ventilation in tunnels.

The equipment engineer will add to the topics already listed (cars, engines, etc.) the article **SIGNAL**, § *Railway Signalling* (Vol. 25, p. 73; as long as 15 pages of this Guide), by B. B. Adams, of the

*Railway Age Gazette*, and H. M. Ross, of the *London Times Engineering Supplement*; and **BRAKE** (Vol. 4, p. 414).

On the history of railroading and on statistics there is much information in the *Britannica* in local articles. It has

**Legislation** already been remarked that each article dealing with a state of the United States, or any of the commercial countries of the world, has a section on *Communications*, giving railway mileage and describing the principal railway lines in the area; and that articles on cities and towns give accurate and minute information about railway service. In pursuing the study of legislation bearing on railways, and especially on rate legislation, the student should read the article **INTERSTATE COMMERCE** (Vol. 14, p. 711), by Prof. Frank A. Fetter of Princeton University, a part at least of the article **TRUSTS** (Vol. 27, p. 334), by Prof. J. W. Jenks, of New York University (formerly of Cornell), parts of the article on the history of the United States, in the same volume, especially pp. 315, 316, 353, 367, 394, 395, 396, 406, 407, and, in separate state articles, the sections on laws and history, notably **NORTH CAROLINA** for the rate cases of 1907 (Vol. 19, p. 778), **NEBRASKA** for the maximum freight rate of 1893 (Vol. 19, p. 329), **WISCONSIN** on radical rate legislation and on physical valuation for *ad valorem* tax of railways (Vol. 28, p. 744).

The biographical articles in the new *Britannica* also have much important information for the student of railways.

**Biographies** Among the names of inventors whose lives are outlined are: **THOMAS NEWCOMEN** (Vol. 19, p. 475), **JAMES WATT** (Vol. 28, p. 414), **MATTHEW BOULTON** (Vol. 4, p. 324), **GEORGE** and **ROBERT STEPHENSON** (Vol. 25, pp. 888 and 889), **RICHARD TREVITHICK** (Vol. 27, p. 256), **OLIVER EVANS** (Vol. 10, p. 2), **JOHN ERICSSON** (Vol. 9, p. 740), **PETER COOPER** (Vol. 7, p. 80), and **SIR MARC I.**

BRUNEL (Vol. 4, p. 682); among the names of engineers and railway and bridge builders GEORGE PARKER BIDDER (Vol. 3, p. 918), THOMAS BRASSEY (Vol. 4, p. 435), JOHN COCKERILL (Vol. 6, p. 625), ERASTUS CORNING (Vol. 7, p. 174), JAMES BUCHANAN EADS (Vol. 8, p. 789), SIR WILLIAM FAIRBAIRN (Vol. 19, p. 129), SIR JOHN FOWLER (Vol. 10, p. 761), JAMES HENRY GREATHEAD (Vol. 12, p. 398), SIR JOHN HAWKSHAW (Vol. 13, p. 99), WILLIAM KINGSFORD (Vol. 15, p. 817), SIR ROBERT GILLESPIE REID (Vol. 23, p. 50), JOHN RENNIE (Vol. 23, p. 101), and J. A. ROEBLING (Vol. 23, p. 450); and among railway financiers,—to take only a few American names,—the VANDER-

BILTS (Vol. 27, p. 885), JAY GOULD (Vol. 12, p. 284), ASA PACKER (Vol. 20, p. 441) and E. H. HARRIMAN (Vol. 13, p. 18).

In such articles as STRIKES AND LOCK OUTS (Vol. 25, p. 1024) and TRADE UNIONS (Vol. 27, p. 140), each with American sections by Carroll D. Wright, late U. S. Commissioner of Labor, the reader will find valuable assistance in studying railway economics as affected by the relations of labour and capital.

For marine transportation see the next chapter in this Guide.

The following is a brief list of articles, and of sections of articles, of interest to all railroad men:

|                        |                        |                      |                       |
|------------------------|------------------------|----------------------|-----------------------|
| Analysis of Train Re-  | Concrete               | Horse Power          | Roof                  |
| sistance               | Conveyors              | Hydraulics           | Semaphore             |
| Anthracite             | Cranes                 | Iron and Steel       | Sewerage              |
| Atmospheric Railway    | Cross-overs            | Location             | Shaft Sinking         |
| Ballast                | Curves                 | Locomotive Power     | Shoring               |
| Balancing of Locomo-   | Current Developments   | Maximum Boiler Power | Shovel                |
| tives                  | Cuttings               | Masonry              | Signalling            |
| Blasting               | Dock                   | Methods of applying  | Siphon                |
| Bearings               | Draught                | Locomotive Power     | Sleeper               |
| Bogie                  | Dredge                 | Monorail Systems     | Smoke                 |
| Boiler                 | Elevators              | Mortar               | Steam Engines         |
| Boring                 | Embankments            | Motors, Electric     | Steel Construction    |
| Brake                  | Engine                 | Oil Engine           | Stone                 |
| Brickwork              | Engine Efficiency      | Permanent Way        | Strength of Materials |
| Bridges                | Engine Resistance      | Pier                 | Switches (or points)  |
| Cable Railways         | Felloe                 | Piston Speed         | Switching Yards       |
| Caisson                | Fire brick             | Rack Railways        | Ties                  |
| Canal                  | Fish-plates            | Rafter               | Timber                |
| Cantilever             | Foundations            | Rail                 | Traction              |
| Car                    | Freight                | Railways             | Tractive Force        |
| Cement                 | Fuel                   | Railway Stations     | Tramway               |
| Classes of Locomotives | Gauge                  | River Engineering    | Tunnels               |
| Coal                   | General Locomotive Ef- | Roads and Streets    | Vehicle Resistance    |
| Cog Railways           | iciency                | Roadbeds             | Ventilation           |
| Compound Locomotives   | Gradients              | Rolling Stock        | Welding               |

## CHAPTER XIX

### FOR MARINE TRANSPORTATION MEN

**T**HE immediate future of marine commerce cannot fail to be very greatly affected by changed conditions. No one believes that England, Germany, France, Russia, Austria, Japan and China will be able, before the middle of the century, to establish a stable adjustment of the international difficulties which surround them. No one knows what changes the Panama Canal may make in the movement of freights within the first ten years of its operation. No one knows to what industry the United States may next apply the methods by which the country has created the age of steel.

#### Problems of the Near Future

Coal and the steam engine may both, within a few years, be displaced as factors in marine transportation. Sweeping tariff changes in the United States, in Great Britain and in Germany may vitally affect the movement of freights. Transatlantic passenger traffic, not only a huge business in itself, but also important, so long as it is sea-borne, in its effects upon transatlantic freights, may become aerial instead of marine.

Confronted by the approach of a period so full of changes, the uttermost alertness of outlook is merely elementary prudence on the part of everyone engaged in the business of marine transportation; and the new Britannica reviews all the many fields of knowledge which are of importance in this connection. It supplies technical information regarding the construction of ships, the management of shipping lines, marine engines of every kind, shipboard and waterside appliances for the handling of cargo, the de-

velopment of harbours and the dredging and embankment of rivers, the building of docks, warehouses and dry docks, ship canals and canal locks, navigation,

#### Technical Subjects

lighthouses, lightships, buoys, lanes of traffic, marine insurance, cold transport—every conceivable subject with which shipping men are concerned. Articles by contributors in twenty different countries, deal with all the world's ports, industries, exports, imports and shipping. The financial and legal aspects of the business are exhaustively covered. Tariffs, legislation affecting marine transportation, and such questions of international policy as the command of the sea, the right of search, and the position of neutrals in wartime are discussed by the highest authorities.

In addition to all this, the Britannica articles on these and similar subjects contain historical sections which, in conjunction with the articles on the history of all countries, *show how past changes, as sweeping as these which are now anticipated, have affected commerce.* Whether your present position—or the position you are endeavouring to make for yourself—in relation to shipping is such that this coming period of transition promises to affect you favourably or unfavourably, you need to be forewarned and forearmed, prepared to keep what you have or get what you want.

A course of reading should always begin with the study of general principles, in order that in your subsequent and more detailed examination of the field, the relative importance of each fact that you master may be appreciated. The Britannica provides, in the article

COMMERCE (Vol. 6, p. 766), a bird's-eye view of the whole subject of marine transportation. The

**An Outline of Sea Trade** article would not fill more than 16 pages

of this Guide; you can read it (and digest it as you read it, so clear is it) in an hour, and yet it will give you such a grasp of the whole science—for it is a science—of international trade that you will spend another hour in assorting and classifying, in your own mind, a mass of impressions you had received before, at school or in the course of casual reading, impressions which have not been so useful to you as they should have been because they had not been systematically arranged. There is no text book in existence which outlines the subject so fully and clearly as does this one brief article—about one five-thousandth part of the total contents of the Britannica.

This article will arouse your interest in the direct relation between commerce, past, present and future, and the progress of civilization. You will realize that the man who has any part in the vast shifting of cargoes from one part of the world to another is distributing ideas and ideals and ambitions as well as commodities, and in the article CIVILIZATION (Vol. 6, p. 403), by Dr. Henry Smith Williams, editor of *The Historians' History of the World*, you will see how harbours receive and send on to the inland the influences as well as the manufactures of the more advanced communities.

From these articles you should turn to the three great articles which deal with the methods by which these wonderful results are accomplished. These three are SHIP, SHIPBUILDING and SHIP-PING, all in volume 24, and equivalent to about 420 or 425 pages of this Guide. These three articles contain hundreds of illustrations, more than forty being full page plates. They are by the most eminent authorities. Sir Philip Watts,

director of naval construction for the British Navy, designer of the Dreadnoughts and the Super-Dreadnoughts of the British Navy, as well as of the "Mauretania" and the "Lusitania," chairman of the Federation of Shipbuilders, and naval architect and director of the war-shipbuilding department of Armstrong, Whitworth & Co., Ltd., wrote the articles SHIPBUILDING and SHIP (except the history of ships before the invention of steamships, which is by Edmund Warre, provost of Eton, well-known as a writer on nautical history). The article SHIP-PING is by Douglas Owen, lecturer at the Royal Naval War College and author of *Ports and Docks*.

In brief, these three articles in length, contents,—both text and illustrations,—and authorship, make up a remarkable book on the subject, valuable either as a text-book or a work of reference for the ship builder, the marine engineer or the student of shipping.

Taking the articles separately, the article SHIP begins with a section of nearly 10,000 words on the early development of ships. It suggests that shells floating on the water or the nautilus may first have suggested the use of a hollowed tree-trunk for transportation—the first boat or "ship" (the word comes from the same root as "scoop") as distinct from a raft. The evolution of boat building is traced,—from dug-out to bark- or skin-covered frame, built like modern racing-shells sometimes ribs first and then skin laid on and sometimes shell first and then ribs inserted. In spite of the great length of the period during which such boats were used—of course they are still used by more primitive peoples,—it is interesting to notice that there were local variations which never became general, such as the outrigger and weather platform, used in the South Pacific and not found elsewhere.

Egyptian vessels we may study in the excellent early tomb-paintings still pre-



served, and one of these shows a ship, not a canoe or large boat, such as was in use from 3000 - 1000 B. C., fitted with oars and a mast in two pieces which could be lowered and laid along a high spar-deck.

The Phoenicians did more than the Egyptians to develop ship and navigation, and a Phoenician galley of the 8th century B. C. is shown in an Assyrian wall painting. The Phoenicians probably sailed out of the Mediterranean, to Britain for tin, or even around Africa.

Greek ships and shipbuilding we know from a full and varied national literature, from the figures on coins and vases, and from the discovery in 1834 at the Peiraeus, the port of Athens, of records of Athenian dockyard superintendents for several years between 373 and 324 B.C. We have besides descriptions, partly technical, showing the point of view of the engineer or architect, written by Roman authors. The article gives a critical account of the Greek types of vessels. The growth of Roman shipping seems to have been due primarily to political reasons and to have advanced slowly but surely,—practical devices being introduced to solve special difficulties in a field and on an element where the Romans were far from being at home. A five-tiered Carthaginian galley which had drifted ashore served the Romans as a model for their first war-ship, and with crews taught to row in a framework set up on dry land they manned a fleet which was launched in sixty days from the time that the trees were felled.

Passing quickly over the remainder of the earlier period, which the reader will find treated in full in the article SHIP, he should notice that the sailing vessel came into use gradually for merchant use, but that galleys (propelled by oars) were long the only type for warships. There were some galleys even in the Spanish Armada of 1588. In the meantime the invention

of gunpowder and the development of artillery brought about changes in size and in form, with a notable tendency to more masts and a greater spread of sail. The discoveries of the 15th and 16th centuries and especially the consequent expansion of trade in the 17th century, all tended to increase the size and efficiency of sailing ships. The end of the 18th and the beginning of the 19th century marked the highest point in the development of American sailing ships. "The Americans with their fast-sailing 'clippers' taught the English builders a lesson, showing that increased length in proportion to beam gave greater speed, while permitting the use of lighter rigging in proportion to tonnage, and the employment of smaller crews. The English shipyards were for a long time unequal to the task of producing vessels capable of competing with those of their American rivals, and their trade suffered accordingly. But after the repeal of the Navigation Laws in 1850, things improved and we find clippers from Aberdeen and the Clyde beginning to hold their own on the long voyages to China and elsewhere."

The revolution in marine transportation by the introduction of steam is summed up by Sir Philip Watts as follows:

Before steam was applied to the propulsion of ships, the voyage from Great Britain to America lasted for some weeks; at the beginning of the 20th century the time had been reduced to about six days, and in 1910 the fastest vessels could do it in four and a half days. Similarly, the voyage to Australia, which took about thirteen weeks, had been reduced to thirty days or less. The fastest of the sailing tea-clippers required about three months to bring the early teas from China to Great Britain; in 1910 they were brought to London by the ordinary P. & O. service in five weeks. Atlantic liners now run between England and America which maintain speeds of 25 and 26 knots over the whole course, as compared with about 12 knots before the introduction of steam.

The introduction of iron for wood began about the same time as the sub-

stitution of steam for sails, and there was even more prejudice against it. This was due not merely to the sentiment attaching to the oaken timbers that typified "hearts of oak," or to the "Wooden Walls of England." In all seriousness it was objected that iron would not float! It was feared that iron bottoms would be more easily perforated when ships grounded; but this was found not to be the case when construction was careful. It was proved that fouling of iron bottoms from weeds and barnacles might be remedied by frequent cleaning and repainting. The most serious objection against iron was that it affected the compass; but in 1839 Sir G. B. Airy laid down rules for the correction of compass errors due to iron in construction. But even to-day wood is preferred for the construction of ships for scientific expeditions to the Polar regions where the slightest disturbance of the compass is to be avoided. Iron and steel (first used in ship-building to any extent in 1870-75) have three advantages over wooden ships: less weight; greater durability; greater ease in securing the necessary general and local strengths. But while iron was coming into use largely because it is more durable, there was a great increase in the durability of wooden ships, due to the improved knowledge of wood-preservation. At the end of the 18th century 15 or 20 years was the average life of a wooden ship; but there are several instances of ships built in the first decade of the 19th century—or even earlier—which were still in commission at the beginning of the 20th century.

Full details are given in regard to the first ships used for canal and river navigation in Great Britain and the United States; the comparatively rapid adoption of steam vessels on the Irish and English channels; and the first steamships to make long trips—the American-built "Savannah" which crossed the At-

lantic in 1819 in 25 days using steam only a part of the time, the "Enterprise" which went from London to Calcutta in 1825 in 103 days (64 under steam), the "Sirius," the "Great Western," etc. All these were propelled by paddle-wheels. Jet propulsion had been suggested by Benjamin Franklin in 1775 and was tried several times with some success. But the greater success of the screw-propeller, perfected by Colonel John Stevens and Captain John Ericsson, soon caused jet-propulsion to be abandoned. The screw-propeller made possible—and was quickly followed by—great improvements in engines; the gearing used with paddles was soon given up for direct-acting engines—compound about 1854, triple-expansion in 1874.

Statistics of shipping for all countries are given in tables and diagrams equivalent to 18 or 20 pages of this Guide.

A brief summary outline of the remainder of this article SHIP is all that can be given here.

#### Merchant Vessels

##### Sailing Ships

Barges, Smacks or Cutters, Schooners, Brigs and Brigantines

##### Steamships

Types: Turtle-back, etc. Cargo Ships: Modern Developments, Great Lake Freighters, Oil Tank Steamers, Motor Tank Vessels. Passenger Steamers: Ferries, River and Sound, Cross-Channel, Ocean Liners (Atlantic: Canadian, Emigrant Vessels, Liners on other Routes; Pacific Liners). Special Vessels (Dredge, Train Ferries, Ice Breakers, Surveying Vessels, Lightships, Coastguard and Fishery Cruisers, Salvage and Fire Vessels, Lifeboats, Yachts). Propulsion by Electricity, by Naphtha Engines, by Internal Combustion Engines

##### War Vessels

Battleships and Armour Protec-

tion; Sir E. J. Reed and the British Navy Turret Ships; American Monitor; Sir Nathaniel Barnaby in England; the work of Sir W. H. White; Development from 1885 to 1902; The "Dreadnought" type — in England, United States, Germany, France, Japan, Russia, Italy, Austria, Brazil, Argentina, etc., with Table, "Development of Some of the Leading Features of Notable Armored Battleships from 1860 to 1910."

Cruisers, Second-Class Cruisers, Third-Class, Armored Cruisers, Dreadnought Cruisers, Cruisers in Different Navies

Gunboats and Torpedo Craft and Torpedo-boat Destroyers

Submarines: American experiments in the 18th Century; inventions of Holland and Nordenfeldt; the Goubet System in France; Submarines in different navies.

The article SHIPPING (Vol. 24, p. 983) is devoted to the history and practice of maritime transportation. It outlines

### History of Shipping

the early period of trade, and the contest for trade among Spain, Portugal, the Netherlands and England, especially in the period after the discovery of America, when the prizes of commerce became suddenly so much richer. The Navigation Act of 1651, confining the trade between England and her colonies and the British coasting trade to English ships, was followed by a rapid growth of English shipping. The tonnage doubled between 1666 and 1688. In the 18th century and into the 19th, the history of shipping was primarily a contest for trade between France and England, finally won by the latter. The 19th century, as has already been seen in the article SHIP, was marked by the adoption of steam as a motive power. The struggle for supremacy in the Atlantic trade and in commerce with China and the Far East between the United

States and Great Britain was won by the latter largely for this reason—the American ship-builders clung to the sailing clipper too long—and they were too slow in adopting iron instead of wooden hulls. The American Civil War was an additional set-back to American commerce. Other great factors during the last 50 years in the development of shipping, treated in the article, may be catalogued here:—

The opening of the Suez Canal in 1869.

Improved apparatus for fire prevention.

Refrigerating machinery, making possible the shipment of meats and other foods.

Germany's merchant marine.

Japanese merchant vessels.

French efforts to get trade.

The shipping combine of 1902.

"Liners" and "Tramps."

The freight rate question and increased tonnage.

Special passenger transport: tourists, emigrants, etc.

The third of the main articles is SHIPBUILDING (Vol. 24, p. 922) by Sir Philip Watts. The article is equivalent to 200 pages of this Guide, and the illustrations include more than 120 working drawings. A brief outline of the article is all that can be given here.

### Instructions for the Ship-Builder

*Stability: Equilibrium, Stability of Equilibrium, Transverse Stability, Small Inclinations, Metacentric Heights, Inclining Experiment, Large Inclinations, Curves of Stability, Effect of Freeboard, Effect of Beam, Effect of Position on Centre of Gravity, Geometrical Properties, Dynamical Stability, Sailing Ships, Longitudinal Stability, Stability when Damaged, Stability in any Direction.*

*Rolling of Ships: Unresisted Rolling — Froude's Theory, Resisted Rolling, Methods of Reducing Roll-*

ing (Bilge-Keels, Water Chambers, Gyroscope).

*Resistance:* Components of Force, Wake, Frictional Resistance, Law of Comparison, Model Experiments, Experimental Results.

*Propulsion:* Experimental Results, Cavitation.

*Strength:* Longitudinal Bending, Transverse Bending.

*Steering:* Nature of Forces when Turning, Heel when Turning, Types of Rudders, Experimental Results.

*Process of Design*

Registration Societies  
Board of Trade Supervision  
Load line and Freeboard  
Loading of Grain and Timber

*Ship-yard Work*

Structural Parts  
Materials  
Cranes and Gantries

*Course of Construction*

Models  
Laying-off  
Sheer Drawing  
Fairing the Body  
Contracted Method of Fairing  
Fairing the End  
Stern Mould  
Displacement Calculation  
Frame Lines  
Cant Frames  
Double Canted Frame  
Swell for Propeller Shaft  
Mould for Boss Frame Casting  
Shaft Struts

Sight Edges in Body Plan

Inner Bottom

Inner Surface of Frames

Outside Double Bottom

Deck Lines

Framing and Plating behind

*Armour*

Laying off Armour of a Warship  
Order of Work

Keel

Transverse Frames

Scrive-Board

Shoring Ribbands

Deck Beams

Longitudinals

Bilge Keel

Drawings

Laying Keel Blocks

Keels and Frames

Shell or Outside Plating

*Structural Arrangements*

Longitudinal System as used in New London, Conn.; Great Lake steamer; British cargo steamer; Atlantic liner; Differences between war and merchant ships; Auxiliary Machinery.

The student should read the article

NAVY AND NAVIES

(Vol. 19, p. 299) and

refer to the chapter

*For Naval Officers.*

**A Dictionary of Ships and Shipping**

The following is a partial list of the articles in the Britannica of particular value to the marine transportation man.

|           |                     |
|-----------|---------------------|
| Anchor    | Commerce            |
| Ballast   | Coracle             |
| Barge     | C. H. Cramp         |
| Belay     | Sir Samuel Cunard   |
| Berth     | Dahabeah            |
| Bilge     | Dhow                |
| Binnacle  | Dinghy              |
| Boat      | John Ericsson       |
| Bowline   | Felucca             |
| Bumboat   | John Fitch          |
| Buoy      | Robert Fulton       |
| Burgee    | Gimbal              |
| Cable     | Hawser              |
| Cabotage  | Holystone           |
| Caique    | T. H. Ismay         |
| Canoe     | Junk                |
| Capstan   | Kayak               |
| Catamaran | Keel                |
| Cleat     | Lateen              |
| Coble     | Life-saving Service |

|                 |                      |
|-----------------|----------------------|
| Lighthouse      | Sail, and Sailcloth  |
| Log             | Sampan               |
| Mast            | Schooner             |
| Navigation      | Seamanship           |
| Navigation Laws | Seamen, Laws of      |
| Oars            | Semaphore            |
| Pilot           | Ship                 |
| Pinnacle        | Shipbuilding         |
| Pirogue         | Ship Money           |
| Polacca         | Shipping             |
| Poop            | Sloop                |
| Pram            | Smack                |
| Proa            | Starboard            |
| Punt            | Steamship Lines      |
| Quarterdeck     | Tonnage              |
| Quay            | Trinity House        |
| Random          | Turbine              |
| Rigging         | Wharf                |
| Rowlock         | Sir William H. White |
| Rudder          | Yawl                 |

## CHAPTER XX

### FOR ENGINEERS

**T**HE history of a word will sometimes supply the key to the gradual development of an art. "Engineering" was originally used to describe a mere branch of military science, the construction of fortifications and the trenching and sapping needed for their capture. Then about a century and a half ago the use of the phrase "civil engineering" came into use to indicate the broadening of the engineer's functions to civil pursuits, but even then it served for a long time chiefly to describe surveying, road-making and bridge building. To-day, the specialized knowledge of engineers of one kind or another directs or facilitates every branch of industry. Consider for a moment the handling of iron, which, as the Britannica article IRON AND STEEL shows, has become the most indispensable of all substances save air and water,

**What** because we can find  
**"Engineering"** no substitute for it  
**Includes** that possesses its strength, the hardness and the pliability we can give to it, and its magnetic properties, upon which all our electrical work depends. The mining engineer is concerned with the ore, the mechanical engineer with the machinery employed in its treatment; the transportation of the finished iron or steel depends upon the skill of the engineers who construct railroads and ships; the structural engineer shapes our buildings from the girders and erects them on the

sites indicated by the surveying engineer; the sanitary engineer makes them wholesome, and the electrical engineer provides them with the many convenient appliances we need. Various primitive races have believed that the earth is supported upon the back of a tortoise, an elephant, or a fish; but when we begin to look into the origin of the surroundings we have made for ourselves, we cannot carry our examination very far before we find that almost everything we possess begins with a blueprint.

It seems a paradox, and yet it is true, that the more a man's profession tends to specialization, the more help he can get from the comprehensiveness of the Britannica. He finds it necessary to dig so deep that the shaft he sinks must perforce be of narrow diameter, limiting his daily vision to but a small circle of the broad sky above him. The engineer of each class has his own text books, but at any moment his work may bring him into temporary relation with allied subjects which they do not cover, and in connection with which he may need trustworthy information. There is certainly no other book which surveys so authoritatively and minutely as does the Britannica the whole field of applied science. The services rendered by the 73 engineering experts — German, American, English, French and Italian — who collaborated in the production of the work are not to be measured only by the articles they wrote; for the advice and



assistance many of them gave the editors in planning the book as a whole, ensured such treatment as an engineer would desire of many subjects indirectly connected with his work.

The engineer will naturally turn first to the mathematical articles, which may be described as text-books of the most

### Mathematical Articles

concise and useful nature, written by leading mathematicians of the age.

ALGEBRA (Vol. 1, p. 599) is by Dr. Sheppard, and G. B. Mathews, formerly professor of mathematics, University College of North Wales; ALGEBRAIC FORMS (Vol. 1, p. 620) by Major P. A. Macmahon, formerly president of the London Mathematical Society; GEOMETRY (Vol. 11, p. 675), *Euclidean, Projective, Descriptive*, by Dr. Henrici, professor of mathematics, Central Technical College of the City and Guilds of London Institute; *Analytical*, by E. B. Elliott, Waynflete professor of pure mathematics, Oxford; *Line*, by B. A. W. Russell, author of *Foundations of Geometry*, etc., and Dr. A. N. Whitehead of Trinity College, Cambridge; *Axioms*, by Dr. Whitehead; TRIGONOMETRY (Vol. 27, p. 271) by Dr. E. W. Hobson of Cambridge University; SURVEYING (Vol. 26, p. 142), *Geodetic Triangulation, Levelling, Topographical Surveys, and Geographical Surveying*, by Sir Thomas Holdich, formerly superintendent of Frontier Surveys, India; *Nautical*, by Vice-Admiral A. M. Field, R.N., author of *Hydrographical Surveying*, etc.; GEODESY (Vol. 11, p. 607) by Col. A. R. Clarke of the British ordinance survey, and Prof. F. R. Helmert of the University of Berlin; LOGARITHM (Vol. 16, p. 868) by Dr. J. W. L. Glaisher, editor of the *Quarterly Journal of Pure and Applied Mathematics*; MECHANICS (Vol. 17, p. 955), *Statics, Kinetics*, by Dr. Horace Lamb, professor of mathematics, University of Manchester; *Theory of Structures, Theory of Machines, Applied Dynamics*, by

Dr. W. J. M. Rankine, late professor of civil engineering, Glasgow University, and W. E. Dalby, professor of civil and mechanical engineering, City and Guilds of London Institute; DYNAMICS (Vol. 8, p. 756) by Professor Lamb; DIFFERENCES, CALCULUS OF (Vol. 8, p. 223), by Dr. W. F. Sheppard; INFINITESIMAL CALCULUS (Vol. 14, p. 535) by Dr. A. E. H. Love, secretary of the London Mathematical Society; VARIATIONS, CALCULUS OF (Vol. 27, p. 915), by Dr. Love; QUATERNIONS (Vol. 22, p. 718) by Alexander McAulay, professor of mathematics and physics, University of Tasmania; DIAGRAM (Vol. 8, p. 146), by Dr. James Clerk Maxwell, the noted physicist; MENSURATION (Vol. 18, p. 135) by Dr. Sheppard; TABLE, MATHEMATICAL (Vol. 26, p. 325), by Dr. J. W. L. Glaisher; UNITS, PHYSICAL (Vol. 27, p. 738), by Dr. J. A. Fleming, professor of electrical engineering, University of London; UNITS, DIMENSIONS OF (Vol. 27, p. 736), by Sir Joseph Larmor, secretary of the Royal Society, England; and CALCULATING MACHINES (Vol. 4, p. 972), with 24 illustrations, is by Professor Henrici.

These admirable treatises as well as the article DRAWING, *Drawing-Office work* (Vol. 8, p. 556), by Joseph G. Horner, will be useful to all engineers, and in the special field of civil engineering the following partial list of articles will convey some idea of the scope of the material to which the professional man has immediate access.

BRIDGES (Vol. 4, p. 533), with 72 illustrations, diagrams, etc., is a thorough discussion of the subject by Dr. William

### Articles for Civil Engineers

C. Unwin, emeritus professor of engineering, Central Technical College, City and Guilds of London Institute, author of *Wrought Iron Bridges and Roofs*, etc. This article covers the whole theory of bridge design, and describes all the typical structures from the timber

Pons Sublicius of ancient Rome, the bridge Horatius defended, to the Manhattan Bridge over the East River at New York. **ROADS AND STREETS** (Vol. 23, p. 388); **RIVER ENGINEERING** (Vol. 23, p. 374), with 26 illustrations, by the late L. F. Vernon-Harcourt, professor of civil engineering, University College, London, and author of *Rivers and Canals*, etc.; **JETTY** (Vol. 15, p. 359), with 6 illustrations, and **PIER** (Vol. 21, p. 588), illustrated, also by Prof. Vernon-Harcourt; **DREDGE AND DREDGING** (Vol. 8, p. 562), with 13 illustrations, by William Hunter, consulting engineer for Waterworks to Crown agents for the Colonies.

**HYDRAULICS** (Vol. 14, p. 35), with 213 illustrations, is by Prof. W. C. Unwin—an article in which the whole theory and practice of water-power, including discussions of water-motors and turbines, are brought fully up to date by the designer of the first water-motors at Niagara, the section dealing with hydraulic machines occupying 25 pages; **HYDROMECHANICS** (Vol. 14, p. 115) by Sir Alfred George Greenhill, formerly professor of mathematics in the Ordnance College, Woolwich; **VENTILATION** (Vol. 27, p. 1008), illustrated, by James Bartlett; **WATER SUPPLY** (Vol. 28, p. 387), with 20 illustrations, diagrams, and maps, by Dr. G. F. Deacon, formerly engineer-in-chief for the Liverpool Water Supply; **AQUEDUCT**, *Modern Construction* (Vol. 2, p. 244), by E. P. Hill; **SEWERAGE** (Vol. 24, p. 735), with 29 illustrations, by James Bartlett; **IRRIGATION** (Vol. 14, p. 841).

**CANAL** (Vol. 5, p. 168), by Sir E. Leader Williams, chief engineer of Manchester Ship Canal during construction, is an interesting article. There are also separate articles on great engineering undertakings, such as **PANAMA CANAL** (Vol. 20, p. 667); **MANCHESTER SHIP CANAL** (Vol. 17, p. 550) by Sir E. Leader Williams; **SUEZ CANAL** (Vol. 26, p. 22). It will surprise many readers to learn

that the project of a ship canal across Central America was considered as early as 1550, when a book demonstrating its feasibility was published in Portugal. Only a year later the King of Spain was strongly urged, in a memorial presented by De Gomara, the Spanish historian, to undertake the work.

**TUNNEL** (Vol. 27, p. 399), with many plans and illustrations, by H. A. Carson, in charge of designing and constructing the Boston Subway; **DOCK** (Vol. 8, p. 353), with illustrations and plans; **CAISSON** (Vol. 4, p. 957); **BREAKWATER** (Vol. 4, p. 475), with 16 illustrations; **HARBOUR** (Vol. 12, p. 935), illustrated; **RECLAMATION OF LAND** (Vol. 22, p. 954), with 13 illustrations. The last five articles are by Professor Vernon-Harcourt; **LIGHTHOUSE** (Vol. 16, p. 627), with 59 illustrations, by W. T. Douglass, who erected the Eddystone and Bishop Rock Lighthouses, and Nicholas G. Gedye, chief engineer to the Tyne Improvement Commission; **SHIPBUILDING** (Vol. 24, p. 922), with 125 illustrations—a complete treatise on the subject by Sir Philip Watts, director of naval construction for the British Navy; **TRACTION** (Vol.

27, p. 119), illustrated, by Prof. Louis **Railways and Transportation** Duncan, of the Massachusetts Institute of Technology; **TRAMWAY** (Vol. 27, p. 159), illustrated, by Emile Garcke, managing director of the British Electric Traction Co., Ltd.; **RAILWAYS** (Vol. 22, p. 819), a magnificent composite article, fully illustrated, in which the *Introduction* and the sections on *Construction* and *Rolling Stock* are by H. M. Ross, editor of *The Times Engineering Supplement*; *General Statistics and Financial Organization*, by Ray Morris, formerly of the *Railway Age Gazette*, New York, and author of *Railroad Administration*; *Economics and Legislation*, by Arthur T. Hadley, president of Yale University; *American Railway Legislation*, by Prof. Frank H. Dixon, of Dartmouth College,

author of *State Railroad Control; Accident Statistics*, by B. B. Adams, associate editor, *Railway Age Gazette; Intra Urban Railways*, by W. B. Parsons, formerly chief engineer, Rapid Transit Commission, New York, and *Light Railways*, by C. E. Webber of the Royal Engineers, and Emile Garcke. No book on the subject has ever before contained so great a collection of expert knowledge as this article presents.

In regard to construction, engineers will find most valuable for reference and study the elaborate treatises

### Structural Engineering

**STRENGTH OF MATERIALS** (Vol. 25, p. 1007), with 42 diagrams and illustrations, by Prof. J. A. Ewing, and **ELASTICITY** (Vol. 9, p. 141), with 32 diagrams, by Prof. A. E. H. Love. Notable articles in this connection are **IRON AND STEEL** (Vol. 14, p. 801), illustrated, by Dr. H. M. Howe, professor of metallurgy, Columbia University; and **STEEL CONSTRUCTION** (Vol. 25, p. 861), illustrated. It is interesting to note that early in the 19th century a tall shot-tower was built in New York city by erecting a braced cage of iron and filling in the panels with masonry. **STONE** (Vol. 25, p. 958); **MASONRY** (Vol. 17, p. 841), with 18 illustrations; **BRICKWORK** (Vol. 4, p. 521), with 15 illustrations—these four articles by James Bartlett, lecturer on construction at King's College, London; **CEMENT** (Vol. 5, p. 653), illustrated, by Bertram Blount, hon. president, Cement Section of International Association for Testing Materials, Budapest; **CONCRETE** (Vol. 6, p. 835), with 16 illustrations, by F. E. Wentworth-Shields, dock engineer of the London and South-Western Railway; **MORTAR** (Vol. 18, p. 875); **FOUNDATIONS** (Vol. 10, p. 733), with 13 illustrations; **TIMBER** (Vol. 26, p. 978); **ROOFS** (Vol. 23, p. 697), with 23 illustrations; **SCAFFOLD** (Vol. 24, p. 279) illustrated; **SHOR-**

**ING** (Vol. 24, p. 1004), illustrated—the last six by James Bartlett.

The Engineering Section of the new Britannica provides an equal wealth of authentic material for members of other branches of the profession. It is impossible to indicate the exact lines of demarcation be-

tween these branches, and many articles are of use to all engineers alike; but in the special field of mechanical engineering there are **THERMODYNAMICS** (Vol. 26, p. 808) by Dr. H. L. Callendar, professor of physics, Royal College of Science, London; **STEAM ENGINE** (Vol. 25, p. 818) by Prof. Ewing, more than 30 pages long, with 68 illustrations. This article, with its up-to-date section on turbines, is one of the many in the engineering department of the Britannica which have been said by technical critics to merit separate publication as text-books. But such articles are all the more useful because they form part of one great library of universal knowledge. Other mechanical articles are **AIR ENGINE** (Vol. 1, p. 443), illustrated, also by Professor Ewing; **GAS ENGINE** (Vol. 11, p. 495), illustrated, by Dugald Clerk, inventor of the Clerk Cycle Gas Engine; **OIL ENGINE** (Vol. 20, p. 35), illustrated, also by Dugald Clerk; **BOILER** (Vol. 4, p. 141), with 20 illustrations, by James T. Milton, chief engineer surveyor to Lloyd's Registry of Shipping, and Joseph G. Horner, author of *Plating and Boiler Making*; **INJECTOR** (Vol. 14, p. 570); **WATER MOTORS** (Vol. 28, p. 382), illustrated, by T. H. Beare, Regius professor of engineering in the University of Edinburgh; **WINDMILL** (Vol. 28, p. 710), illustrated, by Professor Unwin; **FUEL** (Vol. 11, p. 274), illustrated, *Solid Fuels* by Hilary Bauermann, of the Ordnance College, Woolwich; *Liquid Fuel*, by Sir James Fortescue-Flannery, formerly president of the Institute of Marine Engineers; *Gaseous Fuel*, by Dr. Georg Lunge,

professor of technical chemistry at the Zurich Polytechnic; *GAS, Gas for Fuel and Power* (Gas producers) (Vol. 11, p. 490), illustrated, also by Professor Lunge.

**POWER TRANSMISSION** (Vol. 22, p. 224), illustrated, *Mechanical*, by Professor Dalby; *Hydraulic*, by Edward B. Ellington, chief engineer of the General Hydraulic Power Co., Ltd.; *Pneumatic*, by A. de W. Foote, superintendent of the North Star Mining Co., California; **PULLEY** (Vol. 22, p. 641), illustrated, by Dr. Ernest G. Coker, professor of mechanical Engineering in the City and Guilds of London Technical College; **PUMP** (Vol. 22, p. 645), illustrated; **BRAKE** (Vol. 4, p. 413), illustrated; **TOOL** (Vol. 27, p. 14), with 79 illustrations, by Joseph G. Horner; **CRANES** (Vol. 7, p. 368), with 21 illustrations, by Walter Pitt; **ELEVATORS** (Vol. 9, p. 263), illustrated, by G. F. Zimmer, author of *Mechanical Handling of Material*; **LUBRICANTS** (Vol. 17, p. 89) by R. M. Deeley, joint author of *Lubrication and Lubricants*; **PNEUMATIC DESPATCH** (Vol. 21, p. 865) by H. R. Kempe, electrician to the General Post Office, London; **GYROSCOPE AND GYROSTAT** (Vol. 12, p. 769), illustrated, by Sir Alfred Greenhill; **MOTOR VEHICLES** (Vol. 18, p. 914), with 37 illustrations—*Light*, by the Hon. C. S. Rolls, late managing director of the Rolls Royce Co., Ltd.; *Heavy Commercial Vehicles*, by Edward S. Smith, editor of *The Commercial Motor*; **RAILWAYS, Locomotive Power** (Vol. 22, p. 842) by Professor W. E. Dalby.

The key article describing the general principles of electrical engineering is **ELECTRICITY SUPPLY** (Vol. 9, p. 192),

**For the  
Electrical  
Engineer**

illustrated, by Emile Garcke, but at the immediate service of the electrical engineer there also stand **DYNAMO** (Vol. 8, p. 764), with 42 illustrations, by C. C. Hawkins, author of *The Dynamo*; **POWER TRANSMISSION, Electrical** (Vol. 22, p. 233) by Dr. Louis Bell, chief engineer,

**Electric Power Transmission Dept., General Electric Co.**; **CONDUCTION, ELECTRIC** (Vol. 6, p. 255), *Conduction in Solids* by Professor Fleming; *in Liquids*, by W. C. D. Whetham; *in Gases*, by Sir J. J. Thomson, a Nobel prize-winner and professor of experimental physics at Cambridge; **ELECTROLYSIS** (Vol. 9, p. 217) by W. C. D. Whetham; **ELECTROKINETICS** (Vol. 9, p. 210), illustrated; **ELECTROSTATICS** (Vol. 9, p. 240); **ELECTROMAGNETISM** (Vol. 9, p. 226), illustrated; **UNITS, PHYSICAL, Electrical Units** (Vol. 27, p. 740); **GALVANOMETER** (Vol. 11, p. 428), illustrated; **ELECTROMETER** (Vol. 9, p. 234), illustrated; **AMPEREMETER** (Vol. 1, p. 879), illustrated; **VOLTMETER** (Vol. 28, p. 206), illustrated; **OHMMETER** (Vol. 20, p. 34), illustrated; **WATTMETER** (Vol. 28, p. 419)—all of these by Professor Fleming; **POTENTIOMETER** (Vol. 22, p. 205); **ACCUMULATOR** (Vol. 1, p. 126), with 24 illustrations and diagrams, by Walter Hibbert, of the London Polytechnic; **TRANSFORMERS** (Vol. 27, p. 173), with 15 illustrations and diagrams, and **WHEATSTONE'S BRIDGE** (Vol. 28, p. 584), illustrated, by Professor Fleming; **MOTORS, ELECTRIC** (Vol. 18, p. 910), by Dr. Louis Bell; **METER, ELECTRIC** (Vol. 18, p. 291), by Professor Fleming; **LIGHTING, Electric** (Vol. 16, p. 659), with 16 illustrations, by Professor Fleming, and a chapter on its commercial aspects, methods of charging, wiring of houses, testing meters, etc., by Emile Garcke; **TELEGRAPH** (Vol. 26, p. 510), fully illustrated, *Land and Submarine Telegraphy*, by H. R. Kempe; *Wireless Telegraphy*, by Professor Fleming, and *Commercial Aspects*, by Emile Garcke; **TELEPHONE** (Vol. 26, p. 547), illustrated, by H. R. Kempe and Emile Garcke; **TRACTION, Electric** (Vol. 27, p. 120), illustrated, by Professor Duncan. An admirable historical sketch of electricity will be found in **ELECTRICITY** (Vol. 9, p. 179), by Professor Fleming, which contains also an account of the development of electric theory.



It is typical of the policy pursued in making the new Britannica that the Editor placed the mining section in the hands of American experts, since they are universally regarded as the best in the world. This entire section is a worthy monument to American learning and practice.

### American Practice in Mining

The key-article MINING (Vol. 18, p. 528), fully illustrated, is by Dr. Henry Smith Munroe, professor of mining in Columbia University. This covers every branch of the subject, but further discussion of its special phases is continued in MINERAL DEPOSITS (Vol. 18, p. 504) by Dr. James F. Kemp, professor of geology, Columbia University; QUARRYING (Vol. 22, p. 712) by Dr. F. J. H. Merrill, formerly state geologist of New York; ORE-DRESSING (Vol. 20, p. 238), illustrated, by Dr. R. H. Richards, professor of mining and metallurgy, Massachusetts Institute of Technology; SHAFT-SINKING (Vol. 24, p. 766), illustrated; BORING (Vol. 4, p. 251), illustrated; BLASTING (Vol. 4, p. 44), illustrated—the last three by Robert Peele, professor of mining in Columbia University.

METALLURGY (Vol. 18, p. 203) describes in outline the general sequence of operations. ASSAYING (Vol. 18, p. 776) is by Andrew

### The Metallurgical Section

A. Blair, formerly chief chemist U. S. Geological Survey. See also METAL (Vol. 18, p. 198). METALOGRAPHY (Vol. 18, p. 202), illustrated, is an account of the new and important method of microscopical examination of alloys and metals by Sir William Chandler Roberts-Austen, and Francis H. Neville. ALLOYS (Vol. 1, p. 704), with unique photomicrographs of alloys and metals, is also by the authors of the article METALLOGRAPHY. ANNEALING, HARDENING AND TEMPERING (Vol. 2, p. 70), illustrated, is by Joseph G. Horner, who also writes

FORGING (Vol. 10, p. 663), which has 19 illustrations, FOUNDING (Vol. 10, p. 743), with 11 illustrations, and ROLLING-MILL (Vol. 23, p. 468), with 8 illustrations. The material on FUEL has already been mentioned. FURNACE (Vol. 11, p. 358) describes and illustrates all the latest designs. WELDING (Vol. 28, p. 501) is by J. G. Horner and Elihu Thomson, who writes on his own invention, *Electric Welding*.

The mining engineer or metallurgist will have in the new Britannica constantly at his elbow a complete series of articles dealing with the mining and metallurgy of all minerals and metals. Professor Howe's exhaustive article IRON AND STEEL has already been noted in another part of this chapter. A few of the other important articles are COPPER (Vol. 7, p. 103); GOLD (Vol. 12, p. 192); SILVER (Vol. 25, p. 112); LEAD (Vol. 16, p. 314); TIN (Vol. 26, p. 995); ZINC (Vol. 28, p. 981); MANGANESE (Vol. 17, p. 569); ALUMINUM (Vol. 1, p. 767) by E. J. Ristori, member of Council, Institute of Metals. SAFETY-LAMP (Vol. 23, p. 998) is written by Hilary Bauermann. The latest mining statistics of all countries are to be found under their respective headings.

Military men are familiar with the lives and deeds of great soldiers; lovers of art and literature know something of the

### Biographies of Engineers

careers of their favorites; but as a rule the engineer knows little or nothing about the lives of the great ornaments of his profession, the splendid heroes of peace who have done much more than the soldier and the artist to create the world of to-day. The reason for this is that engineering biographies are very scarce, and in this connection the new Britannica fills a positive gap in the engineer's library. There are considerably more than 100 biographies of great engineers, living and dead, written in the most interesting fashion by authorita-



tive contributors. Among these articles are WATT, JAMES (Vol. 28, p. 414) by Professor Ewing; ARKWRIGHT, SIR RICHARD (Vol. 2, p. 556); STEPHENSON, GEORGE (Vol. 25, p. 888); BESSEMER, SIR HENRY (Vol. 3, p. 823); WHITWORTH, SIR JOSEPH (Vol. 28, p. 616); RENNIE, JOHN (Vol. 23, p. 101); LESSEPS, FERDINAND DE (Vol. 16, p. 494) by Henri G. S. A. de Blowitz; EADS, JAMES B. (Vol. 8, p. 789);

EDISON, THOMAS A. (Vol. 8, p. 946); ERICSSON, JOHN (Vol. 9, p. 740); MAXIM, SIR HIRAM (Vol. 17, p. 918); ROEBLING, JOHN A. (Vol. 23, p. 450); SIEMENS, SIR WILLIAM (Vol. 25, p. 47) by Professor Ewing; TELFORD, THOMAS (Vol. 26, p. 573); McADAM, JOHN L. (Vol. 17, p. 190), and TREVITHICK, RICHARD (Vol. 27, p. 256).

ALPHABETICAL LIST OF THE PRINCIPAL ARTICLES IN THE ENCYCLOPÆDIA  
BRITANNICA OF SPECIAL INTEREST TO ENGINEERS

|                          |                          |                       |                        |
|--------------------------|--------------------------|-----------------------|------------------------|
| Aberration               | Baird, James             | Brindley, James       | Clock                  |
| Abrasion                 | Baker, Sir Benjamin      | Bronze                | Coal                   |
| Abscissa                 | Ballast                  | Bronzing              | Cockerill, W. (and J.) |
| Absorption of Light      | Ballistics               | Brown, Sir John       | Cofferdam              |
| Acceleration             | Balloon                  | Brunel, I. K.         | Cold                   |
| Accumulator              | Banket                   | Brunel, Sir Marc      | Colour                 |
| Achromatism              | Barker's Mill            | Buoy                  | Combinational Analysis |
| Acoustics                | Barometer                | Building              | Compass                |
| Actinometer              | Barometric Light         | Burns, Sir George     | Conchoid               |
| Adhesion                 | Battery                  | Bush                  | Concrete               |
| Adjutage                 | Bazalgette, Sir Joseph   |                       | Condensation of Gases  |
| Adze                     | William                  | Cab                   | Conduction, Electric   |
| Aeronautics              | Bearings                 | Cable                 | Conduction of Heat     |
| Aether, or Ether         | Bell, Henry              | Caisson               | Cone                   |
| Aggregation              | Bellows and Blowing Ma-  | Caisson Disease       | Congreve, Sir William  |
| Agonic Lines             | chines                   | Calculating Machines  | Conic Section          |
| Air Engine               | Bench-mark               | Caledonian Canal      | Conoid                 |
| Algebra                  | Berlin                   | Calorescence          | Continued Fractions    |
| Algebraic Forms          | Berthon, Edward Lyon     | Calorimetry           | Contour, Contour-line  |
| Aliquot                  | Berthoud, Ferdinand      | Camera Lucida         | Conveyors              |
| Alloys                   | Bessel Function          | Camera Obscura        | Coode, Sir John        |
| Aluminium                | Bessemer, Sir Henry      | Camus, F. J. des      | Copper                 |
| Amicable Numbers         | Bicycle                  | Canal                 | Copying Machines       |
| Amperemeter, or Ammeter  | Bidder, George Parker    | Cantilever            | Cordite                |
| Anchor                   | Bidder, George Parker    | Capillary Action      | Corning, Erastus       |
| Angle                    | Binocular Instrument     | Car                   | Coxwell, Henry Tracey  |
| Annealing, Hardening and | Binomial                 | Cardioid              | Cramp, Charles Henry   |
| Tempering                | Biquadratic              | Carnegie, Andrew      | Cranes                 |
| Anthraxite               | Bisectrix                | Carpentry,            | Crank                  |
| Anvil                    | Blasting                 | Cart                  | Crompton, Samuel       |
| Aperture                 | Bloom                    | Cartwright, Edmund    | Cube                   |
| Aqueduct                 | Bogie                    | Cash Register         | Cubitt, Thomas         |
| Archimedes, Screw of     | Boiler                   | Catenary              | Cubitt, Sir William    |
| Architecture             | Boring                   | Causeway              | Cunard, Sir Samuel     |
| Arkwright, Sir Richard   | Boulton, Matthew         | Caustic               | Currie                 |
| Armature                 | Brachistochrone          | Cautley, Sir Proby    | Curve                  |
| Armour Plates            | Bradawl                  | Thomas                | Cycloid                |
| Armstrong, 1st Baron     | Brake                    | Cement                | Cyclometer             |
| Artesian Wells           | Bramah, Joseph           | Chain                 | Cylinder               |
| Assaying                 | Brass                    | Chappe, Claude        |                        |
| Atmospheric Electricity  | Brassey, Thomas          | Chart                 | Damascening or Damas-  |
| Atmospheric Railway      | Brazing and Soldering    | Chisel                | keening                |
| Auger                    | Breakwater               | Chronograph           | Damask Steel or Damas- |
| Autoclave                | Brick                    | Chubb, Charles        | cus Steel              |
| Awl                      | Brickwork                | Cinematograph         | Density                |
| Axe                      | Bridges                  | Circle                | Destructors            |
| Axis                     | Bridgewater, 3rd Duke of | Cissoïd               | Determinant            |
| Axle                     | Bright, Sir Charles      | Clark, Josiah Latimer | Diagonal               |

- Diagram  
Diamagnetism  
Diameter  
Dielectric  
Differences, Calculus of  
Differential Equation  
Diffraction of Light  
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Divers and Diving Apparatus  
Dock  
Dodecahedron  
Drawing  
Dredge and Dredging  
Drill  
Drummond, Thomas  
Dry Rot  
Dupuy de Lôme, S.C.H.L.  
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Dynamite  
Dynamo  
Dynamometer
- Eads, James Buchanan  
Earth Currents  
Earth, Figure of the  
Edison, Thomas Alva  
Elasticity  
Electrical, or Electrostatic Machine  
Electricity  
Electricity Supply  
Electric Waves  
Electrochemistry  
Electrokinetics  
Electrolysis  
Electromagnetism  
Electrometallurgy  
Electrometer  
Electron  
Electroplating  
Electroscope  
Electrostatics  
Electrotyping  
Electrum  
Elevators, Lifts or Hoists  
Ellipse  
Ellipsoid  
Embankment  
Employers' Liability  
Energetics  
Energy  
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Engineering  
Epicycloid  
Equation  
Ericsson, John  
Evans, Oliver  
Explosives
- Fairbairn, Sir William  
Felloe  
Ferguson, James  
Figurate Numbers  
File  
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Finlay, Sir George
- Fire and Fire Extinction  
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Firth, Mark  
Fitch, John  
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Folium  
Forging  
Fortification and Siegecraft  
Fossick  
Foundations  
Founding  
Fourier's Series  
Fowler, John  
Fowler, Sir John  
Friction  
Frustum  
Fuel  
Fulton, Robert  
Function  
Furnace  
Fusible Metal  
Fusion  
Fuze, or Fuse
- Galvanized Iron  
Galvanometer  
Gas Engine  
Gatling, Richard Jordan  
Gauge, or Gage  
Geodesy  
Geoid  
Geometrical Continuity  
Geometry  
Gimlet  
Girard, Philippe Henri de  
Glazing  
Gnomon  
Gold  
Gooch, Sir Daniel  
Goodyear, Charles  
Gouge  
Graduation  
Gramophone  
Graphical Methods  
Gravitation  
Greathead, James Henry  
Grimthorpe, 1st Baron  
Groups, Theory of  
Guncotton  
Gyroscope and Gyrostat  
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- Hachure  
Hammer  
Harbour  
Harmonic  
Harmonic Analysis  
Harrison, John  
Hartley, Sir Charles Augustus  
Hawkshaw, Sir John  
Hawksley, Thomas  
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Heathcoat, John
- Heating  
Heliostat  
Hodgkinson, Eaton  
Holograph  
Holden, Sir Isaac  
Horse-Power  
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Hydraulics  
Hydrodynamics  
Hydrography  
Hydromechanics  
Hydrometer  
Hydrostatics  
Hyperbola  
Hypsometer  
Hysteresis
- Icosahedron  
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Inclinometer  
Induction Coil  
Infinitesimal Calculus  
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Interpolation  
Invar  
Inversion  
Involution  
Iron and Steel  
Irrigation  
Ismay, Thomas Henry
- Jacquard, Joseph Marie  
Jenkin, H. C. F.  
Jetty  
Joinery  
Joints  
Joist
- Kaleidoscope  
Kiln  
Kinematics  
Kinetics  
Kingsford, W.  
Knife  
Knot  
Krupp, Alfred
- Labour Legislation  
Ladder  
Lamp  
Lantern  
Lath  
Lathe  
Latitude  
Latten  
Lead  
Lemniscate  
Lens  
Lesseps, Ferdinand de  
Lever  
Leyden Jar, or Condenser  
Life-boat  
Light  
Lighthouse  
Lighting  
Lightning Conductor  
Limaçon
- Lindley, William  
Line  
Liquid Gases  
Lock  
Locus  
Logarithm  
Logocyclic Curve, Strophoid, or Foliate  
Longitude  
Loxodrome  
Lubricants  
Lubrication
- Magic Square  
Magnetism  
Magnetism, Terrestrial  
Magnetograph  
Magnetometer  
Magneto-Optics  
Manchester Ship Canal  
Manganese  
Manometer  
Map  
Masham, Baron  
Masonry  
Mathematics  
Matter  
Maxima and Minima  
Maxim, Sir Hiram  
McAdam, John Loudon  
McCormick, Cyrus Hall  
Mechanics  
Mensuration  
Meridian  
Metal  
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Metallurgy  
Meter, Electric  
Metric System  
Microscope  
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Mineral Deposits  
Mining  
Mirror  
Model  
Molecule  
Mortar  
Mortise, or Mortice  
Motion, Laws of  
Motors, Electric  
Motor Vehicles  
Murdock, William  
Myddelton, Sir Hugh
- Nasmyth, James  
Navigation  
Newcomen, Thomas  
Nitroglycerine  
Nixon, John  
Noble, Sir Andrew  
Number  
Numbers, Partition of  
Numeral
- Objective, or Object Glass  
Octahedron  
Ohmmeter  
Oil Engine  
Optics

|                                       |                                     |                               |                               |
|---------------------------------------|-------------------------------------|-------------------------------|-------------------------------|
| Ordinate                              | Railways                            | Smoke                         | Tramway                       |
| Ore Dressing                          | Random                              | Solder                        | Transformers                  |
| Oscillograph                          | Rankine, W. J. M.                   | Sound                         | Tredgold, Thomas              |
| Oval                                  | Rawlinson, Sir Robert               | Sounding                      | Trevithick, Richard           |
| Painter-work                          | Reclamation of Land                 | Spade                         | Triangle                      |
| Palanquin                             | Reflection of Light                 | Spectroscopy                  | Tricycle                      |
| Palmer, Sir Charles Mark              | Refraction                          | Speculum                      | Trigonometry                  |
| Panama Canal                          | Refrigerating and Ice Making        | Sphere                        | Trisectrix                    |
| Pantograph                            | Reid, Sir Robert G.                 | Spherical Harmonics           | Trumpet, Speaking and Hearing |
| Parabola                              | Rennie, John                        | Spheroid                      | Tube                          |
| Parachute                             | River Engineering                   | Sphereometer                  | Tunnel                        |
| Parallel Motion                       | Rivet                               | Spiral                        | Turbine                       |
| Pedometer                             | Roads and Streets                   | Starley, James                | Tweezers                      |
| Perkins, Jacob                        | Roebing, J. A.                      | Statics                       | Typewriter                    |
| Permeability, Magnetic                | Rolling-mill                        | Steel Construction            | Units, Dimensions of          |
| Permeameter                           | Roofs                               | Steam Engine                  | Units, Physical               |
| Perpetual Motion, or Perpetuum Mobile | Roulette                            | Stephenson, George            |                               |
| Perspective                           | Safes, Strong-rooms and Vaults      | Stephenson, Robert            |                               |
| Phonograph                            | Safety-lamp                         | Stereoscope                   |                               |
| Photography                           | Saw                                 | Stevenson, Robert             |                               |
| Photometry                            | Scaffold, Scaffolding               | Stone                         | Vacuum Tube                   |
| Physics                               | Scantling                           | Strength of Materials         | Valve                         |
| Pier                                  | Schichau, Ferdinand                 | Strutt, Jedediah              | Vaporization                  |
| Piston                                | Science                             | Stucco                        | Variations, of Calculus       |
| Plaster-work                          | Scissors                            | Suez Canal                    | Vector Analysis               |
| Pneumatic Despatch                    | Screw                               | Sun Copying, or Photo Copying | Ventilation                   |
| Pneumatics                            | Semaphore                           | Surface                       | Vernier                       |
| Polarity                              | Seppings, Sir Robert                | Surveying                     | Vision                        |
| Polarization of Light                 | Series                              | Table, Mathematical           | Voltmeter                     |
| Pole, William                         | Serpentine                          | Tacheometry                   | Wagon or Waggon               |
| Polygon                               | Sewerage                            | Tangye, Sir Richard           | Water Motors                  |
| Polygonal Numbers                     | Sewing Machines                     | Technical Education           | Water Supply                  |
| Polyhedral Numbers                    | Sextant                             | Telegraph                     | Watt, James                   |
| Polyhedron                            | Shadoof                             | Telephone                     | Wattmeter                     |
| Porism                                | Shadow                              | Telford, Thomas               | Wave                          |
| Potentiometer                         | Shaft-sinking                       | Tetrahedron                   | Wedge                         |
| Power Transmission                    | Shears                              | Theodolite                    | Weighing Machines             |
| Prism                                 | Ship                                | Thermodynamics                | Weights and Measures          |
| Probability                           | Shipbuilding                        | Thermoelectricity             | Weir                          |
| Projection                            | Shoring                             | Thermometry                   | Welding                       |
| Prony, G. C. F. M. R. de              | Shovel                              | Thomas, Sidney Gilchrist      | Well                          |
| Pulley                                | Shuttle                             | Tide                          | Wheatstone's Bridge           |
| Pump                                  | Siemens, Sir William (Karl Wilhelm) | Timber                        | White, Sir William H.         |
| Pyrometer                             | Sieve                               | Time, Measurement of          | Whitney, Eli                  |
| Quadratrix                            | Signal                              | Time, Standard                | Whitworth, Sir Joseph         |
| Quarrying                             | Silver                              | Tin                           | Wilkinson, John               |
| Quaternions                           | Siphon, or Syphon                   | Tin-plate and Terne-plate     | Windmill                      |
| Radiation, Theory of                  | Sleeper                             | Tire                          | Witch of Agnesi               |
| Radiometer                            | Sleigh, Sled, or Sledge             | Tongs                         | Zero                          |
| Rafter                                | Smeaton, John                       | Tool                          | Zinc                          |
|                                       |                                     | Topography                    |                               |
|                                       |                                     | Traction                      |                               |

## CHAPTER XXI

### FOR PRINTERS, BINDERS AND PAPER-MAKERS AND ALL WHO LOVE BOOKS

“**A**N author, even an immortal genius, is, from the economic point of view, a producer of raw material,” says the Britannica article PUBLISHING, and from the educational point of view, his product, until it has undergone the industrial and commercial processes of reduplication and distribution, is as undeveloped as the seed lying hidden in the winter soil. The history of civilization might, indeed, be divided into four stages: the period before writing; the period before printing, when libraries of manuscripts were almost exclusively the property of kings and priests; the period of costly, hand-printed books; and the period of the power-press, which began less than a hundred years ago. Of these four periods, the first is almost unimaginable. You are sometimes brought into contact with absolutely illiterate people. But they live in shadow, not in total darkness; they get the diffused light of our age of culture. The second period, the era of books in manuscript, we can, however, to some extent reconstruct; and by one fantastic supposition we can even bring it into the focus of our 20th century. Let it be assumed that for some reason the printing of the new Britannica had been enjoined by the law courts, but that the original typescript was available for consultation—say in a public library at

New York or Chicago. Instead of your 29 volumes, weighing only 80 lbs. and occupying only about two cubic feet of space, the walls of a large room would be lined with partitioned shelves on which the 300,000 typed sheets and the 7,000 illustrations, on cardboard, would be ranged. What a mob of students there would be, waiting their turns to read the 40,000 articles, what a mass of notebooks would be filled each day! The impossibility of accomplishing, without the use of printing, all that the Britannica does, will present itself very forcibly to your mind, in another aspect, if you try to imagine 1,500 separate audiences, assembled each day to listen to lectures by the 1,500 contributors to the book. Any attempt to imagine the Britannica doing its work in any way but the way in which it does makes you realize, too, that if it were not for modern methods of *spreading* knowledge, there would be no such system of *assembling* and co-ordinating knowledge as finds its fullest development in the Britannica. It is not only for commercial reasons that the demand must be sufficient to justify the supply; the 1,500 specialists who laid aside their usual work in order to write these articles would never have combined their efforts if this vast public of all educated English speaking people

**Supply and  
Demand  
Interacting**

were not to have been enabled to avail themselves of the result.

The industrial arts which make it possible to produce books swiftly and to sell them at low prices are obviously subjects of interest not only to those who do the producing and selling, but to all who profit by the use of books. And, as the articles mentioned in this chapter show, these arts are in themselves among the most ingenious and curious of all processes; so that in a double sense they merit the attention of everyone to whom the chapters on *Literature* in this Guide would appeal. As the warp of cloth carries the weft, so the raw material of printers' paper and printers' ink carries the "raw material" of the writer's thoughts.

The article on PAPER (Vol. 20, p. 725) is equivalent to 35 pages of this Guide and is illustrated with 15 diagrams. The article is divided into three parts: *History*, by Sir Edward Maunde Thompson, director of the British Museum; *Manufacture*, by J. W. Wyatt, author of *The Art of Making Paper*; and *India Paper*, by W. E. Garrett Fisher.

The history of paper, like that of so many other great inventions, dates back to an early period in China; and, as is

### History of Paper

the case with almost every great contribution to civilization which came from China, paper came to the Western world only after many years and only by chance. In the 8th century of the Christian era, when paper had been made in China for 1000 years, some Chinese paper-makers were taken captives in Samarkand by Arabs, who thus learned the methods of its manufacture. The Arabs and the Persians used linen as a base for the paper instead of the cotton the Chinese used; and the name "paper" was transferred from the Egyptian rush and the writing material made from its fibres to the new product. Paper was manufactured in Europe first by the

Moors in Spain at Xativa, Valencia and Toledo in the 12th century; and into Italy also it seems to have been brought by the Arab occupation of Sicily. Among other interesting points in regard to the history of paper are: water-marks as a sign of age; old papers; variation in prices of paper; blotting-paper, wrapping paper, etc. The articles PAPHYRUS (Vol. 20, p. 743) and PARCHMENT (Vol. 20, p. 798), both by Maunde Thompson, deal with these earlier writing materials. PALIMPSEST (Vol. 20, p. 633) describes the processes by which writings which have been scraped or washed from sheets of vellum, so that the material might be used again, can sometimes be chemically restored and deciphered.

In taking up the study of paper manufacture, the first article to be read is FIBRES by C. F. Cross, the well-known

**Paper Manufacture** analytical and consulting chemist, and especially the section in it on *Paper-making* (Vol. 10, p. 312). This describes the treatment of cotton and flax for writing and drawing papers, wood pulp, esparto, cellulose and cereal straws for printing-paper, etc. See also the article CELLULOSE (Vol. 5, p. 606) by C. F. Cross.

The section on *Manufacture* in the article PAPER, already mentioned, should next be read. Here it is stated that rags, linen or cotton, were the principal materials used for paper in Europe until the middle of the 19th century; and then when prices rose, because the necessarily inelastic supply was no longer sufficient, esparto-grass, wood and straw began to be used as substitutes. The change from hand-making to machinery began in France in 1798 and was accomplished in England in 1803, with the result that hand-made paper is now used only where great durability is the chief requisite, as for bank-notes and drawing paper.

Actual paper manufacture may be divided into two processes: the preliminary cleaning and reduction to pulp; and



the methods of converting pulp to paper—including beating, sizing, colouring, making the sheet or web, surfacing, cutting, etc. Reduction to pulp is described in the treatment of esparto, straw and wood, and there are cuts showing rag-boiler, rag-breaking engine, esparto boiler, press-pâte or half-stuff machine, esparto bleaching and beating plant, and the Porion evaporator and the Yaryan multiple-effect evaporator for soda recovery.

Paper-making proper, after the pulp has been prepared, is next described. The first process is beating; and besides the esparto bleaching and beating plant, described under bleaching, there are drawings of the Taylor and Jordan beaters and a description of them and of the Kingsland beater. Sizing, loading and colouring are then explained. The other main topics of the section on manufacture are: hand manufacture (with two illustrations), paper machine, with pictures of the paper machine, of the dandy roll, of super-calender and of reel paper cutters, and paragraphs on straining, forming the sheet, shake, water marking and couching, pressing and drying, surfacing, machine power, tub-sizing, glazing or surfacing for better grades, cutting, sheeting, sizes (with table), standards of quality, the paper trade, and a list of the best books on paper.

The article PAPER closes with a brief history and description of India paper, which is of particular interest because

**India Paper** of the adoption and successful use of this paper in the new Encyclopaedia Britannica. In this true India paper, "the material used is chiefly rag," but "the extraordinary properties of this paper are due to the peculiar care necessary in the treatment of the fibres, which are specially beaten in the beating engine." The first India paper was brought to England from the Far East in 1841 by an Oxford gradu-

ate, and the name India was used merely to express this Oriental origin, as in "Indian ink" or in the name "Indians" as applied to the American aborigines when their home was thought to be a part of the East. Just where the paper came from is not known. It was given to the Oxford University Press and was used in printing a very small English Bible in 1842. This book was only one-third the usual thickness, and attracted much attention by its lightness and by the opacity of the thin tough paper.

In 1874 a copy of this Bible fell into the hands of Henry Frowde, and experiments were instituted at the Oxford University paper mills at Wolvercote with the object of producing similar paper. On the 24th of August 1875 an impression of the Bible, similar in all respects to that of 1842, was placed on sale by the Oxford University Press. The feat of compression was regarded as astounding, the demand was enormous, and in a very short time 250,000 copies of this "Oxford India paper Bible" had been sold. Many other editions of the Bible, besides other books, were printed on the Oxford India paper, and the marvels of compression accomplished by its use created great interest at the Paris Exhibition of 1900. Its strength was as remarkable as its lightness; volumes of 1500 pages were suspended for several months by a single leaf, as thin as tissue; and, when they were examined at the close of the exhibition, it was found that the leaf had not started, the paper had not stretched, and the volume closed as well as ever. The paper, when subjected to severe rubbing, instead of breaking into holes like ordinary printing paper, assumed a texture resembling chamois leather, and a strip 8 in. wide was found able to support a weight of 28 lb. without yielding. The success of the Oxford India paper led to similar experiments by other manufacturers, and there were, in 1910, nine mills (two each in England, Germany and Italy, one each in France, Holland and Belgium) in which India paper was being produced. India paper is mostly made upon a Fourdrinier machine in continuous lengths, in contradistinction to a hand-made paper, which cannot be made of a greater size than the frame employed in its production.

In addition to technical information in regard to paper the student of the manufacture of books must know something about ink.

The necessary information he will find in the article **INK** (Vol. 14, p. 571) with special descriptions of writing inks, tannin inks, China or Indian ink, logwood ink, aniline ink, copying ink, red and blue ink, marking ink, gold and silver inks, indelible or incorrodible ink, sympathetic ink, and, of the most importance for our present purpose, printing inks.

The process of putting ink on paper is a subject which in the Britannica takes much more ink and paper than the subject of ink or of paper.

This topic is treated in two main articles: one dealing with type and the other with presses. The former, **TYPOGRAPHY** (Vol. 27, p. 509), is a good sized treatise in itself, being equivalent to more than 135 pages of this Guide. It is divided into two parts: *The History of Typography*, by John Henry Hessels, author of *Gutenberg: an Historical Investigation*; and *Modern Practical Typography*, by John Southward, author of *A Dictionary of Typography and its Accessory Arts*, and Hugh Munro Ross, editor of *The (London) Times Engineering Supplement*.

The former part of the article, and the longer, is a very important and elaborate contribution to the knowledge of early printing. On these first developments the student should read the same writer's article **GUTENBERG** (Vol. 12, p. 739) and should notice the great difficulty surrounding the whole question of the "invention," obscured by the fact that so many of the documents on Gutenberg exist only in copies, while others seem to be forgeries by two librarians of the city of Mainz who were eager to prove the claims of their fellow citizen Gutenberg to be the inventor of printing with movable metal types. See also Mr. Hessel's article on **JOHANN FUST** (Vol. 11, p. 373). The honour of the invention of typography, Mr. Hessels decides, belongs to Lorens Janszoon Coster of

Haarlem and its date was somewhere between 1440 and 1446. In Mexico printing was established in 1544, in Manila in 1590, and in Cambridge, Massachusetts, in 1638 or 1639. The early printers had only a few types of each character in a fount, and they printed books, even small quartos, page by page.

This whole treatment of the history of typography is too elaborate to be summarized here, but it is interesting to note that the article gives information about the history of the earliest types—Gothic, Bastard Italian, Roman, Burgundian, etc., with fac-similes of 13 different and characteristic faces between 1445 and 1479; and of different styles and alphabets—Italic, Greek, Hebrew, Arabic, Syriac, Armenian, Ethiopic, Coptic, Samaritan, Slavonic, Russian, Etruscan, Runic, Gothic, Scandinavian, Anglo-Saxon, Irish, Music, Characters for the Blind, Initials, Ornaments and Flowers.

The second part of the article **TYPOGRAPHY**, on *Modern Practical Typography*, will be of more value, probably, to most students of printing and book-making.

It deals with the following topics:—

Material characteristics of Type. Fount may consist of 275 "sorts" or characters. Numbers of sorts vary with different languages—and with different styles and writers; Dickens draws heavily on vowels, Macaulay on consonants. Bill of type or scheme—how computed.

Logotypes or word character as distinct from letters.

Parts of a type—face, stem, serif, beard, shoulder, shank, belly, back, counter, nick, kern, feet, burr and batter.

Species of letter—short, ascending, descending, long, superior, inferior, fat-faced, lean-faced, bastard.

Sizes: classification by names and by point-system.

Varieties of face: Roman, sanserifs or grotesques; black; script; old style; Caslon; influence of William Morris and the Kilmecott Press; Vale Press.

Manufacture of type: type metal; punch, drive and matrix (with illustrations); type-casting—by hand and machine; inventions of Bruce, Barth, Wicks, with description and picture of the Wicks rotary type-casting machine.

Type-setting by hand. Type case, with illustration. Composition, justifying. Imposition. Signatures. Forme, quoin, side-stick, foot-stick, shooting-stick. Distributing.

Type-setting by machine. Linotype and Monotype. Earlier machines—the Paige (in which Mark Twain lost a fortune). Distributing machines—Delcambre, Fraser, Empire, Dow, Thorne, Simplex (with cut). Linotype—with diagrams and description. Monotype (the machine used for the *Encyclopaedia Britannica*) with illustrations of perforated strip.

Electrotyping and Stereotyping. Shells. Turtle. Flong. Wood's Autoplate process. See also the articles ELECTROTYPING (Vol. 9, p. 252) and ELECTROPLATING (Vol. 9, p. 237).

The reader should next turn to the articles ENGRAVING (Vol. 9, p. 645), LINE-ENGRAVING (Vol. 16, p. 721), WOOD-ENGRAVING (Vol. 28, p. 798)—special reference to America where this method is still used for some book and magazine illustration—to LITHOGRAPHY (Vol. 16, p. 785) including offset printing; and PROCESS (Vol. 22, p. 408), for further information in regard to "printing" apart from (and before) actual press work. The last-named of these articles is by Edwin Bale, art director of Cassell & Company, Ltd.; it would occupy about 20 pages of this Guide; and it is illustrated by a plate showing the three-colour process. The article describes:

- (1)—relief processes, line blocks, swelled gelatin process, typographic etching, half-tone processes, three colour blocks, colour filters;
- (2)—intaglio processes, monotype, electrotpe, steel-facing, blanketting, changes in machinery;

- (3)—planographic processes, including woodburytype, stannotype, collotype or phototype, heliotype and photolithography. In relation to lithography there is further information in the biographical sketch of Senefelder, its inventor.

The article PRINTING (Vol. 22, p. 350) deals entirely with the subject of press-work, thus using printing in the narrower

and more correct sense of the word.

**Press-Work** In length this article is equivalent to 25 pages of this Guide; and it contains 9 illustrations of presses. The article is by C. T. Jacobi, author of *Printing*, and *The Printer's Handbook of Trade Recipes*. The article gives a history of the printing press, which was practically unchanged for a century and a half, until the Dutch map-maker Blaeu greatly simplified it. The first important metal press—earlier ones were of wood—was invented by Lord Stanhope nearly two hundred years later. It had greater power with smaller expenditure of labour, and its workings, as well as that of the Blaeu press, and of the Albion, which was used by William Morris at Kelmscott, may be readily understood from the illustrations in the article. Another hand press is the Columbian, invented in 1816 by a Philadelphian, George Clymer, and still in use for heavy hand work. Power presses began to be made at the end of the 18th century, but the presses invented by William Nicholson (1790) and Friedrich König (adopted by the *London Times* in 1814) printed only on one side at a time, as did the "double platen" machine of a little later date. The cylindrical eight feeder built by Augustus Applegath in 1848 for the *London Times* and the Hoe Type Revolving Machine are described in the section on the history of power presses, which closes with the story of Bullock's machine (1865) for printing from a continuous web of paper.

The closing section of the article on printing is devoted to a description of modern presses. It opens with a list of the principal types of presses still in use, which are classified under the following seven heads:—

- (1)—iron hand-presses like the Albion or Columbian, for proof-pulling or limited editions;
- (2)—small platen machines for job or commercial work;
- (3)—single cylinder machines (“Wharfedales”) printing one side only;
- (4)—perfecting machines, usually two cylinder, printing both sides, but with two distinct operations;
- (5)—two-revolution machines with one cylinder;
- (6)—two-colour machines, with one cylinder usually, but two printing surfaces and two sets of inking apparatus;
- (7)—rotary machines for printing from curved plates upon an endless web of paper—principally for newspapers or periodical work.

These seven classes are next described in detail and the article illustrates them all. A cut of an Albion press is given in an early part of the article, and the other six presses shown in the cuts are:

The Golding jobber platen machine  
 Payne & Sons' Wharfedale stop-cylinder machine  
 Dryden & Foord's perfecting machine  
 The Miehle two-revolution cylinder machine  
 Payne & Sons' two-colour single cylinder machine  
 Hoe's double-octuple rotary machine

The article closes with a discussion of the following very practical topics: the preparation or “make ready” for printing; recent development in printing with cross references to the article PROCESS; and a paragraph on the management of a printing house.

From this closing paragraph and the article on PRINTING, the student is referred to the article PROOF-READING (Vol. 22, p. 438)

**Proof-Reading** which is by John A. Black, head press reader of the 10th edition of the Encyclopaedia Britannica, and John Randall, sub-editor of the *Athenaeum* and of *Notes and Queries* and former secretary of the London Association of Correctors of the Press, so that this article, like all the other articles on the subject of book-making, is written by eminent practical authorities on the subject.

The same is true of the article BOOK-BINDING (Vol. 4, p. 216), which naturally follows in a systematic course of study. This is by

**Book-Binding** Cyril J. H. Davenport, assistant keeper of books in the British Museum and author of *History of the Book*, etc. This article is illustrated with 14 figures, including 8 in halftone, showing typical fine bindings. The other illustrations show machines and processes used in binding. Besides a historical sketch of book-binding the article treats of the following topics:

Modern methods and modern binding designers; machine binding, machine sewing, rounding and backing, casing, wiring, and blocking. A case-making machine, a casing-in machine and a blocking machine are shown in the illustrations.

A bookbinder or a student of the subject will find a great deal of very valuable information elsewhere in the book, particularly in the article LEATHER (Vol. 16, p. 330) by Dr. J. Gordon Parker, principal of the Leathersellers Technical College, London, and author of *Leather for Libraries*, etc. The article occupies the equivalent of 55 pages of this Guide; and the possessor of the Britannica will be interested to know that the leather bindings used for its volumes were all made according to specifications drawn



up by Dr. Parker, the greatest authority in the world on tanning, curing and dyeing leather for book-bindings.

The last stages in getting the author's raw material "from him to the ultimate consumer" are those in which the publisher and bookseller

### **Publishing and Book-Selling**

play their part; and for a description of their functions the

student should refer to the articles on publishing and book-selling in the *Britannica*. The article PUBLISHING (Vol. 22, p. 628) explains that publishing and book-selling were for a long time carried on together since "booksellers were the first publishers of printed books, as they had previously been the agents for the production and exchange of authentic manuscript copies." The separation of publishing from book-selling is due to "the tendency of every composite business to break up, as it expands, into specialized departments." As publishers became a separate class the work of their literary assistants also broke up into specialized departments—proof-reading and the reading of manuscripts submitted by authors—or the work of *printers'* readers and *publishers'* readers.

The importance of the work of the publisher's reader is dwelt upon in this article which sketches besides the growth of the Society of Authors in England and of the formation there of the Publishers' Association and the Booksellers' Association. The article also outlines the methods of publishing in the United States and gives particular prominence to the effect on the British market of the introduction of American books and of American book-selling methods.

Among other articles of interest to the manufacturer of books are the following:

**Historical and Miscellaneous Articles** by Alfred William Pollard, assistant keeper of books in the British Museum, gives a general historical description of

books and in particular calls attention to the great change in book-prices in the last thirty years. "About 1894 the number of medium-priced books was greatly increased in England by the substitution of single-volume novels at 6s. each (subject to discount) for the three-volume editions at 31s. 6d. . . The preposterous price of 10s. 6d. a volume had been adopted during the first popularity of the *Waverley Novels* and had continued in force for the greater part of the century." To-day, well printed copies of these novels sell for 1s. in England and for 35 cents in the United States.

It may be added that one of the most striking lessons to be learned from the *Britannica*, in relation to the improvements and economies effected by the application of the most modern processes to the manufacture of books, is supplied by the consideration of the *Britannica* itself. The extent of the composition and machinery involved, the accuracy of the proof-reading, the novel employment—upon a large scale—of India paper and flexible bindings, the beauty of the illustrations, and, above all, the low price at which the product is sold, form a combination of the very latest perfections of every department of the industry.

Read too BOOK-COLLECTING (Vol. 4, p. 221) also by A. W. Pollard; the article BOOK PLATES (Vol. 4, p. 230) by Egerton Castle, illustrated with ten cuts of book plates (which are so well chosen that book plate collectors have not infrequently asked the publishers of the *Encyclopaedia Britannica* for extra copies so that they might include them in their collections); the article BOOKCASE (Vol. 4, p. 221) from which the reader may be surprised to learn that "the whole construction and arrangement of bookcases was learnedly discussed in the light of experience by W. E. Gladstone in the *Nineteenth Century* for March 1890;" and the article BIBLIOGRAPHY AND BIBLI-



LOGY (Vol. 3, p. 908) by A. W. Pollard, supplemented by the article INCUNABULA (Vol. 14, p. 369).

The following alphabetical list of articles and sections of articles, although

it does not profess to be complete, will give the student some idea of the large number of topics connected with the general subject of the manufacture of books:

|                       |                       |                       |                         |
|-----------------------|-----------------------|-----------------------|-------------------------|
| Albion Press          | Cutter                | Lithography           | Reel Paper Cutter       |
| Aniline Ink           | Dandy Roll            | Logwood Ink           | Relief Process          |
| Applegath, Augustus   | Delcambre Machine     | Machine Presses       | Roman Type              |
| Autoplate Process     | Distributing          | Marking Ink           | Rotary Presses          |
| Backing               | Distributing Machines | Matrices              | Rounding                |
| Barth, Henry          | Dow Machine           | Miehle Press          | Ruby                    |
| Bastard Letter        | Drive                 | Minion                | Scheme of Type          |
| Batter                | Drying                | Monoline              | Senefelder              |
| Bibliography and Bib- | Electroplating        | Monotype              | Serif                   |
| liology               | Electrotyping         | Morris, William       | Sewing                  |
| Bill of Type          | Empire Machine        | Nicholson, William    | Shake                   |
| Binding               | English Type          | Nick                  | Sheeting                |
| Black Type            | Engraving             | Nonpareil             | Shells                  |
| Blaeu Press           | Esparto               | Octuple Rotary Ma-    | Signature               |
| Blanketing            | Evaporator            | chine                 | Silver Ink              |
| Bleaching             | Face                  | Off-set Printing      | Simplex Machine         |
| Blocking              | Flong                 | Old-style Type        | Sizes of Paper          |
| Blue Ink              | Forme                 | Paige Composing Ma-   | Sizing                  |
| Boiling               | Fount                 | chine                 | Soda Recovery           |
| Book                  | Fraser Machine        | Paper                 | Stanhope Press          |
| Book-Binding          | Fust                  | Papyrus               | Stannotype              |
| Book-case             | Glazing               | Parchment             | Steel-facing            |
| Book-collecting       | Golding Machine       | Pearl (type)          | Stem                    |
| Book-Plates           | Gold Ink              | Perfecting Machine    | Stereotyping            |
| Book-selling          | Goodson               | Photolithography      | Straining               |
| Bourgeois             | Gutenberg             | Phototype             | Super Calender          |
| Breaking              | Half Stuff            | Pica                  | Surfacing               |
| Brevier               | Half-tone             | Planographic Process  | Swelled Gelatin Process |
| Bruce, David          | Heliotype             | Platen                | Sympathetic Ink         |
| Burr                  | Hoe, Robert           | Point System          | Tachytype               |
| Case-making Machine   | Imposition            | Porion Evaporator     | Tannin Ink              |
| Casing                | Incunabula            | Power Presses         | Thorne Machine          |
| Casing-in machine     | Indelible Ink         | Pressing              | Three Colour Process    |
| Caslon Type           | Indian Ink            | Press Plate           | Tub-sizing              |
| Casting               | India Paper           | Press-work            | Turtle                  |
| Cellulose             | Ink                   | Primer                | Type-case               |
| China Ink             | Intaglio Process      | Price of Paper        | Typograph               |
| Chinese Paper-makers  | Italic Type           | Printing              | Typography              |
| Chiswick Press        | Jordan Beaters        | Printing Ink          | Vale Press              |
| Clymer, George        | Justifying            | Process               | Water mark              |
| Collotype             | Kelmscott Press       | Proof-reading         | Wharfedale Presses      |
| Colour Filters        | Kern                  | Publishing            | Wicks, Frederick        |
| Colour Process        | Kingsland Beater      | Pulp                  | Wiring                  |
| Columbian Press       | König, Friedrich      | Punch                 | Woodbury Process        |
| Composition           | Lanston Monotype      | Quality, Standards of | Wood Engraving          |
| Copying Ink           | Leather               | Paper                 | Wood's Autoplate        |
| Coster                | Line-Engraving        | Rag                   | Writing Ink             |
| Couching              | Linotype              | Red Ink               | Yaryan Evaporator       |

## CHAPTER XXII

### FOR JOURNALISTS AND AUTHORS

**N**O writer can consider the use he will make of the tools of his trade—and the Britannica is certainly the chief among them—unless he has very definite views as to the particular kind of work he is trying to do. Where writing is regarded as a business, the art of writing is the art of being read, and the art of being read lies, nowadays, in convincing the reader that you have something fresh to say, rather than in arousing his admiration of your way of saying it. Writing is none the less one of the fine arts: the modern writer must form his style with the utmost care, and always guard himself against the temptation to relax his standards. But the juggling with words, the “rhythmical sequences of recurring consonants,” the musical prose in which sounds are adjusted as artfully as in verse, presuppose readers to whom these elaborations are delightful. Such readers are rare, today. Thirty or forty years ago it was a matter of course, in thousands of homes, for some one member of the household to read aloud to the others. The custom has almost disappeared, and there has been a change in public taste, due, perhaps, in great measure to a change in the *pace* at which people read. A book does

#### The Development of Style

not “last” as it did. Newspaper reading has trained the eye and the mind to swifter consumption. The modern professional writer adapts himself to the existing conditions. He knows that those who ride in automobiles do not peer under tufts of leaves to look for roadside violets. But he also knows that they want a straight, smooth road. He endeavors to write as concisely as possible, yet to

write so clearly that every point he makes is made once for all; and he can work fully as hard, and apply talents fully as great, in forming a style that pleases by its simple directness—or, better, that pleases because the reader does not think of it as “style,”—as if he were aiming at the most elaborate ornament.

In developing the power of clear and concise statement, the first essential is to form the habit of getting your “something to say” absolutely plain to your own mind before you attempt to say it. A writer deliberately strives to be wordy and vague when he is trying to misrepresent facts, and it is impossible, when he is groping for his facts, that he should avoid wordiness and vagueness. The Britannica article on Rudyard Kipling

#### “Vitalized Observation”

speaks of his “powers of observation vitalized by imagination.” It would be difficult to find a phrase more tersely describing the ideal equipment of a writer, and Kipling’s observation is rapid observation *amplified by deliberate investigation*. He gets a swift impression of the complex framework of a ship or of the intricate machinery of a locomotive, and then, before he writes “The Ship that Found Herself” or “.007,” he makes as elaborate a technical study as if he were writing an engineering article instead of a story. His imagination so vitalizes the result that when you read the story, although it describes beams and valves you never saw, you recognize the accuracy of his technical description as you recognize, in an art gallery, the fidelity of a portrait, although you never saw the person portrayed. In using the Britannica, the investigation by which you amplify

your personal observation helps you in four ways. *First*, you correct your facts if they need correction. Whatever your subject may be, you find information so authoritative that you cannot question it. *Second*, you amplify your own observations; you discover the underlying causes and relations of the events or opinions you are about to discuss. *Third*, the reading by which you have, consciously or unconsciously, been influenced in forming your style, is rendered more profitable and stimulating by your study of the Britannica articles in which the work of all the world's great writers, past and present, is analyzed by the most brilliant critics. *Fourth*, you have in the Britannica itself such examples of scholarly, forcible, compacted English as cannot often be found in contemporary books. It is not within the province of this Guide to institute detailed comparisons between these articles by the leading literary men of the day and other writings from the same pens. But the reader will discover for himself that the editorial policy which demanded rigorous concision has stimulated, not hampered, the distinguished writers whose Britannica articles are, in case after case, the best of their productions.

The foregoing summary of the uses of the Britannica to writers is based upon reviews of the work which have appeared in the daily and weekly press; and it may be supplemented by brief extracts from one or two letters to the publishers, written by men whose reputations give their opinions great weight. In one of these Horace White, formerly editor of the *Evening Post* of New York, spoke highly of the practical utility of the Britannica. Joseph Pulitzer, of the New York *World*, shortly before his death wrote: "I want to thank you for the intellectual pleasure I enjoyed this winter in examining this extraordinary production. I have already distributed a dozen

sets in America as presents among *editors* and my children. [He afterwards ordered six more sets.] The work is a liberal education." John Habberton wrote: "The new edition of the Britannica has already cost me hundreds of hours that I should have given to my work, but I do not regret the outlay, for I have been richly repaid. There never was a handier book for a desk or a more readable one."

It is not only true that no ordinary library would supply the information to be found in the Britannica, but it is as true, and as relevant, that no ordinary library presents information in a form as stimulating to the writer who uses books as the tools of his trade. The editor-in-chief of the Britannica had all the world's greatest experts in all fields of human knowledge and endeavour to choose from. He chose in each instance the expert whose knowledge was so thorough, and whose correlation of his special knowledge with related branches was so complete, that his articles are not merely "last word" information but interesting and alive. You may remember the new interest you felt in natural science when you first read an essay by Huxley, because he had the power of creating enthusiasm. It is a justifiable figure of speech to say that, in this sense, the Britannica has been written by Huxleys. Perhaps you have ransacked a public library for some out-of-the-way fact and finally found it, in skeleton form, and in crabbed German, in Meyer or Brockhaus or some other German encyclopaedia. Or did your search end by finding the fact in Larousse or *La Grande Encyclopédie*, in some clever phrase, so brilliantly written, so strikingly put, that it was the phrase and not the fact that you had got—and you felt that the Frenchman had hidden the fact, if he ever had had it, in his epigram? You may have wished, then, for a third type of encyclopaedia which should be "German-thorough" and

"French-interesting." Such a combination is the Britannica,—more authoritative, more up-to-date, more interesting, than any other book.

A newspaper man, reporter or editor, must be informed at a moment's notice on any one of so large a number and so

### The Journalist's Needs

wide a range of topics that the best library of reference obtainable can be none too good for him. This is especially true of the man on the smaller newspaper which does not have the luxury of specialists on its editorial staff, or of many reporters dividing among them the work of gathering news on such lines that each may work in a field with which he is intimately acquainted and in which he is particularly versed. And the rural newspaper is, besides, further from good public libraries and financially less able to have a large office library. The authority, the scope, the interest and the convenience of the Britannica make it just the book to fill these varied needs of the newspaper man. If he has to write a "murder story" in which some unusual poison has been used, he can find a full description of the origin, the use, the action and the tests of the drug by turning to the Britannica—instead of hunting for (and then through) a text book on medicine. And if, on the same day, or the next, he must write an editorial on the tariff, he will find in the article **TARIFF**, in the articles **FREE TRADE** and **PROTECTION**, and in that part of the article **UNITED STATES** which deals with the country's economic history, the information that he wants; and he can get it quickly, and can be sure of its being authoritative.

If the Britannica is evidently *the* work of reference for the writer, how is he to use it?

It has already been suggested that he will find authoritative and recent information on any topic connected with the subject on which he is writing. It would be interesting to see—or at least to imagine

—how largely the Britannica might be used as a source for fiction. A novelist with an appetite for human documents like Balzac's or like that of Charles Reade—with his many albums full of newspaper clippings,—could satisfy himself with the Britannica, taking his characters "from life" in its biographical and historical articles and his setting from its geographical articles.

It has already been suggested that the writer will find in the Britannica the clearness and conciseness of style which he cannot but wish to attain in his own work. Here he has the writings of great masters of English. He may remember Robert Louis Stevenson's story of how he played "the sedulous ape" to the great stylists; and in the Britannica he can read not only an excellent sketch of Stevenson by Edmund Gosse, his friend and a well-known essayist, but Stevenson's own article on Béranger. He may read Matthew Arnold on Sainte-Beuve; Walter Besant on Froissart and on Richard Jefferies; John Burroughs on Walt Whitman; G. W. Cable on William Cullen

Bryant; Edmund Kerchever Chambers on Shakespeare; Ernest Hartley Cole-

ridge on Byron; Sidney Colvin on Giotto, Leonardo, etc.; Austin Dobson on Fielding, Hogarth, Richardson, etc.; Henry van Dyke on Emerson; John Fiske on Francis Parkman; Richard Garnett on T. L. Peacock and on Satire; Israel Gollancz on "The Pearl"; Edmund Gosse on many literary *genres*, on Ibsen, etc.; Edward Everett Hale on James Freeman Clarke and on Edward Everett; Frederic Harrison on Ruskin; W. E. Henley on James Fenimore Cooper; William Price James on Barrie, Henley and Kipling; Prince Karageorgevitch on Maie Bashkirtseff; Stanley Lane-Poole on Richard Burton; Andrew Lang on Ballads, Molière, etc.; Henry Cabot Lodge on Albert Gallatin; E. V. Lucas on Jane Austen and Charles Lamb; Lord Macaulay on Bunyan, Gold-

### Literary Criticism

Bryant; Edmund Kerchever Chambers on Shakespeare; Ernest Hartley Cole-

Ernest Hartley Cole-

ridge on Byron; Sidney Colvin on Giotto, Leonardo, etc.; Austin Dobson on Fielding, Hogarth, Richardson, etc.; Henry van Dyke on Emerson; John Fiske on Francis Parkman; Richard Garnett on T. L. Peacock and on Satire; Israel Gollancz on "The Pearl"; Edmund Gosse on many literary *genres*, on Ibsen, etc.; Edward Everett Hale on James Freeman Clarke and on Edward Everett; Frederic Harrison on Ruskin; W. E. Henley on James Fenimore Cooper; William Price James on Barrie, Henley and Kipling; Prince Karageorgevitch on Maie Bashkirtseff; Stanley Lane-Poole on Richard Burton; Andrew Lang on Ballads, Molière, etc.; Henry Cabot Lodge on Albert Gallatin; E. V. Lucas on Jane Austen and Charles Lamb; Lord Macaulay on Bunyan, Gold-

smith, Johnson and Pitt; David Masson on Milton; Brander Matthews on Mark Twain; Alice Meynell on Mrs. Browning; William Minto on Dryden, Pope, Spenser and Wordsworth; John Nichol on Robert Burns; Charles Eliot Norton on George William Curtis; Mark Pattison on Casaubon, Erasmus, Macaulay and Thomas More; W. H. Pollock on Thackeray and de Musset; Quiller-Couch on Thomas Edward Brown; Whitelaw Reid on Greeley; C. F. Richardson on Bronson Alcott and John Fiske; W. M. Rossetti on Shelley; Viscount St. Cyres on Fénelon and Madame Guyon; Saintsbury on French literature, Balzac, Montaigne, Rabelais, etc.; Carl Schurz on Henry Clay; H. E. Scudder on Lowell and Harriet Beecher Stowe; Thomas Secombe on Boswell, Dickens, Charles Lever, etc.; William Sharp ("Fiona McLeod") on Thoreau; Clement Shorter on the Brontës, Crabbe, Cowper and Mrs. Gaskell; W. W. Skeat on Layamon; E. C. Stedman on Whittier; Sir Leslie Stephen on Browning and Carlyle; Richard Henry Stoddard on Hawthorne; Swinburne on Beaumont and Fletcher, Congreve, Hugo, Landor, Marlowe, Mary, Queen of Scots; John Addington Symonds on the Renaissance, Machiavelli, Tasso, etc.; Arthur Symons on Hardy, Mallarmé, Verlaine; W. P. Trent on Sidney Lanier; A. W. Ward on Drama; Mrs. Humphry Ward on Lyly; Theodore Watts-Dunton on Poetry, Sonnet, Borrow, Wycherley, Matthew Arnold; Arthur Waugh on William Morris, Walter Pater; and G. E. Woodberry on American Literature.

The more you know of the subjects or authors in this list the more likely you will be to say what a Western professor of theology said, in reviewing the articles in the Britannica dealing with the Bible: "They are the very authorities that I would have chosen to write these articles!"

But the Britannica will serve the professional author in other ways than by giving him information in special fields

and by keeping before him admirable models of style. He might well follow any of the courses suggested in the chapter on *Literature* in this Guide; and if he will read the articles on great authors written by great authors, already mentioned, he will have a doubly valuable course in biographical criticism by the ablest of literary critics.

Any newspaper writer or contributor to the periodical press should read such articles as:

NEWSPAPERS (Vol. 19, p. 544; equivalent to 125 pages of this Guide), by Hugh Chisholm, editor-in-chief of the Britannica, with sections  
**Newspapers and Magazines** on the price of newspapers by Lord Northcliffe, on illustrated papers by Clement Shorter, general information on American newspapers, and an elaborate historical account of British, American and foreign newspapers.

PERIODICALS (Vol. 21, p. 151; equivalent to 40 pages in this Guide), by Henry Richard Tedder, librarian of the Athenæum Club of London, treats the subject under the heads: *British, United States, Canada, South Africa, Australia and New Zealand, West Indies and British Crown Colonies, India and Ceylon, France, Germany, Austria, Italy, Belgium, Holland, Denmark, Norway, Sweden, Spain, Portugal, Greece, Russia, and other Countries.*

SOCIETIES, LEARNED (Vol. 25, p. 309), also by H. R. Tedder, deals with the publications of such societies and classifies them (with geographical sub-classification for each head) under *Science Generally, Mathematics, Astronomy, Physics, Chemistry, Geology, Mineralogy and Palaeontology, Meteorology, Microscopy, Botany and Horticulture, Zoology, Anthropology, Sociology, Medicine and Surgery, Engineering and Architecture, Naval and Military Science, Agriculture and Trades, Literature, History and Archaeology, and Geography.*

Local information in regard to newspapers and journalism will be found in



separate local articles. Thus under Boston, Philadelphia, New York City, New Orleans, San Francisco, etc., there is valuable information in regard to these cities as literary centers and about their principal periodical publications, including newspapers; and in the articles on smaller cities, such as Albany and Springfield, Mass., there are valuable historical sketches of the local press of each.

The newspaper man should read the biographies of great American printers and editors: WILLIAM BRADFORD (Vol. 4,

### Literary Biographies

p. 370); BENJAMIN FRANKLIN (Vol. 11, p. 24; equivalent to 20 pages of this Guide); ISAIAH THOMAS (Vol. 26, p. 867); NOAH WEBSTER (Vol. 28, p. 463); WILLIAM CULLEN BRYANT (Vol. 4, p. 698); JAMES G. BIRNEY (Vol. 3, p. 988); GAMALIEL BAILEY (Vol. 3, p. 217); W. L. GARRISON (Vol. 11, p. 477); JAMES GORDON BENNETT (Vol. 3, p. 740); THURLOW WEED (Vol. 28, p. 466); GIDEON WELLES (Vol. 28, p. 506); JOHN BIGELOW (Vol. 3, p. 922); HORACE GREELEY (Vol. 12, p. 531); HENRY J. RAYMOND (Vol. 22, p. 933); GEORGE RIPLEY (Vol. 23, p. 363); C. A. DANA (Vol. 7, p. 791); GEORGE WILLIAM CURTIS (Vol. 7, p. 652); CARL SCHURZ (Vol. 24, p. 386); SAMUEL BOWLES (Vol. 4, p.

344); JOSEPH R. HAWLEY (Vol. 13, p. 101); WHITELAW REID (Vol. 23, p. 52); GEORGE W. CHILDS (Vol. 6, p. 141); E. L. GODKIN (Vol. 12, p. 174); and HENRY WATTERSON (Vol. 28, p. 418).

The reading of these biographies will give the student many interesting starting-points for studies in American politics, economics, literature, reform movements as widely separated as abolition and the introduction of the merit system into the civil service. The author should also read the article AMERICAN LITERATURE (Vol. 1, p. 831; equivalent to 35 pages of this Guide), by Professor G. E. Woodberry, and, if his field is that of the publicist, he should read the article on the history of the UNITED STATES (Vol. 27, p. 663), equivalent to 225 pages of this Guide; and the allied articles to which he is referred from that.

The advertising writer will find a valuable and stimulating article on ADVERTISEMENT (Vol. 1, p. 235, equivalent to 20 pages in this Guide), which gives a history of the subject, deals with posters and signs, circulars, periodical advertising, and legal regulation and taxation.

For a full list of articles of particular usefulness for the author, see the chapter *Literature* in this Guide. The following brief list may serve as the basis for a preliminary course of reading:

Alliteration  
Ana  
Anecdote  
Anthology  
Anticlimax  
Antithesis  
Aphorism  
Apologue  
Apophthegm  
Archaism  
Assonance  
Bathos  
Belles-Lettres  
Biography  
Book  
Book-Collecting  
Bookselling  
Burlesque  
Comedy  
Criticism  
Dialogue  
Drama  
Elegy

Encyclopaedia  
Epic Poetry  
Epigram  
Epilogue  
Epistle  
Essay  
Euphemism  
Fable  
Feuilleton  
Gazette  
Humour  
Hyperbole  
Idyll  
Impromptu  
Index  
Irony  
Lampoon  
Laureate  
Legend  
Libraries  
Limerick  
Litotes  
Lyrical Poetry

Manuscript  
Melodrama  
Metaphor  
Metonymy  
Metre  
Monologue  
National Anthems  
Newspapers  
Novel  
Ode  
Pamphlets  
Parable  
Paradox  
Paraphrase  
Parody  
Pasquinade  
Periodicals  
Philippics  
Plngiarism  
Pleonasm  
Poetry  
Proof-Reading  
Prose

Prosody  
Proverb  
Psalm  
Pseudonym  
Pun  
Quatrain  
Quotation  
Reporting  
Rhetoric  
Rhyme  
Rhythm  
Romance  
Saga  
Satire  
Song  
Sonnet  
Squib  
Stanza  
Style  
Tale  
Tract  
Treatise  
Verse

## CHAPTER XXIII

### FOR TEACHERS

**E**VERY teacher has one pupil who tries harder than any of the others to absorb knowledge, and yet is never content with the progress made, who knows how hard the teacher works, and yet is never satisfied with the teacher—and that pupil is the teacher's self. For every other learner there is a limit to the amount of knowledge to be acquired, but in the case of the teacher a "standard" is supposed to indicate no more than an indispensable minimum. When you are trying to make your pupils master a text-book, the volume seems to contain a most stupendous mass of learning, and when one of them asks you a question about the subject with which the text-book deals, that particular point is sure to be one that the text-book does not cover. What engineers call the "factor of safety," the margin by which the strength of materials must exceed the stress it is expected to encounter, is, for the teacher, incalculable. It is, of

#### The Teacher's "Factor of Safety"

course, a favorite pastime of parents to send a child to school primed with some question "to ask Teacher," selecting an enigma that has been for centuries a battle-ground for scholars or scientists. And, apart from these malicious pitfalls, children themselves seem, quite innocently, to hit upon questions of extraordinary difficulty. A rebuff, a careless response, or, worst of all, an ingenious evasion of the issue, is fatal to the teacher's author-

ity and influence. "Ask me that again, to-morrow morning," is the phrase with which a conscientious teacher often meets such a contingency. And then how a fagged brain is tormented that evening, how the few books available (and they are likely to be a very few if there is no public library at hand) are searched in vain! That is not all. If it be true that the teacher is the most diligent, yet always the least satisfied, of all the teacher's pupils, it is equally true that many of the most puzzling questions with which the teacher is confronted arise in the teacher's own mind.

The question-answering power of the Britannica is therefore of cardinal importance to the teacher, and is to be considered not only in connection with the use of the work for reference, but also in the selection of such courses of reading as may be expected to supply informa-

tion of the kind that  
**Answers to** questions most  
**All Questions** often demand. And

this question-answering power lies in three characteristics of the work, and may be measured by the extent to which the three are found in it: broad scope, unimpeachable authority and convenient arrangement. Its scope covers the whole range of human knowledge, everything that mankind has achieved, attempted, believed or studied. Its authority is doubly vouchsafed. The fact that the Britannica is published by the University of Cambridge (England), one of the world's oldest and most famous seats of learning, in itself gives such a

guarantee as no other Encyclopaedia has ever offered, and the assurance thus given may be regarded as showing, chiefly, that there are no errors of omission, for against the existence of the errors of commission there is a further guarantee. The articles are signed by 1,500 contributors, including the foremost specialists in every department of knowledge. Among this army of collaborators, chosen from twenty countries, there are no less than 704 members of the staffs of 146 universities and colleges. This means that by means of the Britannica the youngest teacher in the most isolated village is brought into stimulating contact with the great leaders of the teaching profession. Its arrangement gives it the advantages of a universal library, providing the varied courses of reading outlined in this Guide, and those also of a work of reference which yields an immediate answer to every conceivable question. The index of 500,000 entries instantly leads the enquirer to any item of information in the 40,000 articles. No teacher could hope to form, in the course of a lifetime, a collection of separate books which would contain anywhere near as much information.

In another relation, the Britannica is of daily service to anyone engaged in educational work. It has already been

#### A Library of Text-Books

remarked that the teacher needs a "factor of safety," a reserve of knowledge beyond that which is directly called for in the ordinary routine of the class room. But in the very course of that routine, there is also a need for co-ordinated knowledge, presented in a form available for use in teaching, of a more advanced kind than that in the text-books with which pupils are provided. And the Britannica is, in itself, a vast collection of text-books.

Professor Shotwell, of Columbia University, recently wrote to the publishers a letter in which he said: "I shall use

the articles in the Encyclopaedia Britannica which deal with industrial processes as a substitute for a text-book in one of my courses in Social and Industrial History and have especially in mind the splendid treatment of the cotton industry by Professor S. J. Chapman and others." A large number of Britannica articles have, by permission, been reprinted, word for word, for use as text-books; and it is impossible to say how many have been paraphrased, and, in a form less clear and vivid than the originals, similarly employed. The writers of the Britannica have, among them, done so large a share of the world's recent work in research and criticism, that no one who is engaged in writing a text-book or in preparing a course of lectures should fail to use the work as a check to test the completeness and the accuracy of independent investigation.

Fortunately, the system of monthly payments has enabled teachers to purchase the Britannica to an extent which, in view of their limited resources, is a striking evidence of their earnest desire to perfect their professional equipment. In some cases two and even three teachers have combined their efforts in order that they might jointly possess the work. But whatever may be the difficulties to be overcome, it is certain that the Britannica is, for the teacher, an instrument as directly productive as a technical library is for a doctor or a lawyer.

A professor in an eastern college wrote to the publishers: "It has become 'the collection of books' which Carlyle might term 'the true university'"; and the practical head of a business school in Pennsylvania says: "By its purchase, I have secured access to a university education." A well known professor of German calls it "a *Hausschatz* of amazing richness and variety," and adds: "I hope you will not be sued at law for an attempt to monopolize the market for profitable and entertaining literature." The presi-

dent of a southern university wrote: "It is the first book to consult, the one book to own, if you can own but one." And a Harvard professor says: "I have been particularly interested in some of the recent phases of European history. Concerning some movements, about which it is as yet extremely difficult to find material in books, I have found the Encyclopaedia most useful." A teacher in a theological seminary exclaims: "What a university of solid training it would be for a young student, if he would spend an hour each day reading the work, volume by volume, and including all the articles except those of a technical nature belonging to other departments than his own!"

This is what teachers have said of the value to them of the Encyclopaedia Britannica. Specialists in school-hygiene and school librarians have also noted the advantage of the light, handy volumes printed on India paper—one weighs no more than two monthly magazines—, which may be easily held at the proper angle for eye-focus on a large page.

The teacher will find in this Guide valuable suggestions about particular subjects which he may wish to teach or study,—such as history, literature, language and biology. In this chapter we suggest a general course.

Let him begin with the article EDUCATION (Vol. 8, p. 951), which is the equivalent in length of 120 pages of the size and type of this Guide, and of which the first part is by James Welton, professor of education in the University of Leeds and author of *Logical Bases of Education*, etc., the sections on national systems by G. B. M. Coore, assistant secretary of the London Board of Education, and that on the United States by Nicholas Murray Butler, president of

### The Theory of Education

the meaning of the term "Education," ex-

cludes John Stuart Mill's extension to everything which "helps to shape the human being," and narrows the meaning to definitely personal work,—the true "working" definition for the practical teacher.

The section on educational theory might equally well be styled a sketch of the history of education and will prove valuable to the teacher preparing for a licence-examination in this subject or for a normal training course. It discusses old Greek education with special attention to Spartan practice, Plato's theory and Aristotle's, and the gradual change from the point of view of the city-state to Hellenistic cosmopolitanism. The older Roman education, practical and given by father to son, is contrasted with the later Hellenized training, largely by Greek slaves, largely rhetorical and largely summed up in Quintilian's *Institutio*. The contest between the pagan system and Christianity is shown to have culminated in monasticism; and barbarian inroads stifled classical culture until the Carolingian revival under Alcuin in the 8th century and the scholastic revival (11th to 13th centuries) of Abelard, Aquinas and Arabic workings over of Aristotle. Scholastic education is considered especially in relation to the first great European universities and the schools of the Dominicans, Franciscans and Brethren of the Common Life, and in contrast to chivalry, the education of feudalism. The Renaissance is treated at greater length, and this is followed by sections on the influence of the Reformation on education, and the consequent growth of Jesuit schools. The key-note of the story thereafter is reform,—the movement away from the classics, toward natural science, and, especially after the French Revolution, by means of new methods and theories, notably those of Rousseau, Pestalozzi, Froebel and Herbart.

The remainder of the article EDUCA-

TION deals with national systems of education: French, German, Swiss, Belgian, Dutch, Scotch, Irish, English, Welsh and American, with an excellent bibliography. These, and other, national systems are also treated from another point of view in the articles on the separate countries.

The article EDUCATION should naturally be followed by a study of the article UNIVERSITIES (Vol. 27, p. 748—about 100 pages, if printed in the style of this Guide) by James Bass Mullinger (author of the *History of Cambridge, The Schools of Charles the Great*, etc.) and, for American universities, by Daniel Coit

Gilman, late president of Johns Hopkins University; and by a reading of articles on the great universities, as for instance, Oxford, Cambridge, Aberdeen, Glasgow, St. Andrews, Dublin, Harvard, Yale, Columbia, Cornell, Princeton, Pennsylvania, Michigan, Wisconsin, California, Leland Stanford, Jr., etc. The student should then turn to the article SCHOOLS (Vol. 24, p. 359; equivalent to about 40 pages of this Guide) by Arthur Francis Leach, author of *English Schools at the Reformation*, who gives a summary of what is known of Greek, Roman and English schools.

Then,—to supplement these general articles,—he should read—

On Greek education:

PLATO (Vol. 21, p. 808), especially p. 812 (on *Meno*) and 818 (on the *Republic*).

ARISTOTLE (Vol. 2, p. 501).

SPARTA (Vol. 25, p. 609, particularly p. 611).

On Roman education:

CATO (Vol. 5, p. 535).

QUINTILIAN (Vol. 22, p. 761).

On early Christian education:

CLEMENT OF ALEXANDRIA (Vol. 6, p. 487, particularly p. 488, on the *Paedagogus*).

AUGUSTINE (Vol. 2, p. 907) and

JEROME (Vol. 15, p. 826), with especial attention to their early pagan education and their attitude toward it as Christians.

AMBROSE (Vol. 1, p. 798).

MARTIANUS CAPELLA (Vol. 5, p. 249).

BOETIUS (Vol. 4, p. 116).

CASSIODORUS (Vol. 5, p. 459).

ISIDORE (Vol. 14, p. 871).

ST. GREGORY (Vol. 12, p. 566).

BEDE (Vol. 3, p. 615).

MONASTICISM (Vol. 18, p. 687).

On the Carolingian revival:

ALCUIN (Vol. 1, p. 529).

ANGILBERT (Vol. 2, p. 9).

CHARLEMAGNE (Vol. 5, p. 891, especially p. 894).

FRANCE (Vol. 10, p. 810).

On the Scholastic revival:

SCHOLASTICISM (Vol. 24, p. 346).

ABELARD (Vol. 1, p. 40).

JOHN OF SALISBURY (Vol. 15, p. 449).

ALBERTUS MAGNUS (Vol. 1, p. 504).

GROSSETESTE (Vol. 12, p. 617).

THOMAS AQUINAS (Vol. 2, p. 250).

ROGER BACON (Vol. 3, p. 153).

On the Renaissance:

RENAISSANCE (Vol. 23, p. 83).

DANTE (Vol. 7, p. 810).

PETRARCH (Vol. 21, p. 310).

BOCCACCIO (Vol. 4, p. 102).

MANUEL CHRYSOLARAS (Vol. 6, p. 320).

MANUTIUS (Vol. 17, p. 624).

THOMAS MORE (Vol. 18, p. 822).

ERASMUS (Vol. 9, p. 727).

JOHN COLET (Vol. 6, p. 681).

THOMAS LINACRE (Vol. 16, p. 701).

On the Reformation period and Counter-Reformation:

REFORMATION (Vol. 23, p. 4).

MELANCTHON (Vol. 18, p. 88).

LUTHER (Vol. 17, p. 133).

TROTZENDORFF (Vol. 27, p. 308).

REUCHLIN (Vol. 23, p. 204).

ASCHAM (Vol. 2, p. 720).

RABELAIS (Vol. 22, p. 769).

JESUITS (Vol. 15, p. 337), especially p. 342.

LA SALLE (Vol. 16, p. 231).



On the *Moaern period*:

- COMENIUS (Vol. 6, p. 759).  
 ROUSSEAU (Vol. 23, p. 775).  
 VOLTAIRE (Vol. 28, p. 199).  
 PESTALOZZI (Vol. 21, p. 284).  
 FROEBEL (Vol. 11, p. 238).  
 HERBERT (Vol. 13, p. 335).  
 WILHELM VON HUMBOLDT (Vol. 13, p. 875).  
 ANDREW BELL (Vol. 3, p. 684).  
 JOSEPH LANCASTER (Vol. 16, p. 147).  
 SIR JOHN FITCH (Vol. 10, p. 438).  
 JAMES BLAIR (Vol. 4, p. 34).  
 T. H. GALLAUDET (Vol. 11, p. 416).  
 F. A. P. BARNARD (Vol. 3, p. 409).  
 HENRY BARNARD (Vol. 3, p. 410).  
 HORACE MANN (Vol. 17, p. 587).  
 MARK HOPKINS (Vol. 13, p. 684).  
 WILLIAM T. HARRIS (Vol. 13, p. 21).  
 JUSTIN S. MORRILL (Vol. 18, p. 869).  
 ALEXANDER MELVILLE BELL (Vol. 3, p. 684).  
 S. C. ARMSTRONG (Vol. 2, p. 591).  
 BOOKER T. WASHINGTON (Vol. 28, p. 344).  
 Co-EDUCATION (Vol. 6, p. 637).  
 BLINDNESS (Vol. 4, p. 66).  
 DEAF AND DUMB (Vol. 7, p. 887).  
 INFANT SCHOOLS (Vol. 14, p. 533).  
 KINDERGARTEN (Vol. 15, p. 802).  
 MUSEUMS OF ART (Vol. 19, p. 60).  
 MUSEUMS OF SCIENCE (Vol. 19, p. 64).  
 POLYTECHNIC (Vol. 22, p. 38).  
 TECHNICAL EDUCATION (Vol. 26, p. 487), an elaborate article, about 40 pages in the form of this Guide, by Sir Philip Magnus, author of *Industrial Education*, member of the Royal Commission on technical instruction (1881-1884) and, in 1907, president of the education section of the British Association.

Of equal importance with this course on the history of education, for the stu-

dent taking the licence-examination or for a teacher taking an examination for a higher grade licence or a principalship, is a course in Psychology in the Britannica. This will be found largely in the great article on PSYCHOLOGY (Vol. 22, p. 547; equivalent in length to 200 pages of this Guide) by James Ward.

The systematic treatment of the subject in this article is particularly valuable to the teacher, whether the object desired is to review the entire subject, sharpening one's impressions from a longer course of reading; to get a general grounding in the subject—for which a careful study of this one article will suffice; or to make one's self more certain of his comprehension of any part of the subject. It is not practicable to give an outline of this article here, but a few of its special topics are listed below:

General analysis of the subject

- Attention
- Theory of presentations
- Sensation
- Perception
- Imagination or Ideation
- Mental Association
- Reminiscence and Expectation
- Experimental Investigations on Memory and Association
- Feeling
- Emotion and Emotional Action
- Intellection
- Self-Consciousness
- Relation of Body and Mind
- Comparative Psychology

Besides the general article with its systematic summary of the subject, the Britannica contains many briefer articles on special topics, so that the teacher will find not only an excellent text-book of the subject in Prof. Ward's article, but also an elaborate dictionary or encyclopaedia of psychological terms or topics. Among the topics treated in this "Dictionary of Psychology" are:

|                      |                 |
|----------------------|-----------------|
| AFFECTION            | INTUITION       |
| APPERCEPTION         | MNEMONICS       |
| ASSOCIATION OF IDEAS | MOTIVE          |
| ATTENTION            | NOÛMENON        |
| CATEGORY             | OBJECT, SUBJECT |
| COGNITION            | PARALLELISM     |
| CONCEPT              | PERCEPTION      |
| CONNOTATION          | PERSONALITY     |
| DEDUCTION            | PHENOMENON      |
| DEFINITION           | PLEASURE        |
| DENOTATION           | PSYCHOPHYSICS   |
| DREAM                | RECEPT          |
| EXTENSION            | RELATIVITY      |
| HEARING              | REMINISCENCE    |
| IDEA                 | RETRO-COGNITION |
| IMAGINATION          | SELF            |
| IMITATION            | SENSATIONALISM  |
| IMMORTALITY          | SMELL           |
| INDIVIDUALISM        | SUGGESTION      |
| INDUCTION            | TASTE           |
| INSTINCT             | TOUCH           |
| INTELLECT            | VISION          |
| INTROSPECTION        | WEBER'S LAW     |
|                      | WILL            |

Furthermore, the teacher will find the Britannica a valuable biographical dictionary. This he will already have realized, if he has looked up the biographical articles mentioned in connection with the history of education. The following is a brief outline course in psychological biography:

|                     |                        |
|---------------------|------------------------|
| Adamson, Robert     | Hucheson, Francis      |
| Aristotle           | James, William         |
| Bain, Alexander     | Kant, Immanuel         |
| Baldwin, James Mark | Ladd, G. T.            |
| Beneke, F. E.       | Lange, F. A.           |
| Berkeley, George    | Leibnitz, G. W.        |
| Clifford, Wm. K.    | Lewes, George Henry    |
| Democritus          | Locke, John            |
| Epicurus            | Lotze, R. H.           |
| Fechner, G. F.      | Mill, James            |
| Geulinx, Arnold     | Mill, J. S.            |
| Hamilton, William   | Müller, Johannes Peter |
| Hartley, David      | Münsterberg, Hugo      |
| Helmholtz, Hermann  | Reid, Thomas           |
| von                 | Ribot, T. A.           |
| Herbart, Johann F.  | Spencer, Herbert       |
| Hobbes, Thomas      | Sully, James           |
| Höfding, Harold     | Ward, James            |
| Hume, David         | Wundt, W. M.           |

## CHAPTER XXIV

### FOR MINISTERS

**T**HE minister or candidate for the ministry will find a valuable course of reading laid out for him in this Guide under the heading *Bible Study*, and it might be said with little exaggeration that *any* systematic course of reading in the Encyclopaedia Britannica should add to the efficiency and power of one who would be an ideal pastor. If the schools of the Middle Ages could truly call all the arts and sciences hand-maids and helpers to Theology, much more truly, in the present age, should the minister, in order that he may minister truly, know not merely the history of the Bible and of the Church, the results of modern criticism, and of comparative religion and folk-lore, but, almost as fully, general history, lit-

erature, philosophy, psychology, education, something of the fine arts, much of law and political science, and still more of social science and economics. In a period of specialization he cannot afford to be a specialist—or, it might be nearer the truth to say that, like every other true specialist, he must make all knowledge, all the circle of the sciences, tributary to his specialty, which is the knowledge and the improvement of the human soul. The

#### The Great Preachers

suggestions that follow must necessarily be fragmentary, and should be considered as including merely a few topics not covered in the chapter on *Bible Study* nor in the other courses which, as has just

been suggested, a minister might profitably pursue.

The article **SERMON** (Vol. 24, p. 673) is by Edmund Gosse, librarian of the House of Lords, biographer of John Donne, Jeremy Taylor and Dr. Thomas Browne. The writer is especially conversant with the English literature of the 17th century, in the middle of which, to quote his article, "the sermon became one of the most highly-cultivated forms of intellectual entertainment in Great Britain, and when the theatres were closed at the Commonwealth it grew to be the only public form of eloquence."

Each name on the following list of great preachers is accompanied by volume and page reference to the biographical sketch in the Britannica, containing criticism of the preacher and a bibliography of his works and of works about him, so that the articles supply the basis for a study of the world's great preachers.

*British.*

- JOHN WYCLIFFE (Vol. 28, p. 868)  
 JOHN FISHER (Vol. 10, p. 427)  
 HUGH LATIMER (Vol. 16, p. 242)  
 JOHN KNOX (Vol. 15, p. 878)  
 RICHARD HOOKER (Vol. 13, p. 672)  
 JOHN DONNE (Vol. 8, p. 417)  
 JOSEPH HALL (Vol. 12, p. 847)  
 JOHN HALES (Vol. 12, p. 834)  
 EDMUND CALAMY (Vol. 4, p. 967)  
 BENJAMIN WHICHCOTE (Vol. 28, p. 587)  
 THOMAS ADAMS (Vol. 1, p. 180)  
 RICHARD BAXTER (Vol. 3, p. 551)  
 THOMAS MANTON (Vol. 17, p. 607)  
 JOHN OWEN (Vol. 20, p. 892)  
 RALPH CUDWORTH (Vol. 7, p. 612)  
 ROBERT LEIGHTON (Vol. 16, p. 898)  
 JEREMY TAYLOR (Vol. 26, p. 469)  
 ISAAC BARROW (Vol. 3, p. 440)  
 ROBERT SOUTH (Vol. 25, p. 463)  
 JOHN TILLOTSON (Vol. 26, p. 976)  
 EDWARD STILLINGFLEET (Vol. 25, p. 921)  
 BENJAMIN HOADLY (Vol. 13, p. 542)  
 JOSEPH BUTLER (Vol. 4, p. 882)  
 THOMAS BOSTON (Vol. 4, p. 289)  
 JOHN WESLEY (Vol. 28, p. 527)  
 GEORGE WHITEFIELD (Vol. 28, p. 603)  
 THOMAS CHALMERS (Vol. 5, p. 809)  
 EDWARD IRVING (Vol. 14, p. 854)

- CHARLES HADDON SPURGEON (Vol. 25, p. 742)  
 EDWARD BOUVERIE PUSEY (Vol. 22, p. 667)  
 JOHN KEBLE (Vol. 15, p. 710)  
 JOHN HENRY NEWMAN (Vol. 19, p. 517)  
 HENRY EDWARD MANNING (Vol. 17, p. 589)  
 JOHN CLIFFORD (Vol. 6, p. 507)  
 GEORGE MÜLLER (Vol. 18, p. 961)  
 FREDERICK TEMPLE (Vol. 26, p. 600)  
 ARCHIBALD CAMPBELL TAIT (Vol. 26, p. 868)  
 BENJAMIN JOWETT (Vol. 15, p. 527)  
 ARTHUR PENRHYN STANLEY (Vol. 25, p. 777)  
 J. F. D. MAURICE (Vol. 17, p. 910)  
 HUGH PRICE HUGHES (Vol. 13, p. 860)  
 ANDREW M. FAIRBAIRN (Vol. 10, p. 129)  
 NORMAN MACLEOD (Vol. 17, p. 262)

*American.*

- COTTON MATHER (Vol. 17, p. 883)  
 INCREASE MATHER (Vol. 17, p. 884)  
 RICHARD MATHER (Vol. 17, p. 885)  
 JONATHAN EDWARDS (Vol. 9, p. 2)  
 JOHN CARROLL (Vol. 5, p. 409)  
 J. L. A. M. L. DE CHEVERUS (Vol. 6, p. 114)  
 S. W. G. BRUTÉ (Vol. 4, p. 695)  
 JOHN WITHERSPOON (Vol. 28, p. 759)  
 JOHN WOOLMAN (Vol. 28, p. 817)  
 SAMUEL SEABURY (Vol. 24, p. 531)  
 FRANCIS ASBURY (Vol. 2, p. 715)  
 PETER CARTWRIGHT (Vol. 5, p. 435)  
 MATTHEW SIMPSON (Vol. 25, p. 185)  
 DEMETRIUS A. GALLITZIN (Vol. 11, p. 421)  
 ALEXANDER CAMPBELL (Vol. 5, p. 127)  
 JOHN WINEBRENNER (Vol. 28, p. 729)  
 WILLIAM A. MUHLENBERG (Vol. 18, p. 957)  
 WILLIAM ELLERY CHANNING (Vol. 5, p. 843)  
 G. W. DOANE (Vol. 8, p. 349)  
 EDWARD PAYSON (Vol. 21, p. 2)  
 ADONIRAM JUDSON (Vol. 15, p. 543)  
 JOHN HUGHES (Vol. 13, p. 860)  
 ARCHIBALD ALEXANDER (Vol. 1, p. 564)  
 MOSES STUART (Vol. 25, p. 1048)  
 NATHANIEL W. TAYLOR (Vol. 26, p. 472)  
 LEONARD BACON (Vol. 3, p. 152)  
 JAMES FREEMAN CLARKE (Vol. 6, p. 444)  
 HENRY WARD BEECHER (Vol. 3, p. 639)  
 HOSEA BALLOU (Vol. 3, p. 282)

HORACE BUSHNELL (Vol. 4, p. 873)  
 PHILLIPS BROOKS (Vol. 4, p. 649)  
 EDWARD EVERETT HALE (Vol. 12, p. 832)  
 R. S. STORRS (Vol. 25, p. 969)  
 CHARLES FORCE DEEMS (Vol. 7, p. 921)  
 EDWARDS AMASA PARK (Vol. 20, p. 825)  
 DAVID SWING (Vol. 26, p. 237)  
 MICHAEL AUGUSTINE CORRIGAN (Vol. 7,  
 p. 197)  
 JAMES GIBBONS (Vol. 11, p. 936)  
 T. DEWITT TALMAGE (Vol. 26, p. 380)  
 ISAAC T. HECKER (Vol. 13, p. 194)  
 ROBERT COLLYER (Vol. 6, p. 694)  
 HENRY C. MCCOOK (Vol. 17, p. 205)  
 JOHN FLETCHER HURST (Vol. 13, p. 960)  
 DWIGHT L. MOODY (Vol. 18, p. 802)  
 WASHINGTON GLADDEN (Vol. 12, p. 63)  
 JOHN IRELAND (Vol. 14, p. 742)  
 JOHN JOSEPH KEANE (Vol. 15, p. 706)  
 MINOT J. SAVAGE (Vol. 24, p. 239)  
 REUBEN ARCHER TORREY (Vol. 27, p. 61)

*French.*

JOHN GERSON (Vol. 11, p. 904)  
 JOHN CALVIN (Vol. 5, p. 71)  
 THEODORE BEZA (Vol. 3, p. 839)  
 ST. FRANCIS OF SALES (Vol. 10, p. 940)  
 J. B. BOSSUET (Vol. 4, p. 287)  
 LOUIS BOURDALOUS (Vol. 4, p. 329)  
 ESPRIT FLÉCHIER (Vol. 10, p. 491)  
 JULES MASCARON (Vol. 17, p. 836)  
 JEAN BAPTISTE MASSILLON (Vol. 17, p.  
 867)  
 JEAN SIFFREIN MAURY (Vol. 17, p. 915)

These lists could easily be made longer and fuller, but the articles mentioned give such a view of the great preachers of the world as cannot fail to stimulate any minister. Supplementing what has been said above about the necessity of the minister's being a well-rounded man, it may be worth while to notice that Donne and Keble and, in a less degree, Doane and Muhlenberg, were poets as well as preachers; that Cudworth was known as the founder of the Cambridge Platonists, and Jowett as the translator of Plato, Barrow as a mathematician, second, in his day, only to Isaac Newton, Edward Everett Hale as an essayist and writer of short stories, and McCook as a great naturalist.

The minister will find the Britannica an

excellent encyclopaedia of comparative religion and of church history, with the newest and most authoritative information on any subject in this field. For a brief outline course in these topics let him read:

The article RELIGION (Vol. 23, p. 61; equivalent to 50 pages of this Guide), by Dr. Joseph Estlin Carpenter, principal of Manchester College, Oxford, and Robert R. Marett, fellow and tutor of Exeter College, Oxford, author of the *Threshold of Religion* and contributor to the Britannica of articles on PRAYER, RITUAL, etc. This article is made up of: a general introduction sketching the history of the study of religions, especially in the last century, and concluding that "the origin of religion can never be determined archaeologically or historically; it must be sought conjecturally through psychology"; a section on primitive religion, which is a remarkable summary of all that is known of this subject; and a section on the higher religions which discusses developments of animism, transition to polytheism, polytheism, the order of nature (a half-way stage to monotheism), monotheism, classification of religions, revelation, ethics and eschatology and bibliography.

Another class of articles comprises ANCESTOR WORSHIP, ANIMAL WORSHIP, ANIMISM, FETISHISM, FOLKLORE, MAGIC, MYTHOLOGY, PRAYER, RITUAL, SACRIFICE, SERPENT-WORSHIP, TOTEMISM and TREE-WORSHIP, written by such authorities as N. W. Thomas, author of *Kinship and Marriage in Australia*, etc., Andrew Lang, Stanley Arthur Cooke and R. R. Marett.

Certain primitive religions are separately treated, as in the article INDIANS, NORTH AMERICAN (Vol. 14, especially pages 471-473), by A. F. Chamberlain, assistant professor of anthropology, Clark University, Worcester; in the article AUSTRALIA (Vol. 2, especially p. 957); in the article HAWAII (Vol. 13, pages 87, 88).

On higher religions there are the following separate articles (among many):

**BABYLONIAN AND ASSYRIAN RELIGION**, by Morris Jastrow of the University of Pennsylvania; and the articles **ANAI**, **ISHTAR**, **EA**, **MARDUK**, **ASSUR** and **GILGAMESH**,—all by the same author and all of particular value as throwing side-lights on Hebrew Religion.

**EGYPT** (Vol. 9, pp. 48–56), by Allan H. Gardiner, editor of the *New* (Berlin) *Hieroglyphic Dictionary*.

**HEBREW RELIGION** (Vol. 13, p. 176; equivalent to 40 pages of this Guide), by Dr. Owen Charles Whitehouse, professor of Hebrew, Cheshunt College, Cambridge; and the articles *Hebrew Literature*, *Jews*, etc.

**BRAHMANISM** (Vol. 4, p. 381) and **HINDUISM** (Vol. 13, p. 501), by Julius Eggeling, Professor of Sanskrit, Edinburgh.

**BUDDHISM**, **BUDDHA** and **LAMAISM**, by T. W. Rhys Davids, author of *Buddhist India*, etc.

**CONFUCIUS**, by James Legge, author of *The Religions of China*.

**SIKHISM**, by Max Macauliffe, whose book *The Sikh Religion* is accepted by the Sikhs as authoritative.

**ZOROASTER**, by Karl Geldner, professor at Marburg, and the article **PARSEES**.

**MAHOMMEDAN RELIGION** (Vol. 17, p. 417; equivalent to 45 pages in this Guide), by G. W. Thatcher, warden of Camden College, Sydney.

**MAHOMET**, by D. S. Margoliouth, Laudian professor of Arabic, Oxford; **MAHOMMEDAN INSTITUTIONS** and **MAHOMMEDAN LAWS**, by D. S. Macdonald, professor of Semitic languages, Hartford Theological Seminary.

**BÁBIISM**, by E. G. Browne, professor of Arabic, Cambridge, and author of *History of the Báb*.

**GREEK RELIGION** (Vol. 12, p. 527), by L. R. Farnell, fellow of Exeter College, Oxford, author of *Cults of the Greek States*; and such articles as **DEMETER**, **HECATE**, **HERA**, **HERMES**, **HESTIA**, **NIKE**, **PHOEBUS**, **THEMIS** and **ZEUS**.

**ROMAN RELIGION** (Vol. 23, p. 577), by Cyril Bailey, fellow of Balliol College, Oxford, and author of *The Religion of Ancient Rome*; and such articles as **ANNA PERENNA**, **ARVAL BROTHERS**, **BONA DEA**, **CONCORDIA**, **FAMA**, **FAUNUS**, **JUNO** and **JUPITER**; and the valuable articles on Eastern cults in Rome, **GREAT MOTHER OF THE GODS**, **ATTIS**, **MITHRAS**, etc., by Professor Grant Showerman of the University of Wisconsin.

**CHRISTIANITY** (Vol. 6, p. 280; equivalent to 35 pages of this Guide), by G. W. Knox, professor of philosophy and history of religion, Union Theological Seminary, New York; **JESUS CHRIST** (Vol. 15, p. 348; equivalent to 35 pages of this Guide), by the Very Rev. Joseph Armitage Robinson, Dean of Westminster; **GOSPEL** (Vol. 12, p. 265), by Rev. V. H. Stanton, Ely professor of divinity, Cambridge; articles on the separate gospels; **PAUL THE APOSTLE** (Vol. 20, p. 938), by the Rev. James Vernon Bartlett, professor of church history, Mansfield College, Oxford.

On **CHURCH HISTORY** there is an excellent key article in volume 6 (p. 331; equivalent to 45 pages of this Guide). It begins with an outline of the work of the great church historians and divides the subject into three parts: *first*, up to 590 B.C.,—this part and the general introduction are by A. C. McGiffert, professor of church history in Union Theological Seminary, New York City; *second*, the Church in the Middle Ages, by Albert Hauck, professor of church history at Leipzig; and *The Modern Church*, by W. Alison Phillips, author of *Modern Europe*. This sketch may be filled in by reference to the following articles (among many):

ABYSSINIAN CHURCH  
ARMENIAN CHURCH  
ROMAN CATHOLIC CHURCH  
PAPACY  
ORTHODOX EASTERN CHURCH  
REFORMATION  
ENGLAND, CHURCH OF  
IRELAND, CHURCH OF



SCOTLAND, CHURCH OF  
 SCOTLAND, EPISCOPAL CHURCH IN  
 LUTHERANS  
 BAPTISTS  
 PRESBYTERIANISM  
 CAMERONIANS  
 CONGREGATIONALISM  
 METHODISM  
 FRIENDS, SOCIETY OF  
 CALVINISTIC METHODISTS  
 DISCIPLES OF CHRIST  
 GERMAN BAPTIST BRETHERN  
 MENNONITES  
 MORAVIAN BRETHERN  
 DOUKHOBORS  
 GERMAN CATHOLICS  
 OLD CATHOLICS  
 UNITED BRETHERN  
 UNITED PRESBYTERIAN CHURCH

A brief course in theology and dogma is contained in the following articles:

THEOLOGY (Vol. 26, p. 772; equivalent to 45 pages in this Guide), by the Rev. Dr. Robert Mackintosh of Lancashire Independent College, Manchester.

ATONEMENT  
 BAPTISM  
 CONFESSION  
 CONFIRMATION  
 CONVERSION

DOGOMATIC THEOLOGY  
 ESCHATOLOGY  
 EUCHARIST  
 EXCOMMUNICATION  
 GRACE  
 IMMACULATE CONCEPTION  
 INFALLIBILITY  
 INSPIRATION  
 PENANCE  
 PREDESTINATION  
 PURGATORY  
 SIN  
 TRANSUBSTANTIATION  
 WORSHIP

#### On Religious Orders:

ABBEY  
 FRIARS  
 MONASTICISM  
 MONK  
 NUN  
 SISTERHOODS

and see also the names of different orders and hundreds of biographical articles on saints and heretics, preachers and theologians.

The following alphabetical list includes only a part of the articles in the Britannica on religious topics; but it will serve to show the value of the book to a clergyman in his own field:

|                    |                        |                        |                        |
|--------------------|------------------------|------------------------|------------------------|
| Abess              | Agnosticism            | Anthropomorphism       | Artemon                |
| Abbey              | Agnus Dei              | Antichrist             | Asaph                  |
| Abbot              | Agrapha                | Antinomians            | Ascension, Feast of    |
| Abbreviators       | Alb                    | Antitype               | Asceticism             |
| Abecedarians       | Albigenses             | Apocalypse, Knights of | Ascitans               |
| Abgar              | Allah                  | Apologetics            | Ash-Wednesday          |
| Ablution           | All Saints             | Apostasy               | Asperges               |
| Abrahamites        | All Souls Day          | Apostle                | Assassins              |
| Absolution         | Allocution             | Apostolic Canons       | Assumption, Feast of   |
| Abstemii           | Almoner                | Apostolic Fathers      | Asterius of Cappadocia |
| Abyssinian Church  | Almuce                 | Apostolical Constitu-  | Atheism                |
| Acephali           | Altar                  | tions                  | Athos, Mount           |
| Acerra             | Ambrosians             | Apostolici             | Atonement              |
| Acoemeti           | Ambrosiaster           | Apotactites            | Attrition              |
| Acolyte            | Amen                   | Apotheosis             | Augsburg, Confession   |
| Adamites           | Amice                  | Aquarii                | of                     |
| Adiaphorists       | Amora                  | Arabici                | Augustinians           |
| Adoptianism        | Ampulla                | Archbishop             | Augustinians Canons    |
| Advent             | Anabaptists            | Archdeacon             | Augustinian Hermits    |
| Adventists, Second | Anathema               | Arches, Court of       | Autocephalous          |
| Advocatus Diaboli  | Angel                  | Archimandrite          | Auto da Fé             |
| Agape              | Angelus                | Archpriest             | Auxentius of Cappa-    |
| Agapemonites       | Anglican Communion     | Aristides, Apology of  | docia                  |
| Agapetae           | Anglo-Israelite Theory | Arius                  | Asan                   |
| Agapetus           | Annates                | Ark                    | Azymites               |
| Agnoetae           | Annunciation           | Armenian Church        | Babilism               |

|                       |                       |                          |                         |
|-----------------------|-----------------------|--------------------------|-------------------------|
| Babylonian Captivity  | Chaplain              | Curia Romana             | Fathers of the Church   |
| Bagimond's Roll       | Chasuble              | Curate                   | Feasts and Festivals    |
| Bairam                | Chiliasm              | Cyprus, Church of        | Febronianism            |
| Bambino, Il           | Chimere               | Dalmatic                 | Ferrara-Florence,       |
| Bangorian Controversy | Chism                 | Davidists                | Council of              |
| Baphomet              | Christ                | Deacon                   | Flagellants             |
| Baptism               | Christadelphians      | Deaconess                | Font                    |
| Baptists              | Christian Catholic    | Dean                     | Franciscans             |
| Basel, Confession of  | Church                | Decretals                | Frankincense            |
| Basel, Council of     | Christian Connection  | Dedication               | Fratricelli             |
| Basilian Monks        | Christian Endeavour   | Deism                    | Free Baptists, or Free- |
| Beatification         | Societies             | Dervish                  | will Baptists           |
| Beguines              | Christianity          | Devil                    | Free Church of Eng-     |
| Benedictines          | Christian Science     | Didache, The             | land                    |
| Benediction           | Christmas             | Diocese                  | Free Church of Scot-    |
| Benedictus            | Church                | Diognetus, Epistle to    | land                    |
| Bethlehemites         | Church Army           | Dionysius Areopagi-      | Free Church Federa-     |
| Bible Christians      | Church Congress       | ticus                    | tion                    |
| Bidding-Prayer        | Church History        | Diptych                  | Friars                  |
| Biretta               | Churching of Women    | Dirge                    | Friends, Society of     |
| Bishop                | Churchwarden          | Disciples of Christ      | Gallicanism             |
| Black Veil            | Ciborium              | Dispensation             | Gaon                    |
| Bogomils              | Cistercians           | Dissenter                | German Baptist Breth-   |
| Bollandists           | Clares, Poor          | Docetae                  | ren, or German          |
| Boy's Brigade         | Clergy                | Dogma                    | Brethren (U. S. A.)     |
| Breviary              | Clerk                 | Dogmatic Theology        | German Catholics        |
| Bridgebuilding        | Clementine Literature | Dominicans               | German Evangelical      |
| Brotherhood           | Cluny                 | Donation of Constan-     | Synod of North          |
| Bridgittines          | Cohen                 | tine                     | America                 |
| Brothers of Common    | Commendation          | Donatists                | Ghazi                   |
| Life                  | Common Order, Book    | Dort, Synod of           | Giaour                  |
| Cadi                  | of                    | Dossal                   | Glasites                |
| Calf, The Golden      | Conclave              | Doukhobors               | Glory                   |
| Calvary               | Concord, Book of      | Doxology                 | Gnosticism              |
| Calvinistic Ministers | Concordat             | Easter                   | Golden Rose             |
| Camaldulians          | Confession            | Ebionites                | Good Friday             |
| Cameronians           | Confessional          | Ecclesiastical Jurisdic- | Grace                   |
| Candlemas             | Confessor             | tion                     | Gradual                 |
| Canon                 | Confirmation          | Ecclesiastical Commis-   | Grandmontines           |
| Canoness              | of Bish-              | sioners                  | Great Awakening         |
| Canon Law             | ops                   | Elder                    | Gustavus Adolphus       |
| Canonization          | Congregation          | Elvira, Synod of         | Union                   |
| Capuchins             | Congregationalism     | Ember Days               | Habdala                 |
| Cardinal              | Consistory            | Encyclical               | Haggada                 |
| Carmathians           | Consistory Courts     | Energia                  | Hagiology               |
| Carmelites            | Constance, Council of | England, Church of       | Hajj                    |
| Carnival              | Constantinople, Coun- | Enthusiasm               | Halakha                 |
| Carthage, Synods of   | cils of               | Ephesus, Council of      | Halfway Covenant        |
| Carthusians           | Consuetudinary        | Ephod                    | Halisah                 |
| Cassock               | Convent               | Epiphany, Feast of       | Hallel                  |
| Catechism             | Conversion            | Episcopacy               | Hanukkah                |
| Catechumen            | Convocation           | Eschatology              | Haptara                 |
| Cathars               | Cope                  | Essenes                  | Harem                   |
| Catholic              | Copts                 | Establishment            | Hebrew Religion         |
| Catholic Apostolic    | Corban                | Eucharist                | Heidelberg Catechism    |
| Church                | Corporal              | Evangelical Alliance     | Helvetic Confessions    |
| Celestines            | Corpus Christi, Feast | Evangelical Association  | Hemerobaptists          |
| Celibacy              | of                    | Evangelical Church       | Heresy                  |
| Cenobites             | Council               | Conference               | Hermas, Shepherd of     |
| Cerdonians            | Cowl                  | Evangelical Union        | Hermeneutics            |
| Chalcedon, Council of | Cowley Fathers        | Exarch                   | Hermit                  |
| Chaldee               | Creatianism and Tra-  | Excommunication          | Hesychasts              |
| Chalice               | ducianism             | Exorcist                 | Hierarchy               |
| Chambre Ardente       | Credece               | Extreme Unction          | Hieronymites            |
| Chant                 | Creeds                | Fakir                    | High Place              |
| Chantry               | Cross and Crucifixion | Faldstool                | Hippolytus, The Can-    |
| Chapel                | Crozier               | Familists                | ons of                  |
| Chapter               | Culdees               | Fasting                  | Holy                    |

|                          |                        |                        |                      |
|--------------------------|------------------------|------------------------|----------------------|
| Holy Water               | Lavabo                 | Monophysites           | Piarists             |
| Holy Week                | Lay                    | Monothelites           | Pietism              |
| Homiletics               | Laymen, Houses of      | Monsignor              | Pilgrim              |
| Homily                   | Lazarites              | Monstrance             | Pilgrimage           |
| Hospice                  | Lazarus, St., Order of | Montanism              | Pirke Aboth          |
| Houri                    | Lecture, Lectionary    | Moravian Brethren      | Pisa, Council of     |
| Hours, Canonical         | Lector                 | Mormons                | Pistoia, Synod of    |
| Housel                   | Legate                 | Morse                  | Plymouth Brethren    |
| Humanitarians            | Lent                   | Mortuary               | Poissy, Colloquy of  |
| Humiliati                | Libellatici            | Mozarab                | Pope                 |
| Hussites                 | Liber Diurnus          | Muckers                | Prayer, Book of Com- |
| Hymns                    | Liber Pontificalis     | Mufti                  | mon                  |
| Hypostasis               | Libertines             | Mysticism              | Prayers for the Dead |
| Iblis                    | Lights, Ceremonial use | Mythology              | Preaching            |
| Icon                     | of                     | Nazarenes              | Prebendary           |
| Iconoclasts              | Limbus                 | Necrology              | Precentor            |
| Ignorantines             | Limina Apostolorum     | Neo-Caesarea, Synod of | Preconization        |
| Illuminati               | Lincoln Judgment, The  | Neophyte               | Predestination       |
| Image                    | Litany                 | Nestorians             | Prelate              |
| Imam                     | Liturgy                | New Jerusalem Church   | Premonstratensians   |
| Imitation of Christ, The | Logia                  | New Year's Day         | Presbyter            |
| Immaculate Conception    | Low Churchman          | Nicaea, Councils of    | Presbyterianism      |
| Immortality              | Low Sunday             | Nîmes, Councils of     | Primate              |
| In Coena Domini          | Lutheran               | Nonconformist          | Primitive Methodist  |
| Incumbent                | Luther League          | Nosairis               | Church               |
| Independents             | Lyons, Councils of     | Novice                 | Prior                |
| Index Librorum Pro-      | Mahdi                  | Nun                    | Procession           |
| hibitorium               | Mahomedan Institu-     | Nuncio                 | Procession Path      |
| Indulgence               | tions                  | Oblation               | Prolocutor           |
| Indult                   | Mahomedan Law          | Oecumenical            | Proselyte            |
| Infallibility            | Mahomedan Religion     | Offertory              | Protestant           |
| Innocents' Day           | Mandaeans              | Official               | Protestant Episcopal |
| Inquisition, The         | Manichaeism            | Old Catholics          | Church               |
| Inspiration              | Maniple                | Olivetans              | Protestantenverein   |
| Installation             | Manse                  | Ophites                | Provision            |
| Institutional Church     | Marabout               | Oratory                | Purgatory            |
| Interim                  | Marburg, Colloquy of   | Oratory of St. Philip  | Purim                |
| Interdict                | Marcion and the Mar-   | Neri, Congregation     | Puritanism           |
| Investiture              | cionite Church         | of the                 | Qaraites             |
| Ireland, Church of       | Maronites              | Order, Holy            | Quakers              |
| Islam                    | Marprelate Controversy | Orphrey                | Quietism             |
| Jacobite Church          | Martyr                 | Orthodox Eastern       | Rabbi                |
| Jansenism                | Martyrology            | Church                 | Ramadan              |
| Jehovah                  | Matins                 | Pallium or Pall        | Ranters              |
| Jerahmeel                | Maundy Thursday        | Palm Sunday            | Rawendis             |
| Jerusalem, Synod of      | Maurists               | Pantheism              | Rector               |
| Jesuati                  | Mechitharists          | Party Royal            | Recusant             |
| Jesuits                  | Melchites              | Passion Week           | Reformed Churches    |
| Jesus Christ             | Mendicant Movement     | Pastoral Letter        | Reformed Church in   |
| Jews                     | and Orders             | Pastoral Staff         | America (Dutch)      |
| Jihad                    | Mennonites             | Patarenes              | Reformed Church in   |
| Jubilee, Year            | Messiah                | Paten                  | U. S. A. (German)    |
| Jubilee, Year of         | Methodism              | Patriarch              | Reformed Episcopal   |
| Ka'ba                    | Methodist New Con-     | Patron                 | Church               |
| Kabbalah                 | nexion                 | Paulicians             | Regium Donum         |
| Kermesse                 | Metropolitan           | Pax                    | Regular              |
| Keswick Convention       | Midrash                | Pectoral               | Relics               |
| Kismet                   | Millennium             | Peculiar               | Religion             |
| Koran                    | Minister               | Peculiar People        | Remonstrants         |
| Koreshan Ecclesia, The   | Miracle                | Pelagius               | Requiem              |
| Kosher or Kasher         | Miserere               | Penance                | Reredos              |
| Kyrie                    | Missal                 | Penitential            | Retable              |
| Labour Church, The       | Missions               | Penitentiary           | Reverend             |
| Lamb                     | Mitre                  | Pentecost              | Ritual               |
| Lambeth Conferences      | Moderator              | Peter's Pence          | River Brethren       |
| Laodicea, Synod of       | Monarchianism          | Pew                    | Robber, Synod        |
| Lateran Councils         | Monasticism            | Philadelphians         | Rochet               |
| Laud                     | Monk                   | Phylactery             | Rogation Days        |

|                        |                       |                     |                       |
|------------------------|-----------------------|---------------------|-----------------------|
| Roman Catholic Church  | Shiites               | Tanna               | United Free Church of |
| Rood                   | Shrine                | Targum              | Scotland              |
| Rosary                 | Shrove Tuesday        | Templars            | United Methodist      |
| Rota, Court of         | Silvestrines          | Tenebræ             | Church                |
| Rubric                 | Sin                   | Tertiaries          | United Methodist Free |
| Rum                    | Sion College          | Testamentum Domini  | Churches              |
| Sabbation              | Sisterhoods           | Tetragrammaton      | United Presbyterian   |
| Sabians                | Skoptsi               | Teutonic Order      | Church                |
| Sacerdotalism          | Soutane               | Theism              | Universalist Church   |
| Sacrament              | Spanish Reformed      | Theocracy           | Ursulines             |
| Sacramentals           | Church                | Theology            | Vallombrosians        |
| Sacramentarians        | Sponsor               | Theosophy           | Vatican, Council of   |
| Sacrarium              | Stations of the Cross | Therapeutæ          | Venerable             |
| Sacred Heart           | Stigmatization        | Thurible            | Verger                |
| Saint John of Jeru-    | Stole                 | Tiara               | Vespers               |
| salem                  | Suffragan             | Tithes              | Vestments             |
| Salvation Army         | Sufism                | Toledo, Councils of | Viaticum              |
| Saragossa, Councils of | Sunnites              | Tonsure             | Vicar                 |
| Sardica, Council of    | Supererogation        | Transubstantiation  | Vienne, Council of    |
| Schism                 | Superintendent        | Trappists           | Vigil                 |
| Scillitan Martyrs      | Surplice              | Trent, Council of   | Wahhabis              |
| Scotland, Church of    | Syllabus              | Trinitarians        | Waldenses             |
| Scotland, Episcopal    | Symbol                | Trinity Sunday      | Wesleyan Methodist    |
| Church in              | Synagogue             | Tunicle             | Church                |
| Sect                   | Synagogue, United     | Ulema               | Westminster Synods    |
| Secular                | Synazarium            | Ultramontanism      | Whitsunday, or Pente- |
| See                    | Syncellus             | Uction              | cost                  |
| Sepulchre, Canons Reg- | Synedrium             | Unitarianism        | Worship               |
| ular of the Holy       | Synod                 | United Brethren in  | Yezidis               |
| Servites               | Talmud                | Christ              | Young Men's Christian |
| Sexton                 |                       |                     | Association           |
| Shakers                |                       |                     | Zenana                |

## CHAPTER XXV

### FOR PHYSICIANS, SURGEONS AND DENTISTS

THE Britannica adds so largely to medical literature that, in outlining the services which the work can render to those engaged in the prevention and treatment of disease, it is desirable to define the limits, rather than to insist upon the extent, of the plan adopted by the technical assistant editors to whom the Editor-in-chief entrusted the control of this important part of the undertaking. It is true that the 644 medical articles, many of which might be described as books in themselves, cover the whole field of anatomy, physiology, pathology, therapeutics, surgery, pharmacology, medical education, medical jurisprudence and medical biography.

It is also true that the writers who sign these articles are specialists of world-wide authority, and that the total number of words and illustrations in these articles is as great as would be required for a complete encyclopædic handbook of medical science. But, notwithstanding all this wealth of matter and of international collaboration, the Britannica does not profess to take the place of the elementary working library in daily use by every professional man. "Working library" is, however, an elastic term, and it is used here to mean only the handbooks which constitute an irreducible minimum, the few without which no beginner would venture to establish

himself in practice. Certain manuals are, to the practitioner, what mathematical tables are to the engineer; and it is not the function of the Britannica to duplicate what the practitioner already possesses, nor yet, for example, to include a pharmacopoeia in a book used by the general public.

On the other hand, no professional man restricts himself a day longer than he must to the bare modicum of medical

**The Encyclopaedic Method**

literature with which he may have been forced, at first, to do his best; and when he can add *anything* to it, there is nothing he will use so often, or find so helpful, as the Britannica. It may be well to define in general, its professional uses, before dealing in detail with the articles included in this course of reading.

(1) The system of technical collaboration is, in the Britannica, organized and coördinated with a completeness which gives the medical articles an authority and impartiality often lacking in isolated treatises. The contributors were selected with a view to their recognized ability only, whereas the publication of medical works is too often an outcome of the writer's ambitions, which, however legitimate they may be, are no proof of his capacity.

(2) The Britannica articles were written for the sole purpose of being used in their present form. A great part of current medical literature originates in lectures to students, and retains too much of its first form to be satisfactory to the professional man.

(3) The articles are all based upon an original and recent survey of knowledge, and thus contain information which cannot be found in reprints of standard medical works insufficiently brought up to date by additions to earlier editions.

(4) In relation to statistics, to administrative and legislative provisions regarding public health, to hospitals and

other public institutions, the broadly international character of the Britannica, with its contributions from twenty different countries, gives a scope which the private writer cannot attain.

(5) The great number of biographies of physicians, surgeons and men who devote themselves exclusively to research, gives professional men access to information which they cannot elsewhere obtain.

(6) Chemistry, bacteriology, general biology, botany, psychology and other sciences allied to the more immediate field of medicine are fully treated by specialists of the highest authority.

(7) Apart from the definite occupational diseases (fully discussed in the Britannica), there is often a relation between the pathological results of overwork and the routine of the patient's business life. Every branch of industry and commerce is treated in detail in the Britannica, and the insight which the physician may thus gain will often be of service to him.

(8) The Britannica not only enlarges the medical library of the practitioner, but gives him, and the members of his family, the use of *the only complete library of general information*.

Specifically, the medical and surgical section of the Britannica comprises 3 general articles, constituting broad systematic surveys of the various provinces of the subject: 103 articles on anatomy and physiology, which are partly surgical; 265

**Scope of the Medical Section** articles on pathology; 75 on pharmacology; 21 on public health, in addition to the articles on dentistry and on veterinary science, and 170 biographies. But this comprehensive scheme does not by any means include all the material of value to the medical man. The sister sciences of chemistry, physics, biology, botany, zoology and psychology, have much to offer him. A consultation of the list appended



to this section will show how the needs of the physician and surgeon are served by the Encyclopaedia. It must suffice here to call attention briefly to some of the more important contributions.

Taking up, first, the more general articles, there is **MEDICINE** (Vol. 18, p. 41) containing about 35,000 words. This deals with the history and development of the science. Dr. J. F. Payne of the Royal College of Physicians, London, traces its history from the earliest known times to the middle of the 19th century; and Sir T. C. Allbutt, professor of physic in Cambridge University, completes this review with a section on *Modern Progress* (p. 55). Of high practical value is **MEDICAL JURISPRUDENCE OR FORENSIC MEDICINE** (Vol. 16, p. 25), by H. H. Littlejohn, professor of forensic medicine, University of Edinburgh, and T. A. Ingram. This deals solely with that branch of the science which has to do with the application of medical knowledge to certain questions of civil and criminal law. There are discussions of questions affecting the civil or social rights of individuals, and injuries to the person, the function of the physician in questions of mutilation, homicide, infanticide, poisoning, etc. **MEDICAL EDUCATION** (Vol. 18, p. 23) is a useful reference article by Sir John Batty Tuke, Dr. W. H. Howell, dean of the medical faculty, Johns Hopkins University, and Dr. H. L. Hennessy, furnishing data on the educational qualifications necessary to the practice of medicine in Europe and America.

Dr. Frederick G. Parsons, vice-president of the Anatomical Society of Great

**Anatomy,**  
**Embryology,**  
**and Physiology**

Britain and Ireland, lecturer on Anatomy at St. Thomas's Hospital, London, contributes the general article **ANATOMY** (Vol. 1, p. 920) which goes deeply into its history, and has further sections on *Modern Human Anatomy* (Anthropotomy) and *Anatomy, Superficial and Artistic* This

noted authority also writes detailed and fully illustrated articles on the anatomy and embryology of the **BRAIN** (Vol. 4, p. 392); **HEART** (Vol. 13, p. 129); **EYE** (Vol. 10, p. 91); **EAR** (Vol. 8, 791); **OLFACTORY SYSTEM** (Vol. 20, p. 77); **LYMPHATIC SYSTEM** (Vol. 17, p. 166); **VASCULAR SYSTEM** (Vol. 27, p. 926); **NERVOUS SYSTEM** (Vol. 19, p. 400); **MUSCULAR SYSTEM** (Vol. 19, p. 51); **REPRODUCTIVE SYSTEM** (Vol. 23, p. 129); and **RESPIRATORY SYSTEM** (Vol. 23, p. 184) and on the **SKELETON** (Vol. 25, p. 169); **SKIN AND EXOSKELETON** (Vol. 25, p. 188); **SKULL** (Vol. 25, p. 196); **JOINTS** (Vol. 15, p. 483); and **NERVE** (Vol. 19, p. 394). Another valuable anatomical article is **CONNECTIVE TISSUES** (Vol. 6, p. 958), by Dr. T. G. Brodie of the University of Toronto. Prof. Adam Sedgwick writes a most excellent general and historical account of **EMBRYOLOGY** (Vol. 9, p. 314); and Dr. Hans A. E. Driesch of Heidelberg University adds to it a section *Physiology of Development* (p. 329), treating of the laws that govern the development of the organism. The general article **PHYSIOLOGY** (Vol. 21, p. 554) is from the pen of the celebrated Prof. Max Verworn of the University of Bonn, and to this there are closely linked, according to the new plan of the Britannica, extensive and detailed accounts of the physiology of the **BRAIN** (Vol. 4, p. 403); **SYMPATHETIC SYSTEM** (Vol. 26, p. 287); **SPINAL CORD** (Vol. 25, p. 672); **MUSCLE AND NERVE** (Vol. 19, p. 44); **RESPIRATORY SYSTEM** (Vol. 23, p. 187); **VASCULAR SYSTEM** (Vol. 27, p. 929); **ALIMENTARY CANAL** (Vol. 1, p. 663); **BLOOD** (Vol. 4, p. 77), etc., by noted specialists, including Dr. Charles S. Sherrington, professor of physiology in the University of Liverpool, Dr. J. S. Haldane of Oxford University, Dr. L. E. Hill, lecturer on physiology at the London Hospital, Dr. P. Chalmers Mitchell, and Dr. T. G. Brodie of the University of Toronto.

Drs. D. J. Hamilton and Richard Muir

are the authors of a brilliant summary of the whole subject of **PATHOLOGY** (Vol. 20, p. 913) with over 50

### Articles on Pathology

illustrations, including coloured plates. The whole story of the elevation of the science dealing with the theory and causation of disease from a mere philosophical abstraction to one of the natural sciences is admirably told. For the pathological details of various diseases and groups of diseases the reader is referred to **PARASITIC DISEASES** (Vol. 20, p. 770), fully illustrated, by Dr. G. Sims Woodhead, professor of pathology, Cambridge University, one of the notable contributions to the *Britannica*; **METABOLIC DISEASES** (Vol. 18, p. 195), by Prof. D. N. Paton of Edinburgh University; **DIGESTIVE ORGANS, Pathology** (Vol. 8, p. 262) by Dr. A. L. Gillespie of Edinburgh and M. Fisher; **KIDNEY DISEASES** (Vol. 15, p. 784), by Dr. J. R. Bradford of University College Hospital, London, and Dr. Edmund Owen, the famous English surgeon; **BLADDER AND PROSTATE DISEASES** (Vol. 4, p. 27); **VENEREAL DISEASES** (Vol. 27, p. 983)—these two also by Dr. Owen; **SKIN DISEASES** (Vol. 25, p. 190); **INSANITY** (Vol. 14, p. 597), by Sir John Batty Tuke, president of the Neurological Society of the United Kingdom, and medical director of the New Staughton Hall Asylum, Edinburgh, Dr. J. Macpherson, and Dr. L. C. Bruce, author of *Studies in Clinical Psychiatry*,—for this article the noted American specialist Dr. Frederick Peterson has written a section on *Hospital Treatment* of the insane; **NEUROPATHOLOGY** (Vol. 19, p. 429), fully illustrated, by Dr. F. W. Mott, the distinguished pathologist to the London County Asylums, and editor of the *Archives of Neurology*; **RESPIRATORY SYSTEM, Pathology** (Vol. 23, p. 195), by Dr. Thomas Harris, author of numerous articles on this subject, and Dr. H. L. Hennessy; **BLOOD, Pathology** (Vol. 4, p. 82), by Dr. G. L. Gulland of Edinburgh; **HEART,**

**Disease** (Vol. 13, p. 132), by Sir J. F. H. Broadbent, author of *Heart Disease and Aneurysm*, etc.; **EYE, Diseases** (Vol. 10, p. 94), by Dr. George A. Berry, hon. surgeon oculist to his Majesty George V; **VISION, Errors of Refraction and Accommodation** (Vol. 28, p. 142), by Dr. Ernest Clark of the Central London Ophthalmic Hospital; **EAR, Diseases of** (Vol. 8, p. 794), by Dr. E. C. Baber, late senior surgeon, Brighton and Sussex Throat and Ear Hospital.

Dr. Harriet L. Hennessy is the author of **GYNAECOLOGY** (Vol. 12, p. 764).

For more specific details there is the complete list of articles on different diseases and ailments under their common names. This includes veterinary diseases, to which branch of medicine an admirable introduction is furnished by **VETERINARY SCIENCE** (Vol. 28, p. 2), by Drs. George Fleming and James MacQueen. In the articles on diseases there will be found accounts of the latest methods of diagnosis and treatment, as, for example, the Calmette eye-test in tubercular diseases, serum treatment and its latest developments, vaccine therapy, etc.

The general article **THERAPEUTICS** (Vol. 26, p. 793), by Dr. Sir Lauder Brunton, consulting physician to St.

**Therapeutics** Bartholomew's Hospital, London, author of *Modern Therapeutics*, etc., not only discusses both rational and empirical therapeutics, but, taking up the different parts of the body considers in detail the therapeutic measures most commonly employed in the treatment of disease. The subjects of **ELECTROTHERAPEUTICS** (Vol. 9, p. 249); **BATHS** (Vol. 3, p. 514); **BALNEOTHERAPEUTICS** (Vol. 3, p. 284); **HYDROPATHY** (Vol. 14, p. 165); **AEROTHERAPEUTICS** (Vol. 1, p. 270); **MASSAGE** (Vol. 17, p. 863) and **X-RAY TREATMENT** (Vol. 28, p. 887) have separate articles devoted to them. The last is by Dr. H. L. Jones, clinical lecturer on medical elec-

tricity at St. Bartholomew's Hospital, London.

In connection with the subject of therapeutics, mention must be made of PHARMACOLOGY (Vol. 21, p. 347), by Professor Stockman of the University of Glasgow, in which will be found an interesting history of drugs, and a classification into 28 groups with a description of the effect of each remedy. To this valuable material Dr. H. L. Hennesy has added a section, *Terminology in Therapeutics* (p. 352)—a general explanation of the common names used in the classification of drugs. The list at the end of this chapter indicates the separate articles on drugs and on materials from which the principal drugs are obtained.

Dr. Charles Creighton of King's College, Cambridge, writes on the history of SURGERY (Vol. 26, p. 125) and the famous English Surgeon, **Surgery** Dr. Edmund Owen the section *Modern Practice of Surgery* (p. 129) in which are discussed antiseptic and aseptic surgery, drainage tubes, bloodless operations, Röntgen rays, use of radium, etc. The article SURGICAL INSTRUMENTS AND APPLIANCES (Vol. 26, p. 132) is fully illustrated. Dr. Owen also contributes articles on the surgery of the different organs, the article BONE, *Diseases and Injuries* (Vol. 4, p. 200) and many accounts of diseases and disorders that come within the province of the surgeon, such as APPENDICITIS (Vol. 2, p. 217); PERITONITIS (Vol. 21, p. 171); HERNIA (Vol. 13, p. 372); FISTULA (Vol. 10, p. 438); VARICOSE VEINS (Vol. 27, p. 920), and HAEMORRHOIDS (Vol. 12, p. 805). Sir Alexander R. Simpson, emeritus professor of midwifery and the diseases of women and children, University of Edinburgh, writes on OBSTETRICS (Vol. 19, p. 962); Dr. Louis Courtauld, formerly research scholar, Middlesex Hospital Cancer Laboratories, on TUMOUR (Vol. 27, p. 370); Dr. Arthur Shadwell,

of the Epidemiological Society, on CANCER, with a special account of cancer research; and H. C. Crouch, teacher of anaesthetics at St. Thomas's Hospital, London, on ANAESTHESIA AND ANAESTHETICS (Vol. 1, p. 907).

A most interesting, unusual and instructive course of reading on the history and development of medicine may

### Medical Biographies

be based on the biographical articles alone. In AESCULAPIUS (Vol. 1, p. 276) we learn how the gods of Greece effected cures. The life story of HIPPOCRATES (Vol. 13, p. 518) is worthy of note, for the "medical art as we now practice it, the character of the physician as we now understand it," both date from him. For information about the theory that disease originated from an irregular or inharmonious motion of the body corpuscles we turn to ASCLEPIADES (Vol. 2, p. 722). An account of the man "out of whom the greater part of medicine has flowed" is found in GALEN (Vol. 11, p. 398). The biography of the great Arab physician and philosopher AVICENNA (Vol. 3, p. 62) should not be overlooked, nor the story of the revolt of PARACELUS (Vol. 20, p. 749). Important and interesting, too, are the biographies of HARVEY, WILLIAM (Vol. 13, p. 42); SYDENHAM, THOMAS (Vol. 26, p. 277), the father of English medicine, and HALLER, A. VON (Vol. 12, p. 855), whose work marks the beginning of modern physiology. The work of MORGAGNI (Vol. 18, p. 831) in pathological anatomy marks an epoch in medicine, and the description in CULLEN, WILLIAM (Vol. 7, p. 616) of his new doctrine of "irritability" possesses a distinct interest. The accounts of JENNER, EDWARD (Vol. 15, p. 319), HUNTER, JOHN (Vol. 13, p. 939) and HAHNEMANN, S.C.F. (Vol. 12, p. 819) describe momentous events in the history of medicine at the close of the 18th century, while among the great names of the 19th will be found the

chemist PASTEUR (Vol. 20, p. 892), KOCH, ROBERT (Vol. 15, p. 885), LISTER (Vol. 16, p. 777) and VIRCHOW, RUDOLF (Vol. 28, p. 110).

It has already been noted that the Britannica will prove an invaluable help to medical specialists in fields of knowl-

### The Allied Sciences

edge other than their own. The regret is often expressed by physicians that it is not easy for them to study subjects outside their profession, even when these are closely connected with their work. It is, unfortunately, only too true, that material for such study is not readily available. But with so complete a work of reference at his disposal, and with its highly authentic information skillfully compressed into reasonable space, the medical man now enjoys a magnificent opportunity to obtain a full acquaintance with many subjects that he knows will assist him in the work.

It would be impossible to name all the articles here, but the alphabetical list at the end of this chapter includes them, and the attention of the physician and surgeon is directed to BACTERIOLOGY (Vol. 3, p. 156), by the late Prof. H. M. Ward of Cambridge and Prof. V. H. Blackman of the University of Leeds, and especially the section *Pathological Importance* (p. 171), which Prof. Robert Muir of Glasgow University has written; BIOLOGY (Vol. 3, p. 954), a classic article by the late Professor Huxley, revised and brought up-to-date by Dr. P. Chalmers Mitchell; HEREDITY (Vol. 13, p. 350), also by Dr. Mitchell; MENDELISM (Vol. 18, p. 115), a brilliant study of the foundations of an exact knowledge of the physiological process of heredity, by Prof. R. C. Punnett of Cambridge; EVOLUTION (Vol. 10, p. 22) and LONGEVITY (Vol. 16, p. 974), both by Dr. Mitchell;

NUTRITION (Vol. 19, p. 921), by Prof. D. N. Paton and Dr. E. P. Cathcart of Glasgow University; DIETETICS (Vol. 8, p. 214), by the world-famous authority on this subject, the late Prof. W. O. Atwater, and R. D. Milner, formerly of the U. S. Dept. of Agriculture; VEGETARIANISM (Vol. 27, p. 967), by Dr. Josiah Oldfield, senior physician to the Lady Margaret Fruitarian Hospital, Bromley; CLIMATE in the *Treatment of Disease* (Vol. 6, p. 526); ACCLIMATIZATION (Vol. 1, p. 114), by the renowned scientist, Dr. A. Russel Wallace; a very complete and up-to-date article on VIVISECTION (Vol. 28, p. 153), by Dr. Stephen Paget; PSYCHOLOGY (Vol. 22, p. 547), by Prof. James Ward of Cambridge; PSYCHICAL RESEARCH (Vol. 22, p. 544), by Andrew Lang, which is the key to a series of 25 remarkably interesting articles covering the entire subject; HYPNOTISM (Vol. 14, p. 201); FAITH HEALING (Vol. 10, p. 135); SUGGESTION (Vol. 26, p. 48); PHRENOLOGY (Vol. 21, p. 534), by Professor Macalister of Cambridge; TEMPERANCE (Vol. 26, p. 578), by Dr. Arthur Shadwell; MICROSCOPE (Vol. 18, p. 392); BLINDNESS, *Causes and Prevention* (Vol. 4, p. 60), by Sir Francis J. Cambell, principal Royal Normal College for the Blind, London; DEAF AND DUMB (Vol. 7, p. 880), by Rev. A. H. Payne, formerly of the National Deaf Mute College, Washington.

The subject of DENTISTRY (Vol. 8, p. 50) is covered by the highest American authority, Dr. Edward C. Kirk, of the University of Pennsylvania, and a full account of the anatomy of the teeth will be found under TEETH (Vol. 26, p. 499), by Dr. F. G. Parsons. It is, however, in connection with bacteriology, chemistry, metallurgy, mechanics and other subjects with which the dentist is concerned, rather than in connection with the technics of his profession, that he will desire to make use of the Britannica.



ALPHABETICAL LIST OF ARTICLES IN THE ENCYCLOPAEDIA BRITANNICA OF  
SPECIAL INTEREST AND IMPORTANCE TO MEMBERS OF THE  
MEDICAL PROFESSION

|                        |                          |                        |                        |
|------------------------|--------------------------|------------------------|------------------------|
| Abano, Pietro d'       | Ankylosis                | Bernard, Claude        | Catabolism             |
| Abattoir               | Ankylostomiasis          | Bert, P.               | Catalepsy              |
| Abdomen                | Anodyne                  | Bhang                  | Catarrh                |
| Abercrombie, J.        | Anthrax                  | Bibirine               | Catechu                |
| Abercromby, D.         | Antipyrene               | Bichat, M. F. X.       | Caul                   |
| Abercromby, P.         | Antiseptics              | Bilharziosis           | Caustic                |
| Abernethy, J.          | Aphasia                  | Billroth, A. C. T.     | Cephalic Index         |
| Abortion               | Aphemia                  | Biology                | Chadwick, Sir Edwin    |
| Abscess                | Apnoea                   | Bismuth                | Chamomile              |
| Abscission             | Aponeurosis              | Blackwater Fever       | Charcot, Jean Martin   |
| Abu-l-qasim            | Apophysis                | Bladder                | Charity and Charities  |
| Acclimatization        | Apoplexy                 | Bladder and Prostrate  | Chemistry              |
| Acetic Acid            | Apothecary               | Diseases               | Cheselden, William     |
| Ackermann, J. C. G.    | Appendicitis             | Blane, Sir Gilbert     | Chicken-pox            |
| Acland, Sir H. W.      | Apyrexia                 | Blindness              | Chilblains             |
| Acne                   | Araroba Powder           | Blister                | Chirurgeon             |
| Aconite                | Aretaeus                 | Blood                  | Chloral                |
| Acromegaly             | Arm                      | Blood-letting          | Chlorates              |
| Acron                  | Arnica                   | Boerhaave, Hermann     | Chloroform             |
| Actinomycosis          | Arnott, Neil             | Boil                   | Cholera                |
| Acupressure            | Arrowroot                | Bone                   | Christison, Sir Robert |
| Acupuncture            | Arsenic                  | Borax                  | Cinchona               |
| Adam's Apple           | Arteries                 | Borelli, G. A.         | Clark, Sir Andrew      |
| Addison's Disease      | Arthritis                | Boric, or Boracic Acid | Clark, Sir James       |
| Adenoids               | Articulation             | Bow-leg                | Clay, Charles          |
| Adolescence            | Arytenoid                | Boyer, Alexis          | Cleft Palate and Hare- |
| Adulteration           | Asafetida                | Brain                  | Lip                    |
| Aegineta, Paulus       | Ascites                  | Brasdor, Pierre        | Climacteric            |
| Aerotherapeutics       | Asclepiades              | Breast                 | Climate                |
| Aesculapius            | Aselli, or Asselio, Gas- | Bright's Disease       | Clinic                 |
| Aetius                 | par                      | Brocklesby, Richard    | Clot, A. B.            |
| Agnew, David Hayes     | Asphyxia                 | Brodie, Sir B. C.      | Club-foot              |
| Ague                   | Asthma                   | Bromine                | Coal-tar               |
| Ala                    | Astruc, Jean             | Bronchiectasis         | Coca, or Cuca          |
| Albumin, or Albumen    | Athetosis                | Bronchitis             | Cocaine                |
| Albuminuria            | Athletic Sports          | Bronchotomy            | Cock, Edward           |
| Alcohol                | Atrophy                  | Broussais, F. J. V.    | Cod-Liver Oil          |
| Aldehydes              | Aurelianus Caelius       | Brown, John            | Coelom and Serous      |
| Alexander of Tralles   | Auscultation             | Brown-Séguard, C. E.   | Membranes              |
| Alienist               | Autopsy                  | Bunion                 | Colchicum              |
| Alimentary Canal       | Avenzoar                 | Burdon-Sanderson, Sir  | Colic                  |
| Aloe                   | Baby-farming             | John S.                | Collodion              |
| Alum                   | Bacteriology             | Burns and Scalds       | Colon                  |
| Amaurosis              | Baldinger, E. G.         | Busk, George           | Colt's Foot            |
| Ambulance              | Baldness                 | Cabanis, P. J. G.      | Coma                   |
| Amman, J. C.           | Balneotherapeutics       | Caesarean Section      | Combe, Andrew          |
| Amman, Paul            | Balsam                   | Caffeine               | Connective Tissues     |
| Ammonia                | Barthez, P. J.           | Caisson Disease        | Connor, Bernard        |
| Amuck, Running         | Bartholinus, Gaspard     | Cajuput Oil            | Conolly, John          |
| Amyl Nitrite           | Baths                    | Calabar Bean           | Constipation           |
| Anabolism              | Beddoes, Thomas          | Caldani, L. M. A.      | Convulsions            |
| Anaemia                | Bedlam, or Bethelam      | Calomel                | Cooper, Sir Astley P.  |
| Anaesthesia and An-    | Hospital                 | Camphors               | Copaiba                |
| aesthetics             | Bedsore                  | Cancer, or Carcinoma   | Corn                   |
| Anatomy                | Bell, Sir Charles        | Cantharides            | Cornaro, Luigi         |
| Anderson, Elizabeth G. | Bell, John               | Capsicum               | Coroner                |
| Anel, Dominique        | Belladonna               | Carbolic Acid, or      | Corpulence             |
| Aneurysm, or Aneur-    | Bellini, Lorenzo         | Phenol                 | Corrosive Sublimate    |
| ism                    | Bence-Jones, Henry       | Carbonic Acid          | Cranioscopy            |
| Angina Pectoris        | Bennett, John Hughes     | Carbuncle              | Cramp                  |
| Animal Heat            | Benzoic Acid             | Cartilage              | Crèche                 |
| Anise                  | Benzoin                  | Carus, K. G.           | Cremation              |
| Ankle                  | Beri-Beri                | Castor Oil             | Creosote               |



|                         |                         |                         |                          |
|-------------------------|-------------------------|-------------------------|--------------------------|
| Cretinism               | Ether                   | Goodsir, John           | Illegitimacy             |
| Croton Oil              | Ethyl Chloride          | Gout                    | Imbecile                 |
| Croup                   | Ettmüller, Michael      | Gräfe, Albrecht von     | Incubation and Incu-     |
| Cruveilhier, Jean       | Eucalyptus              | Gräfe, K. F. von        | bators                   |
| Cubeba                  | Eugenics                | Graham, Sylvester       | Infancy                  |
| Cullen, William         | Eugenol                 | Guaco, Huaco, or Guao   | Influenza                |
| Cupping                 | Euphorbium              | Guaiacum                | Insanity                 |
| Curling, T. B.          | Evolution               | Guarana                 | Insomnia                 |
| Dandelion               | Excretion               | Guinea-worm             | Intestinal Obstruction   |
| Death                   | Extract                 | Gull, Sir William W.    | Intestine                |
| Delirium                | Eye                     | Gymnastics              | Intoxication             |
| Dengue                  | Fabricius, Hieronymus   | Gynaecology             | Iodine                   |
| Dentistry               | Face                    | Haematocele             | Iodoform                 |
| Desault, P. J.          | Faith Healing           | Haemophilia             | Ipecacuanha              |
| Dextrine                | Fallopian, or Fallopio, | Haemorrhage             | Iron                     |
| Diabetes                | Gabriello               | Haemorrhoids            | Israeli, Isaac ben Solo- |
| Diaphoretics            | Fusel Oil               | Hahnemann, S. C. F.     | mon                      |
| Diaphragm               | Fauces                  | Hall, Marshall          | Jaborandi                |
| Diarrhoea               | Favus                   | Haller, Albrecht von    | Jalap                    |
| Dietary                 | Fayrer, Sir Joseph      | Hallucination           | Jaundice                 |
| Dietetics               | Fergusson, Sir William  | Hammer-toe              | Jaw                      |
| Digestive Organs        | Fermentation            | Hand                    | Jenner, Edward           |
| Digitalis               | Fernel, Jean François   | Hart, Ernest Abraham    | Jenner, Sir William      |
| Dilatation              | Feuchtersleben, E. von  | Hartshorn, Spirits of   | Joints                   |
| Dill                    | Fever                   | Harvey, William         | Kala-Azar                |
| Diphtheria              | Fibrin                  | Hashish                 | Kámalá                   |
| Dipsomania              | Filariasis              | Hawkins, Caesar Henry   | Kidney Diseases          |
| Disinfectants           | Finger                  | Hay Fever               | Kino                     |
| Diuretics               | Fistula                 | Head                    | Kitazato, Shibasaburo    |
| Dropsy                  | Flint, Austln           | Health                  | Knee                     |
| Drowning and Life       | Floyer, Sir John        | Heart                   | Koch, Robert             |
| Saving                  | Food                    | Heberden, William       | Kouso                    |
| Drug                    | Foot                    | Heel                    | Lactic Acid              |
| Drunkenness             | Foot-and-mouth Dis-     | Henle, F. G. J.         | Langenbeck, B. R. K.     |
| DuBois-Reymond, Emil    | ease                    | Hernia                  | von                      |
| Duchenne, G. B. A.      | Forbes, Sir John        | Herpes                  | Lanolin                  |
| Ductless Glands         | Formalin, or Formalde-  | Hewett, Sir Prescott G. | Largus, Scribonius       |
| Dupuytren, G., baron    | hyde                    | Hilton, John            | Laryngitis               |
| Dwarf                   | Formic Acid             | Hinton, James           | Laudanum                 |
| Dysentery               | Forster, John C.        | Hip                     | Lead Poisoning           |
| Dyspepsia               | Foster, Sir Michael     | Hippocrates             | Leg                      |
| Ear                     | Fothergill, John        | Hippuric Acid           | Leontiasis Ossea         |
| Eczema                  | Foundling Hospitals     | Hoffmann, Friedrich     | Leprosy                  |
| Elaterium               | Fracastorc, Girolamo    | Holland, Sir Henry      | Lethargy                 |
| Elbow                   | Freind, John            | Homoeopathy             | Lichen                   |
| Electrocution           | Friendly Societies      | Hop                     | Life                     |
| Electrotherapeutics     | Frostbite               | Horehound               | Ligament                 |
| Elephantiasis           | Fructose, or Fruit      | Hospital                | Linacre, or Lynaker,     |
| Elixir                  | Sugar                   | Hufeland, C. W.         | Thomas                   |
| Elliotson, John         | Fumigation              | Humane Society, Royal   | Ling, Per Henrik         |
| Embalming               | Galangal                | Hunger and Thirst       | Linseed                  |
| Embryology              | Galbanum                | Hunter, John            | Lip                      |
| Emetics                 | Galen                   | Hunter, William         | Liquorice                |
| Empysema                | Gall                    | Hutchinson, Sir J.      | Lister, Joseph Lister,   |
| Empyema                 | Gallic Acid             | Hydrastine              | Baron                    |
| Enteritis               | Galvani, Luigi          | Hydrocele               | Liston, Robert           |
| Epilepsy                | Gamboge                 | Hydrocephalus           | Lithium                  |
| Epistaxis               | Gangrene                | Hydrochloric Acid       | Litmus                   |
| Epithelial, Endothelial | Gastric Ulcer           | Hydropathy              | Liver                    |
| and Glandular           | Gastritis               | Hydrophobia, or Rabies  | Lobe                     |
| Tissues                 | Gelsemium               | Hygiene                 | Lobelia                  |
| Epsom Salts             | Giant                   | Hypertrophy             | Locomotor Ataxia         |
| Equilibrium             | Ginseng                 | Hypnotism               | Longevity                |
| Ergot, or Spurred Rye   | Glanders, or Farcy      | Hypochondriasis         | Lumbago                  |
| Erichsen, Sir John E.   | Glauber's Salt          | Hysteria                | Lung                     |
| Erysipelas              | Glycerin, or Glycerol   | Iatrochemistry          | Lupus                    |
| Esmarch, J. F. A. von   | Goitre                  | Ibn Usalbi'a            | Lycanthropy              |
| Esquirol, J. E. D.      | Good, John Mason        | Icthyosis               | Lymphatic System         |

|                                |                                  |                              |                                     |
|--------------------------------|----------------------------------|------------------------------|-------------------------------------|
| Lymph and Lymph Formation      | Oesophagus                       | Pringle, Sir John            | Serenus, Sammonicus                 |
| MacCormac, Sir William         | Official                         | Prognosis                    | Sewerage                            |
| Mackenzie, Sir Morell          | Oils                             | Protoplasm                   | Shock, or Collapse                  |
| Magnesium                      | Old-age Pensions                 | Pruritus                     | Shoulder                            |
| Malaria                        | Olfactory System                 | Prussic Acid                 | Sibbald, Sir Robert                 |
| Malta, or Mediterranean, Fever | Ophthalmology                    | Psoriasis                    | Simon, Sir John                     |
| Mammary Gland                  | Opium                            | Psorospermiasis              | Simpson, Sir James Y.               |
| Marshall, John                 | Orfila, M. J. B.                 | Psychical Research           | Sinew                               |
| Massage                        | Osteology                        | Psychology                   | Skeleton                            |
| Matrix                         | Ovariotomy                       | Ptomaine Poisoning           | Skin and Exoskeleton                |
| Mead, Richard                  | Oxalic Acid                      | Puberty                      | Skin Diseases                       |
| Measles                        | Oxygen                           | Public Health, Law of        | Skull                               |
| Medical Education              | Ozone                            | Puerperal Fever              | Slaughter-house                     |
| Medical Jurisprudence          | Paget, Sir James                 | Pulse                        | Sleep                               |
| Medicine                       | Pain                             | Purpura                      | Sleeping-sickness                   |
| Mendelism                      | Palate                           | Pyrocatechin                 | Sloane, Sir Hans                    |
| Ménière's Disease              | Pancreas                         | Quain, Sir Richard           | Smallpox                            |
| Meningitis                     | Paracelsus                       | Quarantine                   | Smith, T. S.                        |
| Mercury                        | Paraldehyde                      | Quassia                      | Sneezing                            |
| Mesmer, F. A.                  | Paralysis, or Palsy              | Quinine                      | Sodium                              |
| Metabolic Diseases             | Paranoia                         | Quinsy                       | Somnambulism                        |
| Metabolism                     | Parasitic Diseases               | Radcliffe, John              | Soranus                             |
| Microscope                     | Parasitism                       | Radioactivity                | Spikenard, or Nard                  |
| Midwife                        | Paré, Ambroise                   | Radium                       | Spinal Cord                         |
| Milk                           | Pasteur, Louis                   | Raynaud's Disease            | Spirits                             |
| Mineral Waters                 | Pathology                        | Relapsing Fever              | Spleen                              |
| Mitchell, Silas Weir           | Pediculosis, or Phthiriasis      | Reproductive System          | Sprue                               |
| Monster                        | Pellagra                         | Resorcin                     | Squill                              |
| Morphine                       | Pelvis                           | Respiratory System           | Stammering, or Stuttering           |
| Mortification                  | Pemphigus                        | Rhamnus Purshiana            | Starvation                          |
| Mott, Valentine                | Pennyroyal                       | Rhatany, or Krameria Root    | Stethoscope                         |
| Mouth and Salivary Glands      | Pepper, William                  | Rheumatism                   | Stomach                             |
| Mumps                          | Peppermint                       | Rheumatoid Arthritis         | Stramonium                          |
| Murrain                        | Pepsin                           | Rhubarb                      | Strophanthus                        |
| Muscle and Nerve               | Peritonitis                      | Rickets                      | Strychnine                          |
| Muscular System                | Perspiration                     | Rinderpest                   | Sugar                               |
| Mushroom                       | Phagocytosis                     | Ringworm                     | Suggestion                          |
| Mustard                        | Pharmacology                     | Rokitansky, C. von           | Suicide                             |
| Mutilation                     | Pharmacopocia                    | Röntgen Rays                 | Sulphonal                           |
| Myelitis                       | Pharmacy                         | Rush, Benjamin               | Sulphur                             |
| Myxoedema                      | Pharyngitis                      | Saccharin                    | Sumbul, or Sumbal                   |
| Naevus                         | Pharynx                          | St. Vitus Dance, or Chorea   | Sunstroke                           |
| Narcotics                      | Phenacetin                       | Sal-ammoniac                 | Supra-renal Extract                 |
| Navel                          | Phlebitis                        | Salep                        | Surgery                             |
| Necrosis                       | Phosphorus                       | Salicin, Salicinum           | Surgical Instruments and Appliances |
| Nepenthes                      | Phrenology                       | Salicylic Acid               | Sweating-sickness                   |
| Nerve                          | Phthisis                         | Salt                         | Sweetbread                          |
| Nervous System                 | Physiology                       | Sanatorium                   | Sydenham, Thomas                    |
| Nettlerash, or Urticaria       | Picrotoxin                       | Sandalwood                   | Syme, James                         |
| Neuralgia                      | Pinel, Philippe                  | Sandarach                    | Sympathetic System                  |
| Neurasthenia                   | Pinto                            | Santonin                     | Syncope                             |
| Neuritis                       | Piperazin                        | Sarsaparilla                 | Tagliacozzi, Gasparo                |
| Neuropathology                 | Pityriasis Versicolor            | Savory, Sir William S.       | Tannic Acid                         |
| Nicotine                       | Placenta                         | Scabies, or Itch             | Tapeworms                           |
| Nightingale, Florence          | Plague                           | Scalp                        | Tar                                 |
| Nitroglycerin                  | Pleurisy, or Pleuritis           | Scarlet Fever, or Scarlatina | Taraxacum                           |
| Nose                           | Pleuro-pneumonia, or Lung-plague | Sciatica                     | Tartar                              |
| Nosology                       | Pneumonia                        | Scrofula, or Struma          | Tartaric Acid                       |
| Nostalgia                      | Podophyllin                      | Scurvy, or Scorbutus         | Teeth                               |
| Nursing                        | Poison                           | Sea-sickness                 | Temperance                          |
| Nutrition                      | Polypus                          | Seborrhoea                   | Terpenes                            |
| Nux Vomica                     | Possession                       | Semmelweiss, I. P.           | Tetanus                             |
| Obstetrics                     | Potassium                        | Senega                       | Therapeutics                        |
|                                | Pott, Percivall                  | Senna                        | Thompson, Sir Henry                 |
|                                | Poultice                         | Sepsis                       | Thorax                              |
|                                |                                  |                              | Throat                              |

|               |                      |                      |                      |
|---------------|----------------------|----------------------|----------------------|
| Thymol        | Upas                 | Veins                | Whooping-cough       |
| Thyroid       | Urea                 | Venereal Diseases    | Willis, Thomas       |
| Tincture      | Urethane             | Verdigris            | Wilson, Sir W. J. E. |
| Tongue        | Uric Acid            | Veronal              | Windpipe             |
| Tonsillitis   | Urinary System       | Veterinary Science   | Wine                 |
| Toxicology    | Urotropin            | Viburnum             | Wintergreen          |
| Tracheotomy   | Vaccination          | Vivisection          | Witch-hazel          |
| Trachoma      | Valerian             | Voice                | Wound                |
| Trance        | Variation and Selec- | Wakley, Thomas       | Wrist                |
| Trichinosis   | tion                 | Wart                 | Wry-neck             |
| Tuberculosis  | Varicose Veins       | Water-supply         | X-Ray Treatment      |
| Tumour        | Vascular System      | Weights and Measures | Yaws                 |
| Typhoid Fever | Vaseline             | Wells, Sir Thomas S. | Yellow Fever         |
| Typhus Fever  | Vegetarianism        | Whitlow              | Zinc                 |
| Ulcer         |                      |                      | Zymotic Diseases     |

## CHAPTER XXVI

## FOR LAWYERS

**I**N the days when Marshall and Story, on the bench of the Supreme Court at Washington, were listening to Webster's thunder; when Chancellor Kent was scrutinizing precedents in New York, and Rufus Choate quoting Justinian at Salem, success at the bar depended upon elaborate rhetoric and a close study of the Reports. To-day, sound advice is in greater demand than brilliant oratory, and questions of fact are, as a rule, more important and more perplexing than questions of law.

The Britannica is the one great Digest of Facts. Its articles cover all scientific, industrial, commercial and financial subjects. Fifteen hundred of the world's foremost specialists, chosen from twenty different countries, deal not only with all knowledge, but with the practical application of knowledge in the laboratory, the machine shop, in the mine, on the ship's deck and in the ship's engine-room, in the railroad office and on the railroad line. Bankers and engineers, builders and contractors, physicians and surgeons and manufacturers of every kind describe the work which they have themselves successfully done. They explain to the lawyer the details of his client's own business,

which the client is almost always incapable of explaining. They enable the lawyer to test his client's knowledge and his client's good faith. They show the lawyer what he has to hope or to dread from expert evidence.

In a mining town in Alaska, where the workmen were mostly Servians, a lawyer recently had an unusual case. The Servians had a church, which in the absence of the Servian priest, was in the charge of a father or "papa" of the Russian orthodox church, and he tried to exclude from their church the entire congregation because they disobeyed him. The lawyer brought into court the Encyclopaedia Britannica to prove the independence of the Servian Church from the authority of the Russian Church. The Britannica was recognized as an authority by the court, and the Servian congregation won its suit for the use of its church building.

A Buffalo lawyer in a recent letter to the publishers of the Britannica told of his being retained in a case involving the qualities of materials used in the construction of automatic car couplers. He

read many technical works to get information on this subject, but "the article that to me was most instructive was that on IRON AND STEEL in the Encyclopaedia Britannica." He adds, "In my opinion the work is invaluable to any person who desires the means of handy reference to, and accurate information on, any topic." Similar testimony from lawyers all over the world to the usefulness of the Britannica could be adduced in great volume.

A brief reference to the different parts of this Guide will show in a general way the contents and value of the Britannica in the many fields in which an attorney may need, in connection with the preparation of a case, immediate and authoritative information on subjects not purely legal.

But on legal topics, also, the lawyer or the law student will find much valuable information.

He should read the stimulating and suggestive article on AMERICAN LAW (Vol. 1, p. 828), by Simeon E. Baldwin, governor of Connecticut, **American Law** professor of constitutional and private international law at Yale, and formerly chief justice of the Supreme Court of Errors, Connecticut. Governor Baldwin's article points out the general identity of origin of American and English law, with the important exception of territory formerly French or Spanish,—particularly Louisiana,—a point on which the reader will find fuller information in the articles LOUISIANA (Vol. 17, p. 57) and EDWARD LIVINGSTON (Vol. 16, p. 811). Besides he calls attention to the fact that the state and not the nation is for the most part the legislative unit and the legislative authority. And this leads to a consideration of the great part played in American jurisprudence by the Civil War and the consequent changes in the Federal Constitution, especially the Fourteenth Amendment, which has been the basis of so many recent cases in the Supreme Court and has "readjusted and re-

set the whole system of the American law of personal rights" by transferring final jurisdiction from state to Federal courts.

Within the Southern states the Reconstruction period affected local law in various ways: by putting political power into the hands of outsiders ("carpet baggers," etc.), by the social revolution consequent on the abolition of slavery, and by the commercial assimilation of the South to the North.

Governor Baldwin points out that the judicial department has been made partly administrative by the artificial distribution under most state constitutions of governmental powers into executive, legislative and judicial, overlooking the administrative, and making the courts the interpreters of statutes and giving to them the power of deciding whether or not statutes are constitutional.

That the police powers of the states are more and more liberally interpreted by the Federal Supreme Court is an interesting tendency, especially when the student remembers that in the last year or so certain states (notably Washington, c. 74, *Laws* 1911, Compensation of Injured Workmen) have definitely stated the police power as the basis of acts which the state supreme court might otherwise have declared unconstitutional as depriving of property without due process of law.

The article on American law is supplemented:

(a) in a general way by the valuable contribution of James Bryce (author of *The American Commonwealth*, and late British ambassador to the United States) on the Constitution and Government of the United States and of the states (Vol. 27, p. 646—an article which would fill about 50 pages of this Guide).

(b) more particularly, under the articles on the separate states (as well as on Alaska, Hawaii, Philippines and Porto Rico), by the description of the state or local constitution with an outline of characteristic and peculiar statutes. For

instance, in the article ALABAMA (Vol. 1, p. 459), the first in the Britannica on a separate state of the Union, there is a general sketch of the constitution and government with particular attention to these points: term of judiciary, 6 years; legislative sessions, quadrennial; law against lobbying; executive may not succeed himself; sheriffs whose prisoners are lynched may be impeached; grandfather clause, practically disfranchising the negro—with a summary of *Giles v. Harris*, 189 U. S. 474; Jim Crow law; disfranchisement for vote-buying or selling; Australian ballot law; anti-pass law; freight rebate law; homestead exemptions; wife's earnings separate property; women and child labour laws; peonage; liquor laws.

(c) by special articles, such as HOME-STEAD AND EXEMPTION LAWS (Vol. 13, p. 639), ORIGINAL PACKAGE (Vol. 20, p. 273) and INTERSTATE COMMERCE (Vol. 14, p. 711; equal to about 10 pages of this Guide), by Prof. Frank A. Fetter of Princeton (formerly Cornell), which deal with purely American legal topics.

(d) by legal sections in general economic articles, for instance: in RAILWAYS, the section on *American Legislation*, by Prof. F. H. Dixon of Dartmouth, author of *State Railroad Control*; in TRUSTS, by Prof. J. W. Jenks, the great American authority on the subject; in EMPLOYERS' LIABILITY; in TRADE UNIONS and in STRIKES AND LOCKOUTS, both by Carroll D. Wright, late U. S. Commissioner of Labor; BANKRUPTCY, by Edward Manson, author of *Law of Bankruptcy*; and in INSURANCE (Vol. 14, especially p. 662 c).

(e) by general legal articles like: COMMON LAW; CRIMINAL LAW, by W. F. Craies, editor of *Archbold On Criminal Pleading*; LIQUOR LAWS, by Arthur Shadwell, author of *Drink, Temperance and Legislation*; MEDICAL JURISPRUDENCE, by H. H. Littlejohn, professor of forensic medicine in the University of Edinburgh; MILITARY LAW, by Sir John Scott, former

deputy judge-advocate-general, British Army; NAVIGATION LAWS, by James Williams, of Lincoln College, Oxford; PRESS LAWS; SEAMEN, LAWS, RELATING TO, etc.

and (f) by sections and paragraphs on American law in hundreds of articles on legal topics—for list see below.

The following list of American jurists does not include all American lawyers about whom there are separate articles in the Britannica, but **Biographies of Lawyers** will serve to suggest a brief course of biographical readings which the lawyer could not duplicate even in a special and expensive work on the American bar:

SAMUEL SEWALL (Vol. 24, p. 733)  
 JOHN RUTLEDGE (Vol. 23, p. 945)  
 SAMUEL CHASE (Vol. 5, p. 956)  
 FRANCIS DANA (Vol. 7, p. 792)  
 JOHN LOWELL (Vol. 17, p. 76)  
 OLIVER ELLSWORTH (Vol. 9, p. 294)  
 JOHN JAY (Vol. 15, p. 294)  
 ROBERT R. LIVINGSTON (Vol. 16, p. 812)  
 LUTHER MARTIN (Vol. 17, p. 794)  
 THEOPHILUS PARSONS (Vol. 20, p. 868)  
 JOHN MARSHALL (Vol. 17, p. 770)  
 EDMUND RANDOLPH (Vol. 22, p. 886)  
 JAMES KENT (Vol. 15, p. 735)  
 EDWARD LIVINGSTON (Vol. 16, p. 811)  
 BUSHROD WASHINGTON (Vol. 28, p. 344)  
 ROGER BROOKE TANEY (Vol. 26, p. 396)  
 SAMUEL HOAR (Vol. 13, p. 542)  
 HORACE BINNEY (Vol. 3, p. 949)  
 JAMES WILSON (Vol. 23, p. 698)  
 WILLIAM PINKNEY (Vol. 21, p. 627)  
 LEMUEL SHAW (Vol. 24, p. 813)  
 DANIEL WEBSTER (Vol. 28, p. 459)  
 SIMON GREENLEAF (Vol. 12, p. 548)  
 HENRY WHEATON (Vol. 28, p. 583)  
 RICHARD RUSH (Vol. 23, p. 857)  
 JOHN BOUVIER (Vol. 4, p. 336)  
 JOSEPH STORY (Vol. 25, p. 969)  
 LEVI WOODBURY (Vol. 28, p. 790)  
 JAMES HALL (Vol. 12, p. 847)  
 REVERDY JOHNSON (Vol. 15, p. 462)  
 HUGH S. LEGARÉ (Vol. 16, p. 373)  
 RUFUS CHOATE (Vol. 6, p. 258)  
 BENJAMIN F. BUTLER (Vol. 4, p. 881)  
 DAVID DUDLEY FIELD (Vol. 10, p. 321)



S. P. CHASE (Vol. 5, p. 955)  
 JOHN J. CRITTENDEN (Vol. 7, p. 471)  
 HAMILTON FISH (Vol. 10, p. 427)  
 BENJAMIN R. CURTIS (Vol. 7, p. 652)  
 J. S. BLACK (Vol. 4, p. 18)  
 JUDAH P. BENJAMIN (Vol. 8, p. 789)  
 JOHN Y. MASON (Vol. 17, p. 840)  
 GEORGE TICKNOR CURTIS (Vol. 7, p. 651)  
 R. H. DANA (Vol. 7, p. 792)  
 SAMUEL J. TILDEN (Vol. 26, p. 970)  
 SAMUEL F. MILLER (Vol. 18, p. 464).  
 STEPHEN J. FIELD (Vol. 10, p. 322)  
 W. M. EVARTS (Vol. 10, p. 4)  
 FRANCIS WHARTON (Vol. 28, p. 575)  
 MORRISON R. WAITE (Vol. 28, p. 246)  
 T. W. DWIGHT (Vol. 8, p. 741)  
 E. J. PHELPS (Vol. 21, p. 863)  
 STANLEY MATTHEWS (Vol. 17, p. 899)  
 L. Q. C. LAMAR (Vol. 16, p. 100)  
 C. C. LANGDELL (Vol. 16, p. 172)  
 D. W. VOORHEES (Vol. 28, p. 211)  
 T. F. BAYARD (Vol. 8, p. 554)  
 HORACE GRAY (Vol. 12, p. 391)  
 JOSEPH HODGES CHOATE (Vol. 6, p. 258)  
 MELVILLE W. FULLER (Vol. 11, p. 296)  
 WAYNE MACVEAGH (Vol. 17, p. 269)  
 JOHN MARSHALL HARLAN (Vol. 12, p. 954)  
 RICHARD OLNEY (Vol. 20, p. 91)  
 CUSHMAN K. DAVIS (Vol. 7, p. 866)  
 OLIVER WENDELL HOLMES (Vol. 13, p. 616)  
 DAVID BENNETT HILL (Vol. 13, p. 464)  
 ELIHU ROOT (Vol. 23, p. 711)  
 PHILANDER C. KNOX (Vol. 15, p. 882)

Of great value to the student of law, as widening his scope, would be a course of more general reading. This should include:

(a) the articles LAW, JURISPRUDENCE and COMPARATIVE JURISPRUDENCE, by Paul Vinogradoff, Corpus professor of jurisprudence at Oxford.

(b) articles on national and other legal systems, such as

ENGLISH LAW, *History*, by the late Frederick W. Maitland, Downing professor of English law at Cambridge.

ANGLO-SAXON LAW, by Paul Vinogradoff.

GERMANIC LAWS, EARLY, by Professor Christian Pfister, of the Sorbonne.

CODE NAPOLÉON, by Jean Paul Esmein, professor of law in the University of Paris,

and ROMAN LAW, probably one of the most remarkable articles in the new edition and of the utmost importance (as in a less degree are the articles CODE and CODE NAPOLÉON) to the student of civil law. It is based on the well-known article contributed to the Ninth Edition of the Britannica by James Muirhead, professor of civil law, Edinburgh; but the article is actually the work of the reviser, Henry Goudy, regius professor of civil law, Oxford, and it may well be called the best present treatment of the subject. The article is a brief text-book in itself, containing matter equivalent in length to nearly 200 pages of this Guide. The treatment is historical, beginning with the almost mythical regal period and throwing light on the laws before the XII Tables, but this does not mean that the later period, legally more important, is not treated with proper fullness so that the practical as well as the theoretical is considered.

Slightly remoter systems are the subjects of separate articles: SALIC LAW, by Professor Pfister of the Sorbonne; BREHON LAWS, by Lawrence Ginnell, M. P., author of a monograph on the subject;

WELSH LAWS; an elaborate article on the little-known subject GREEK LAW, by John Edwin Sandys of Cambridge, author of *History of Classical Scholarship*; INDIAN LAW, by Sir William Markby, reader in Indian Law at Oxford, formerly judge of the High Court of Calcutta; MAHOMMEDAN LAW (a subject no longer alien to the American because of the large number of Mahommedans in the Philippines), by D. B. Macdonald, professor in Hartford Theological Seminary, and author of *Development of Muslim Theology*; and BABYLONIAN LAW (by C. H. W. Johns, Master of St. Catharine's, Cambridge, author of *The Oldest Code of Laws*, etc.),

containing a summary of the famous code of King Khammurabi.

The following list does not include the biographies of lawyers and is not a com-

plete list of all topics pertaining to law in the Encyclopaedia Britannica, but it will give some idea of the scope of the legal department of the work.

|                        |                         |                       |                        |
|------------------------|-------------------------|-----------------------|------------------------|
| Abandonment            | Alien                   | Assize                | Blasphemy              |
| Abatement              | Alienation              | Associate             | Blinding               |
| Abdication             | Aliment                 | Assumpsit             | Blockade               |
| Abduction              | Alimony                 | Asylum, Right of      | Blue-book              |
| Abettor                | Allegiance              | Attachment            | Boarding-house         |
| Abeyance               | Alliance                | Attainder             | Boceland               |
| Abjuration             | Allocatur               | Attaint, Writ of      | Body-snatching         |
| Abode                  | Allodium                | Attempt               | Boiling to Death       |
| Abrogation             | Allonge                 | Attestation           | Bona Fide              |
| Abscond                | Allotment               | Attorney              | Bond                   |
| Abstract of Title      | Allowance               | Attorney-General      | Boot                   |
| Acceptance             | Alluvion                | Attornment            | Borough                |
| Acceptilation          | Ambiguity               | Auctions              | Borough English        |
| Access                 | Amendment               | Audience              | Bottomry               |
| Accession              | Amercement              | Autocracy             | Bound, or Boundary     |
| Accessory              | American Law            | Autonomy              | Brachylogus.           |
| Accommodation Bill     | Amicus Curiae           | Average               | Branding               |
| Accomplice             | Amnesty                 | Avizandum             | Branks                 |
| Accord                 | Amortization            | Award                 | Brawling               |
| Accountant-General     | Analyst                 | Babylonian Law        | Breach                 |
| Accretion              | Ancient Lights          | Back-bond             | Brehon Laws            |
| Accumulation           | Angary                  | Bail                  | Breviary of Alaric     |
| Accusation             | Anglo-Saxon Law         | Bailiff and Bailie    | Bribery                |
| Acknowledgment         | Annates                 | Bailment              | Brief                  |
| Act                    | Annexation              | Ballot                | Britton                |
| Action                 | Annoy                   | Bank Holidays         | Burgage                |
| Act of Parliament      | Answer                  | Bankruptcy            | Burgess                |
| Act of Petition        | Apology                 | Banns of Marriage     | Burglary               |
| Address, The           | Appanage                | Bar, The              | Burial and Burial Acts |
| Ademption              | Apparitor               | Bargain and Sale      | Burke, William         |
| Adjournment            | Appeal                  | Barmote Court         | Burning to Death       |
| Adjudication           | Appearance              | Barratry              | By-law                 |
| Adjustment             | Appointment, Power of   | Barrington, George    | Cabinet                |
| Administration         | Apportionment           | Base fee              | Cadastre               |
| Administrator          | Apportionment Bill      | Basilica              | Camera                 |
| Admiralty, High Court  | Appraiser               | Basoche               | Cangue                 |
| Admiralty Jurisdiction | Appropriation           | Bastard               | Canon Law              |
| Admission              | Appurtenances           | Bastinado             | Canton                 |
| Adoption               | Aram, Eugene            | Baylo                 | Capital Punishment     |
| Adscript               | Arbitration             | Beadle                | Capitulary             |
| Adultery               | Arbitration, Interna-   | Beheading             | Capitulation           |
| Advancement            | tional                  | Belligerency          | Caption                |
| Adventure              | Arches, Court of        | Bench                 | Captive                |
| Advocate               | Aristocracy             | Benefice              | Capture                |
| Advocates, Faculty of  | Arraignment             | Beneficiary           | Cargo                  |
| Adwoson                | Array                   | Bequest               | Carrier                |
| Affidavit              | Arrest                  | Bering Sea Arbitra-   | Case                   |
| Affiliation            | Arrestment              | tion                  | Caseus Belli           |
| Affinity               | Arroundissement         | Bet and Betting       | Caucus                 |
| Affray                 | Arson                   | Betterment            | Caveat                 |
| Affreightment          | Art and Part            | Bigamy                | Cemetery               |
| Age                    | Articles of Association | Bill                  | Cessio Bonorum         |
| Agent                  | Assault                 | Bill of Exchange      | Cestui, Cestuy         |
| Agistment              | Assembly, Unlawful      | Bill of Sale          | Challenge              |
| Agnates                | Assessment              | Birth                 | Chamberlain            |
| Alabama Arbitration    | Assessor                | Blackmail             | Chambers               |
| Alderman               | Assets                  | Black Rod             | Champerty, or Cham-    |
| Alias                  | Assignment, Assigna-    | Blanch Fee, or Blanch | party                  |
| Alibi                  | tion, Assignee          | Holding               | Chance-medley          |

|                        |                        |                          |                       |
|------------------------|------------------------|--------------------------|-----------------------|
| Chancery               | Consanguinity, or Kin- | Decree                   | Electrocution         |
| Chantage               | dred                   | De Donis Conditional-    | Elegit                |
| Chargé d'affaires      | Conseil de famille     | bus                      | Embargo               |
| Charging Order         | Conservator            | Deed                     | Embassy               |
| Charter                | Consideration          | Defamation               | Embezzlement          |
| Chartered Companies    | Consignment            | Default                  | Emblems               |
| Charter-Party          | Consistory Courts      | Defeasance               | Embracery             |
| Chattel                | Consolidation Acts     | Defence                  | Eminent Domain        |
| Cheating               | Consort                | Defendant                | Emperor               |
| Children, Law relating | Conspiracy             | Del Credere              | Enclave               |
| to                     | Constable              | Demesne                  | English Law           |
| Children's Courts      | Constituency           | Demise                   | Englishry             |
| Chiltern Hundreds      | Constitution and Con-  | Democracy                | Entail                |
| Chose                  | stitutional Law        | Demurrage                | Envoy                 |
| Church Rate            | Consul                 | Demurrer                 | Equity                |
| Churchwarden           | Consulate of the Sea   | Denizen                  | Error                 |
| Churchyard             | Contempt of Court      | Deodand                  | Escheat               |
| Cinque Ports           | Contraband             | Department               | Estate                |
| Circuit                | Contract               | Deportation or Trans-    | Estate and House      |
| Citation               | Contumacy              | portation                | Agents                |
| Citizen                | Conversion             | Deposit                  | Estate Duty           |
| City                   | Conveyancing           | Deputy                   | Estoppel              |
| Civil Law              | Convoy                 | Derelict                 | Estovers              |
| Civil List             | Coparcenary            | Desertion                | Estreat               |
| Civil Service          | Copyhold               | Detainer                 | Evidence              |
| Clergy, Benefit of     | Copyright              | Detinue                  | Execution             |
| Clerk                  | Co-respondent          | Digest                   | Executors and Admin-  |
| Closure                | Coroner                | Dilapidation             | istrators             |
| Code                   | Corporal Punishment    | Diligence                | Exequatur             |
| Code Napoléon          | Corporation            | Diplomacy                | Exhumation            |
| Codicil                | Corpse                 | Directors                | Exile                 |
| Coercion               | Corrupt Practices      | Disability               | Expatriation          |
| Cognizance             | Costs                  | Discharge                | Expert                |
| Coif                   | Counsel and Counsellor | Disclaimer               | Express               |
| Coinage Offences       | Counterfeiting         | Discovery                | Expropriation         |
| Collateral             | County                 | Disorderly House         | Expulsion             |
| Collusion              | County Court           | Dissolution              | Extenuating Circum-   |
| Colony                 | Court                  | Distress                 | stances               |
| Comity                 | Court Baron            | District                 | Exterritoriality      |
| Commercial Court       | Court Leet             | Divorce                  | Extortion             |
| Commercial Law         | Court-martial          | Doctors' Commons         | Extradition           |
| Commisson              | Covenant               | Document                 | Factor                |
| Commissioner           | Coverture              | Domestic Relations       | Faculty               |
| Commitment             | Covin                  | Domicile                 | False Pretences       |
| Common Law             | Credentials            | Donatio Mortis Causa     | Faubourg              |
| Common Lodging-        | Crime                  | Dower                    | Federal Government    |
| House                  | Criminal Law           | Dowry                    | Fee                   |
| Common Pleas, Court    | Criminology            | Dragoman                 | Felo De Se            |
| of                     | Crimp                  | Drawing and Quarter-     | Felony                |
| Commons                | Crown Debt             | ing                      | Feoffment             |
| Commonwealth           | Crown Land             | Droit                    | Ferry                 |
| Company                | Cruelty                | Duke of Exeter's         | Fetters and Handcuffs |
| Compensation           | Culprit                | Daughter                 | Feu                   |
| Compromise             | Curator                | Durbar                   | Fictions              |
| Comptroller            | Curtesy                | Duress                   | Fiduciary             |
| Compurgation           | Curtilage              | Earl Marshal             | Fieri Facias          |
| Conacre                | Custom                 | Earnest                  | Fine                  |
| Concert                | Customary Freehold     | Easement                 | Finger Prints         |
| Conditional Fee        | Custos Rotulorum       | Eavesdrip                | Fishery, Law of       |
| Conditional Limitation | Cy-près                | Ecclesiastical Commis-   | Fixtures              |
| Confarreatio           | Damages                | sioners                  | Flat                  |
| Confession and Avoid-  | Day                    | Ecclesiastical Jurisdic- | Fleet Prison          |
| ance                   | Death                  | tion                     | Fleta                 |
| Confiscation           | Debentures             | Ecclesiastical Law       | Flotsam, Jetsam and   |
| Congé d'Elire          | Debt                   | Edict                    | Ligan                 |
| Congress               | Declaration            | Ejectment                | Foreclosure           |
| Conjugal Rights        | Declaration of Paris   | Election                 | Foreign Office        |
| Conquest               | Declarator             | Elections                | Foreshore             |

|                         |                            |                               |                                      |
|-------------------------|----------------------------|-------------------------------|--------------------------------------|
| Forest Laws             | Incendiarism               | Knight-Service                | Maritime Territory                   |
| Forfeiture              | Incest                     | Knout                         | Marriage                             |
| Forgery                 | Inclosure                  | Kurbash                       | Marshalsea                           |
| Franchise               | Incorporation              | Laches                        | Martial Law                          |
| Frank-almoign           | Indemnity                  | Lading, Bill of               | Master and Servant                   |
| Frank-marriage          | Indenture                  | Landlord and Tenant           | Master of the Horse                  |
| Fraud                   | Indian Law                 | Land Registration             | Master of the Rolls                  |
| Freebench               | Indictment                 | Lapse                         | Maxims, Legal                        |
| Freehold                | Indorsement                | Larceny                       | Mayhem                               |
| Freeman                 | Inebriety, Law of          | Law                           | Mayor                                |
| Freight                 | Infamy                     | Law Merchant                  | Mediation                            |
| Fuero                   | Infant                     | Lease                         | Medical Jurisprudence                |
| Gallows, or Gibbet      | Infanticide                | Legacy                        | Meeting                              |
| Game Laws               | In Forma Pauperis          | Legation                      | Memorandum of Association            |
| Gaming and Wagering     | Information                | Legitim                       | Merger                               |
| Garnish                 | Informers                  | Legitimacy and Legitimation   | Mesne                                |
| Garrote                 | Inheritance                | Lesion                        | Messuage                             |
| Gavelkind               | Inhibition                 | Letters Patent                | Military Law                         |
| Geneva Convention       | Initials                   | Libel and Slander             | Ministry                             |
| Germanic Laws, Early    | Injunction                 | Liberty                       | Miscarriage                          |
| Gift                    | Inn and Innkeeper          | Licence                       | Misdemeanour                         |
| Glebe                   | Inns of Court              | Lien                          | Misprision                           |
| Goodwill                | Innuendo                   | Limitation, Statutes of       | Mistake                              |
| Government              | Inquest                    | Liquidation                   | Monarchy                             |
| Grant                   | Insanity                   | Liquor Laws                   | Monition                             |
| Gravamen                | Instalment                 | Local Government              | Mortgage                             |
| Greek Law               | Instrument                 | Local Government Board        | Mortmain                             |
| Gross                   | Intent                     | Lodger and Lodgings           | Motion                               |
| Ground Rent             | Interdiction               | Lord Advocate                 | Multiplepointing                     |
| Guarantee .             | Interesse Termini          | Lord Chamberlain              | Municipality                         |
| Guardian                | Interest                   | Lord Chief Justice            | Muniment                             |
| Guerrilla               | International Law          | Lord Great Chamberlain        | Murder                               |
| Guillotine              | Interpellation             | Lord High Chancellor          | Mutiny                               |
| Habeas Corpus           | Interpleader               | Lord High Constable           | Nationality                          |
| Hanging                 | Interpretation             | Lord High Steward             | Naturalization                       |
| Hanaper                 | Interstate Commerce        | Lord High Treasurer           | Navigation Laws                      |
| Handwriting             | Intestacy                  | Lord Justice Clerk            | Negligence                           |
| Haro, Clameur de        | Intransigent               | Lord Justice-General          | Negotiable Instrument                |
| Hegemony                | Inventory                  | Lord Keeper of the Great Seal | Neutrality                           |
| Heir                    | I. O. U.                   | Lord President of the Council | Next Friend                          |
| Heirloom                | Jactitation                | Lords Justices of Appeal      | Nisi Prius                           |
| Hereditament            | Joinder                    | Lords of Appeal               | Noise                                |
| Heriot                  | Joint                      | Lord Steward                  | Nolle Prosequi                       |
| Heritable Jurisdictions | Jointure                   | Lost Property                 | Nonconformity, Law relating to       |
| High Seas               | Jougs, Juggs, or Joggs     | Lotteries                     | Nonfeasance, Misfeasance, Malfesance |
| Highway                 | Judge                      | Lynch Law                     | Nonsuit                              |
| Hinterland              | Judge - Advocate-General   | Magistrate                    | North Sea Fisheries Convention       |
| Hire-Purchase Agreement | Judgment                   | Mahomedan Law                 | Notary or Notary Public              |
| Hiring                  | Judgment Debtor            | Maiden                        | Notice                               |
| Holiday                 | Judgment Summons           | Maiming                       | Novation                             |
| Homage                  | Judicature Acts            | Maintenance                   | Nuisance                             |
| Home Office             | Jurat                      | Majority                      | Nullification                        |
| Homicide                | Jurisdiction               | Mandamus, Writ of             | Oath                                 |
| Horning, Letters of     | Jurisprudence              | Mandarin                      | Obiter Dictum                        |
| Hotch-pot               | Jurisprudence, Comparative | Mandate                       | Obligation                           |
| Household, Royal        | Jury                       | Manifest                      | Obscenity                            |
| Hue and Cry             | Jus primae noctis          | Manor                         | Office                               |
| Hundred                 | Jus Relictae               | Mansion                       | Oligarchy                            |
| Husband and Wife        | Justice                    | Manslaughter                  | Ordeal                               |
| Hypothec                | Justice of the Peace       | Man-traps                     | Order in Council                     |
| Identification          | Justiciary, High Court     | Mare Clausum and Mare Liberum | Ordinance                            |
| Ignoramus               | Justification              |                               | Ordinary                             |
| Ignorance               | Juvenile Offenders         |                               | Original Package                     |
| Immunity                | Ketch, John                |                               |                                      |
| Impeachment             | Kidnapping                 |                               |                                      |
| Impotence               | King's Bench, Court of     |                               |                                      |
| Impressment             |                            |                               |                                      |

|                                 |                                |                               |                                  |
|---------------------------------|--------------------------------|-------------------------------|----------------------------------|
| Ouster                          | Privy Seal                     | Reservation                   | Specific Performance             |
| Outlawry                        | Prize or Prize of War          | Residence                     | Spheres of Influence             |
| Overt Act                       | Probate                        | Resident                      | Spring-gun                       |
| Oyer and Terminer               | Probation                      | Residue                       | Spy                              |
| Pacific Blockade                | Procedure                      | Respite                       | State                            |
| Pandects                        | Process                        | Respondent                    | State, Great Officers of         |
| Paraphernalia                   | Procès-verbal                  | Restraint                     | State Rights                     |
| Pardon                          | Proclamation                   | Retainer                      | State Trials                     |
| Parish                          | Proctor                        | Reward                        | Statute                          |
| Parlement                       | Procurator                     | Ridings                       | Stipend                          |
| Parliament                      | Procurator                     | Riot                          | Stocks                           |
| Parricide                       | Profanity                      | Robbery                       | Stocks and Shares                |
| Parson                          | Prohibition                    | Roman Law                     | Stolen Goods                     |
| Partition                       | Promoter                       | Rundale                       | Subinfeudation                   |
| Partnership                     | Property                       | Sacrilege                     | Succession                       |
| Party Wall                      | Prorogation                    | Salary                        | Succession Duty                  |
| Passport                        | Prosecution                    | Sale of Goods                 | Suffrage                         |
| Patents                         | Prospectus                     | Salic Law and other           | Summary Jurisdiction             |
| Patents of Precedence           | Protectorate                   | Frankish Laws                 | Summons                          |
| Patron and Client               | Provisional Order              | Salvage                       | Sunday                           |
| Paymaster-General               | Provost                        | Sanction                      | Superannuation                   |
| Payment                         | Proxy                          | Satisfaction                  | Supercargo                       |
| Payment of Members              | Public House                   | Scandal                       | Supply                           |
| Peace                           | Puisne                         | Scavenger's Daughter          | Supreme Court of Ju-<br>dicature |
| Peace, Breach of                | Purchase                       | Schedule                      | Surety                           |
| Peace Conferences               | Quantum Meruit                 | Scire Facias                  | Surrender                        |
| Peine forte et dure             | Quarantine                     | Scot and Lot                  | Surrogate                        |
| Peerage                         | Quare Impedit                  | Scrip                         | Suzerainty                       |
| Penalty                         | Quarter Sessions               | Scrutiny                      | Swearing                         |
| Penology                        | Queen Anne's Bounty            | Sea Laws                      | Syndic                           |
| Pension                         | Quorum                         | Seamen, Laws relating<br>to   | Syndicate                        |
| Perjury                         | Quo Warranto                   | Search or Visit and<br>Search | Taille                           |
| Perpetuity                      | Rack                           | Seclusion                     | Tally                            |
| Person, Offences<br>against the | Ragman Rolls                   | Secret                        | Tanistry                         |
| Personal Property               | Raid                           | Secretary of State            | Tenant                           |
| Personation                     | Rape                           | Security                      | Tenant-right                     |
| Petition                        | Rate                           | Sederunt, Act of              | Tenement                         |
| Picketing                       | Real Property                  | Sedition                      | Tenure                           |
| Pillory                         | Rebellion                      | Seduction                     | Term                             |
| Pirate and Piracy               | Receipt                        | Seignory or Seignory          | Theatre                          |
| Plaintiff                       | Receiver                       | Seisin                        | Theft                            |
| Pleading                        | Recess                         | Senate                        | Thegn                            |
| Plebiscite                      | Recidivism                     | Sentence                      | Threat                           |
| Pledge                          | Recognizance                   | Sequestration                 | Tichborne Claimant               |
| Plurality                       | Record                         | Sergeant-at-Law               | Ticket-of-leave                  |
| Plutocracy                      | Recorder                       | Serjeanty                     | Time                             |
| Police                          | Reeve                          | Servitude                     | Tipstaff                         |
| Police Courts                   | Referee                        | Session                       | Tithes                           |
| Posse Comitatus                 | Referendum and Initi-<br>ative | Set-off                       | Tithing                          |
| Possession                      | Refresher                      | Settlement                    | Toleration                       |
| Post & Postal Service           | Regent                         | Sexton                        | Toll                             |
| Potwalloper                     | Register                       | Share                         | Tort                             |
| Power of Attorney               | Registration                   | Shelley's Case, Rule in       | Torture                          |
| Praemunire                      | Release                        | Sheppard, John (Jack)         | Town                             |
| Preamble                        | Remainder, Reversion           | Sheriff                       | Trade, Board of                  |
| Prerogative                     | Remand                         | Shire                         | Transfer                         |
| Prerogative Courts              | Remembrancer                   | Sign Manual, Royal            | Tread-mill                       |
| Prescription                    | Rent                           | Simony                        | Treason                          |
| Press Laws                      | Repairs                        | Slander                       | Treasure Trove                   |
| Prime Minister                  | Repeal                         | Socage                        | Treasury                         |
| Primogeniture                   | Replevin                       | Soke                          | Treaties                         |
| Principal and Agent             | Representation                 | Solicitor                     | Trespass                         |
| Prison                          | Reprive                        | Solicitor-General             | Trial                            |
| Privateer                       | Reprisals                      | Sovereignty                   | Tribute                          |
| Privilege                       | Request, Letters of            | Speaker                       | Trover                           |
| Privy Council                   | Requests, Court of             | Specification                 | Truck                            |
| Privy Purse                     | Rescue                         |                               | Trust and Trustees               |



|                       |                     |                        |                       |
|-----------------------|---------------------|------------------------|-----------------------|
| Turpin, Richard       | Veto                | Warden                 | Whig and Tory         |
| Twelve Tables         | Vicar               | Warrant                | Whip                  |
| Udal                  | Vice-Chancellor     | Warrant of Attorney    | Whipping or Flogging  |
| Ukaz or Ukase         | Viceroy             | Warranty               | Wild, Jonathan        |
| Ultimatum             | Vidocq, F. E.       | Warren                 | Will or Testament     |
| Underwriter           | Vigilance Committee | Waste                  | Witness               |
| University Courts     | Vizier              | Water Rights           | Woolsack              |
| Uses                  | Vote and Voting     | Waters, Territorial    | Works and Public      |
| Valuation and Valuers | Voucher             | Welsh Laws             | Buildings, Board of   |
| Venue                 | Wager               | Wergild                | Wreck                 |
| Verdict               | Wainwright, T. G.   | Westminster Statutes   | Writ                  |
| Vestry                | War, Laws of        | Wheel, Breaking on the | Writers to the Signet |

## CHAPTER XXVII

## FOR BANKERS AND FINANCIERS

**O**F all classes of business men, bankers and financiers study most closely the general tendencies of public opinion and the general course of industrial and commercial development. Each day's financial news reports a position which has been reached in the path of a movement of which the origin and earlier course—and therefore the direction—must be sought in the record of past months and years, and sometimes in the record of a past century. But the banker who turns to the standard histories in his library with the desire to trace the course of any gradual and long-continued development is generally disappointed.

It is only of late that historical investigation has been directed to social and commercial activities rather than to politics and wars. Yet the history of civilization may be said to lie in the course of finance and commerce much more than in party strife and in civil and international wars. For the latter always arrest for the moment, even if they ultimately further, the progress of civilization.

The new Britannica has been called "the most comprehensive of all surveys of past and present civilization," and its

treatment of finance and commerce possesses a breadth and sweep directly due to the international character of the book. The American financier knows that under existing conditions he must take into account the laws and usages of foreign countries in regard to banking, currency, taxation, stock exchange transactions, corporations and all the other methods and appliances used in dealing with money and credit. The Britannica could not have covered this broad field authoritatively if its articles had all been written by Americans instead of being contributed, as they are, by specialists of twenty countries. And the very first step, in examining any question of American finance, may be to consider what has been done abroad.

**International Finance** For example, there has been adopted in Louisiana a system of rural credit such as was strongly urged, for more general use, during President Taft's administration. That would seem to be purely a matter of internal policy. But for a description of the actual working of such a system, the sources of information are in the Britannica article **RAIFFEISEN** (Vol. 22, p. 817), the German banker who perfected the system of agrarian credits, in the article **SCHULZE-**

DELITZSCH (Vol. 24, p. 383), the Saxon economist who founded the German central bureau of co-operative societies, and in the article CO-OPERATION (Vol. 7, p. 82), where the Danish system of financing farmers is described and compared with the German and French methods.

Systematic reading in the Britannica on financial subjects should begin with the article FINANCE (Vol. 10, p. 347, equivalent to 20 pages of this Guide), by C. F. Bastable, professor of political economy in the University of Dublin, whose books on economics have been largely read in the United States. This article deals with state revenue and expenditure, or *public finance*, after pointing out the prevailing looseness in the use of the word finance. It is interesting to know that "in the later middle ages, especially in Germany, the word *finance* acquired the sense of usurious or oppressive dealing with money and capital." So long ago did an unpopular meaning attach to a term connected with "big business." The same is true of the word *usury*, which originally meant use, or interest; and the Britannica in an article on USURY (Vol. 27, p. 811) says "usury, if used in the old sense of the term could embrace a multitude of modes of receiving interest upon capital to which not the slightest moral taint is attached." In each case there may have been some reason besides chance for the development of the unpleasant meaning, and it has always been the custom of the spendthrift and the gambler to make the wrong use of words as well as of business methods. But what we call public finance was a century ago called political economy, "political" being used strictly to apply to the state, and "economy" in its original sense of housekeeping or house-rule. The word "economy" has thus become broader, as the word "usury" has become narrower, in significance.

It is curious to see how one page after another of the historical section of this article describes theories of finance which

are to-day propounded by popular agitators as if they were absolutely new

and not only describes them but shows how they were tried and how they

failed. The eastern empires taxed land produce, usually to the extent of one fourth or one fifth (two tithes). In Athens, under a more elaborate system, the state owned and administered agricultural land and silver mines, and yet this state ownership, instead of making for democratic equality, resulted in too rigid a separation of classes; and the Athenian attempt to surtax the rich citizens in order to defray the cost of public games and theatrical performances and to equip ships (in this case a close parallel to certain recent German legislation) led, as class taxation always does, to ingenious evasions and, in the end, increased the power it sought to restrict.

In Rome, home taxes were suspended as soon as conquests brought tribute from Spain and Africa. But taxes were always the curse of the provinces, and the vexatious *method* of the tax "may be regarded as an additional tax." "The defects of the financial organization were a serious influence in the complex of causes that brought about the fall of the Republic." The early Empire took its revenues from public lands, from monopolies, from the land tax, from customs, and from taxes on inheritances (5%), sales (10%) and the purchase of slaves (40%). There was no just distribution of taxation among the territorial divisions, and the burden fell too much upon the actual workers and their employers. In the kingdoms which succeeded the Empire after its fall, Roman customs survived in finance, as in all departments of government; and there was a want of coherent policy until the time of Charlemagne, when centralization produced a better system. But scientific taxation did not really exist until, in the 15th century, under Charles VII, the first French standing army was

created, and its needs led to a new and more intelligent system. In England, the co-ordination and control of public revenue and expenditure was similarly due to the growth of the navy. Since then the tendency has been to include taxes in general categories; the need for national credit has developed a system of national debts; and expenditures and receipts are now governed by legislative sanction. Local finance has been revolutionized by modern business methods, too slowly adopted it is true, and by the gradual change from private to public control of water supply, lighting and transportation.

The articles **TAXATION**, **NATIONAL DEBT** and **TARIFF** should be read after this article on public finance. **TAXATION**

**Taxation and  
Tariff**

(Vol. 26, p. 458; equivalent to 25 pages of this Guide),  
by Sir Robert Giffen,

formerly Controller-General of the British Board of Trade, classifies taxes, points out that direct and indirect taxes are not intrinsically different and that such a classification is merely a matter of convenience, and the article proceeds to describe the principal taxes. It should be supplemented by reading the sections on finance in the articles on various countries and especially by the article **ENGLISH FINANCE** (Vol. 9, p. 458; equivalent to 25 pages in this Guide), the section on Finance in the article **UNITED STATES** (Vol. 27, p. 660) and similar sections in the articles on each of the states of the Union. These articles give definite information about public debts, national or state, but the student should read carefully the main treatment in the article **NATIONAL DEBT** (Vol. 19, p. 266). The articles **TARIFF** (Vol. 26, p. 422), by Prof. F. W. Taussig of Harvard, author of *The Tariff History of the United States*; **PROTECTION** (Vol. 22, p. 464), by Edmund Janes James, president of the University of Illinois and author of the well-known *History of American Tariff Legislation*;

and **FREE TRADE** (Vol. 11, p. 88), by William Cunningham, author of *Growth of English Industry and Commerce*, will be of great interest. The student should read besides the sketches in the *Britannica* of **HENRY CLAY** (Vol. 6, p. 470), by Carl Schurz, of **WILLIAM MCKINLEY** (Vol. 17, p. 256), **ROGER Q. MILLS** (Vol. 18, p. 475), and of other American tariff-leaders, and, for the tariff reform movement in England, the articles on **JOSEPH CHAMBERLAIN** (Vol. 5, p. 813) and **ARTHUR J. BALFOUR** (Vol. 3, p. 250). Before turning from public to private finance the reader should study the articles **EX-CHEQUER** (Vol. 10, p. 54) and **TREASURY** (Vol. 27, p. 228).

For what may be called *private* finance, the student should turn first to the article **BANKS AND BANKING** (Vol. 3, p. 334; equivalent to nearly 60 pages in this Guide), by **Private Finance** Sir R. H. I. Palgrave, director of Barclay & Co., Ltd., Bankers; Charles A. Conant, author of *The Principles of Money and Banking*; and Sir J. R. Paget, author of the *Law of Banking*. Further information on the early history of banking in the United States will be found in the historical section of the article **UNITED STATES** (Vol. 27, especially p. 697), and in the article **ANDREW JACKSON** (Vol. 15, p. 107) by Prof. W. G. Sumner of Yale.

Next in his course of reading, he should study the article **MONEY** (Vol. 18, p. 694; equivalent to 45 pages in this Guide), by C. F. Bastable.

**Currency** This deals with: the functions and varieties of money, including coined money and all else that can take its place in *facilitating exchange, in estimating comparative values, as a standard of value or of deferred payments, as a store of value*; the determining causes of the value of money and of the quantity of money required by a country, the credit theory, early forms of currency—greenstones, ochre, shells, furs, oxen, grain; metals

as money; coinage and state control; representative money, and credit as money; economic aspects of the production and consumption of precious metals; review of the history of some important currencies—Greek, Roman, medieval, English and French coinages are treated in the article NUMISMATICS (Vol. 19, pp. 869-911, equivalent to 135 pages of this Guide, with 6 plates and 11 other text illustrations); which discusses such questions as the constitution of money; typical currency systems; statistics of production of gold and silver since the discovery of America, and coinage systems. Other relevant articles are BIMETALLISM, and MONETARY CONFERENCES for the relation of the metals; and the articles GOLD, SILVER, SEIGNIORAGE, DEMONETIZATION, GRESHAM'S LAW, TOKEN MONEY and GREENBACKS. In the article on the GEORGE JUNIOR REPUBLIC (Vol. 11, p. 749), the "children's state" at Freeville, N. Y., the student will find an interesting proof of the relation of "token" to "real" money. "The government issued its own currency in tin and later in aluminium and 'American' money could not be passed within the 48 acres of the Republic until 1906, when depreciation forced the Republic's coinage out of use and 'American' coin was made legal tender."

For information as to the methods of financial business the reader should study the articles SAVINGS BANKS (Vol. 24, p. 248) by Sir G. C. T. Bartley, founder of the National Penny Bank, and Bradford Rhodes, founder of the 34th St. National Bank, N. Y. FRIENDLY SOCIETIES (Vol. 11, p. 217); TRUST COMPANY (Vol. 27, p. 329), by Charles A. Conant, author of *The Principles of Money and Banking*;

CLEARING HOUSE (Vol. 6, p. 476); LETTER OF CREDIT (Vol. 16, p. 501); STOCK EXCHANGE (Vol. 25, p. 930); BILL OF EXCHANGE (Vol. 3, p. 940); EXCHANGE (Vol. 10, p. 50); FUTURES (Vol. 11, p. 375); TIME BARGAINS (Vol. 26, p. 988); MARKET (Vol. 17, p. 731), by Wynnard Hooper, financial editor of *The Times*, London, with sections on Movements of Prices, Cycles, Tendency to Equilibrium, Disturbance of Equilibrium, Future Delivery, Corners, Money Market, The Great Banks, Foreign Loans, and Discount Houses; CONSOLS (Vol. 6, p. 979); COUPON (Vol. 7, p. 318); DIVIDEND (Vol. 8, p. 331); and PREMIUM (Vol. 22, p. 279).

Information on distinctive banking and business laws in the separate states will be found in the section on finance of the article on each state. For instance in the article OKLAHOMA (Vol. 20, p. 60) there is a summary of the bank deposit guaranty fund.

For insurance see the chapter in this Guide *For Insurance Men*.

In financial biography, as in history, theory and practice, the Britannica is valuable because of its full, clear and

**Lives of** a u t h o r i t a t i v e  
**Financiers** t r e a t m e n t . The student will find articles on great financiers, such as the Astors, the Vanderbilts, the Barings, the Rothschilds, James Law, George Peabody, James Fisk, Jay Gould, E. H. Harriman, James J. Hill, J. P. Morgan; and on great authors on the subjects of economics and finance,—for instance, Malthus, Adam Smith, Walter Bagehot, Ricardo, Roscher, Boehm von Bawerk, Thorold Rogers, H. C. Carey, E. R. A. Seligman, F. A. Walker, J. W. Jenks, F. W. Taussig, Richmond Mayo-Smith and A. T. Hadley.

authoritative treatment. The student will find articles on great financiers, such as the Astors, the Vanderbilts, the Barings, the Rothschilds, James Law, George Peabody, James Fisk, Jay Gould, E. H. Harriman, James J. Hill, J. P. Morgan; and on great authors on the subjects of economics and finance,—for instance, Malthus, Adam Smith, Walter Bagehot, Ricardo, Roscher, Boehm von Bawerk, Thorold Rogers, H. C. Carey, E. R. A. Seligman, F. A. Walker, J. W. Jenks, F. W. Taussig, Richmond Mayo-Smith and A. T. Hadley.

#### ALPHABETICAL LIST OF ARTICLES IN THE ENCYCLOPAEDIA BRITANNICA OF INTEREST TO BANKERS

|                      |                |                    |               |
|----------------------|----------------|--------------------|---------------|
| Account              | Agio           | Allport, Sir J. J. | Anna          |
| Accountants          | Aguado, A. M.  | Alstromer, Jonas   | Annuity       |
| Achenwall, Gottfried | Alcavala       | Amortization       | Arbitrage     |
| Adams, Henry Carter  | Aldrich, N. W. | Angel              | Armour, P. L. |

- Ashley, W. J.  
 Assignats  
 Astor, John Jacob  
 (and family)  
 Atkinson, Edward  
 Attwood, Thomas  
 Audit and Auditor  
 Backwardation  
 Bagehot, Walter  
 Balance of Trade  
 Bank Notes  
 Bank Rate  
 Banks and Banking  
 Barbon, Nicholas  
 Baring (family)  
 Barter  
 Bastiat, Frédéric  
 Bates, Joshua  
 Baudrillard, H. J. L.  
 Bawbee  
 Baxter, Robert Dudley  
 Bemis, E. W.  
 Bezant  
 Biddle, Nicholas  
 Bill of Exchange  
 Bimetallism  
 Blanqui, J. A.  
 Bliss, C. N.  
 Block, Maurice  
 Bodin, Jean  
 Bodle  
 Boehm von Bawerk  
 Boisguilbert, Sieur de  
 Book-keeping  
 Bourse  
 Breaking Bulk  
 Brentano, L. J.  
 Broker  
 Bucketshop  
 Budget  
 Bullion  
 Buying in  
 Cairnes, John Elliott  
 Call  
 Capital  
 Carey, Henry Charles  
 Carli-Rubbi  
 Carrying-over  
 Cash  
 Chase, S. P.  
 Cheque, or Check  
 Chevalier, Michel  
 Child, Sir Josiah  
 Circular Note  
 Claffin, H. B.  
 Clark, John Bates  
 Clearing House  
 Cohn, Gustav  
 Coin  
 Coeur, Jacques  
 Colston, Edward  
 Combination  
 Commerce  
 Commercial Treaties  
 Consols  
 Contango  
 Cooke, Jay  
 Co-operation  
 Cooper, Peter  
 Cossa, Luigi  
 Coulisse  
 Coupon  
 Courcelle-Seneuil, J. G.  
 Cournot, A.  
 Coutts, Thomas  
 Cover  
 Credit  
 Crédit Foncier  
 Crockford, William  
 Crore  
 Crown (coin)  
 Cunningham, William  
 Custom Duties  
 Custom House  
 Davenant, Charles  
 Decker, Sir Matthew  
 Decimal Coinage  
 Delessert, J. P. B.  
 Delfico, Melchiorre  
 Demonetization  
 Dewey, Davis Rich  
 Dime  
 Discount  
 Distribution  
 Dividend  
 Dock Warrant  
 Dollar  
 Drawback  
 Drexel, A. J.  
 Ducat  
 Ely, Richard Theodore  
 Engel, Ernst  
 English Finance  
 Exchange  
 Exchequer  
 Excise  
 Farr, William  
 Farrer, Baron  
 Farthing  
 Florin  
 Field, Cyrus West  
 Fisk, James  
 Fix, Theodore  
 Fouquet, Nicolas  
 Franc  
 Free Trade  
 Friendly Societies  
 Futures  
 Gabelle  
 Gallatin, Albert  
 Ganilh, Charles  
 Garnier, C. J.  
 Garnier, Marquis  
 Genovesi, Antonio  
 George, Henry  
 Giffen, Sir Robert  
 Gilds  
 Gilbert, James William  
 Gioja, Melchiorre  
 Girard, Stephen  
 Goldsmid (family)  
 Gould, Jay (and family)  
 Grain Trade  
 Greenbacks  
 Gresham, Sir Thomas  
 Gresham's Law  
 Groat  
 Guinea  
 Gurney (family)  
 Hadley, A. T.  
 Hamilton, Alexander  
 Hamilton, Robert  
 Hanna, M. A.  
 Harriman, Edward H.  
 Haxthausen, L. von  
 Hermann, F. B. W. von  
 Hill, James J.  
 Horner, Francis  
 Horton, Samuel Dana  
 Hudson, George  
 Hufeland, Gottlieb  
 Income Tax  
 Ingram, J. K.  
 Insurance  
 Invoice  
 Jakob, L. H. von  
 Jenks, J. W.  
 Jesup, M. K.  
 Jevons, William S.  
 Jones, Richard  
 Kay, Joseph  
 Laing, Samuel  
 Lakh  
 Laveleye, E. L. V. de  
 Law, John  
 Lawrence, Amos  
 Le Play, P. G. Frédéric  
 Leroy-Beaulieu, P. P.  
 Leslie, Thomas E. C.  
 Letter of Credit  
 Levasseur, Pierre Emile  
 Levi, Leone  
 Lingen, Baron  
 Lipton, Sir T. J.  
 Lira  
 List, Friedrich  
 Lloyd's  
 McCulloch, John R.  
 Mackay, John William  
 Macleod, Henry Dun-  
 ning  
 Making-up Price  
 Malthus, Thomas Rob-  
 ert  
 Mark  
 Market  
 Marshall, Alfred  
 Marx, Heinrich Karl  
 Mayo-Smith, Richmond  
 Mint  
 Mohur  
 Moidore  
 Monopoly  
 Monetary Conferences  
 (International)  
 Money  
 Money-lending  
 Moon, Sir Richard  
 Moratorium  
 Morgan, John Pierpont  
 Morris, Robert  
 Morton, L. P.  
 Mun, Thomas  
 National Debt  
 Newmarch, William  
 North, Sir Dudley  
 Octroi  
 Overstone, 1st baron  
 Par  
 Paterson, William  
 Pauperism  
 Pawnbroking  
 Peabody, George  
 Pender, Sir John  
 Penny  
 Penrhyn, 2nd baron  
 Peseta  
 Petty, Sir William  
 Picayune  
 Pistole  
 Poll-tax  
 Pound  
 Premium  
 Price, Bonamy  
 Production  
 Profit-sharing  
 Protection  
 Proudhon, P. J.  
 Pyx  
 Quesnay, François  
 Raiffeisen, F. W.  
 Rau, Karl Heinrich  
 Rebate  
 Reciprocity  
 Revenue  
 Ricardo, David  
 Rockefeller, J. D.  
 Rodbertus, K. J.  
 Rogers, James Edwin  
 Roscher, W. G. F.  
 Rothschild (family)  
 Royalty  
 Rupee  
 Sadler, Michael Thomas  
 Sage, Russell  
 Saint-Simon, Comte de  
 Savings Banks  
 Say, Jean Baptiste  
 Say, Leon  
 Schäffle, A. E. F.  
 Schmoller, Gustav  
 Schulze-Delitzsch, F. H.  
 Seigniorage  
 Seligman, E. R. A.  
 Senior, Nassau William  
 Sequin  
 Shekel  
 Shell-money  
 Sherman, John  
 Shilling  
 Slater, John Fox  
 Smith, Adam  
 Sou  
 Sovereign (coin)  
 Spreckels, Claus  
 Stag  
 Stamp  
 Standards Department  
 Sterling  
 Stewart, Sir J. D.  
 Stewart, A. T.



|                        |                       |                       |                       |
|------------------------|-----------------------|-----------------------|-----------------------|
| Stock Exchange         | Title Guarantee Com-  | Trusts                | Wanamaker, John       |
| Sumner, W. G.          | panies                | Trust Company         | Watkin, Sir E. W.     |
| Tael                   | Token Money           | Tucker, Josiah        | Wealth                |
| Tariff                 | Tonnage and Poundage  | Vanderbilt, Cornelius | Wells, David Ames     |
| Taxation               | Tontine               | (and family)          | Window Tax            |
| Taussig, Frank William | Tooke, Thomas         | Wagner, Adolf         | Wolowski, L. F. M. R. |
| Thornton, Henry        | Torrens, Robert       | Wages                 | Wright, Carroll D.    |
| Thornton, W. T.        | Torrens, William Tor- | Walker, Francis Amasa | Zollverein            |
| Time Bargains          | rens M'Cullagh        | Walras, M. E. L.      |                       |

## CHAPTER XXVIII

### FOR CIVIL SERVICE MEN AND WOMEN AND STUDENTS PREPARING FOR SERVICE EXAMINATIONS

**F**EDERAL, state and municipal civil service includes so many specialized branches that a number of the chapters in Part 1 of this Guide, devoted to courses of reading adapted to various occupations (such as *For Teachers, For Engineers, For Builders and Contractors*) will supply useful indications. Part 2 of the Guide, containing classified courses of educational reading, will point to articles especially serviceable to those who are preparing for examinations and, for that reason, desire to review the ground they covered at school or college.

Part 4 of the Guide, with its special references to the subjects to which administration and legislation are chiefly directed, should be carefully examined. There the reader will find lists of articles dealing with schools and institutions; the defective classes; crime and alcohol; revenue and finance; ballot representation and suffrage; trusts, competition, co-operation and socialism; labour and immigration; legislation and the administration of justice; foreign relations and the expansion of the United States.

The present chapter, in order that repetition may be avoided, deals only with the aspects of federal, state and municipal government which are most

closely related to civil service organization. The article **CIVIL SERVICE** (Vol. 6, p. 412) devotes

**International Comparisons** nearly as much space to the British as to the American service,

and its information as to British organization, examinations, salaries and pensions will greatly interest those to whom the details needed for an international comparison have not been elsewhere accessible. Until 1855 all British appointments were by nomination; and although the service was quite free from the abominable system of secretly taxing salaries in order to support party funds, that was about all that can be said for it. There was hardly a pretense of selection for merit. Influential families and the relatives and personal friends of ministers of state and of ladies whom kings delighted to honor monopolized the appointments. Many posts were pure sinecures, and in many others the work was done by a substitute to whom the nominee paid less than half the salary or fees he received. Under George III the system was at its worst, and the discontent that was aroused in the American colonies by the maladministration of colonial affairs was "one of the efficient causes of the American revolution."

The reforms begun in 1855 had by 1870 been so successful that since then open competition has been the general rule; and where nomination is still required, as in the Foreign Office and the Education Department, searching examinations must be passed. Women are employed in the post-office, board of agriculture, customs, India office, department of agriculture, local government board and home office (factory inspectors, etc.). The age for compulsory retirement is 65, but the commissioners may prolong this five years in exceptional cases. Subjects of examinations, salaries and pensions are described in the article. Since 1859 there has been a superannuation pension of 10/60 of the annual salary and emoluments to any one serving 10 years and less than 11, and an additional sixtieth for each year's service more than ten.

In the same article there is an historical treatment of civil service in the United States and of its gradual reform and extension since 1883.

**Civil Service in the United States** This may well be supplemented by a study of the American party system of government and of the "spoils system" under which party loyalty and personal service to a party machine became the test of a candidate's fitness for office. For this the student should refer to the section (Vol. 27, p. 646) on *Constitution and Government*, of the article UNITED STATES, written by James Bryce, author of *The American Commonwealth* and formerly British ambassador to the United States; see p. 658-659, especially. There is also much information in the section *History* of the same article, especially paragraphs 168, 169 (p. 697) on the beginnings of the spoils system in Jackson's time, paragraph 333 (p. 722) on the beginnings of reform under Hayes, and paragraph 343 (p. 724) on Cleveland and civil service reform, etc.; and biographies of Andrew Jackson, W. L. Marcy and

Martin Van Buren (for the spoils system) and of George William Curtis, E. L. Godkin, Carl Schurz, R. B. Hayes, Grover Cleveland, Benjamin Harrison, William McKinley and Theodore Roosevelt.

Information in regard to the civil service systems of states and cities may be found in separate state and city articles,—in addition to the material on state and city systems in the articles already mentioned.

The wide-awake student who has read this far in this chapter and has referred to the articles mentioned in

the *Britannica*, will  
**"General Information" Papers** now be saying to himself: "There is evidently much valuable information in

the encyclopaedia about the history and status of civil service reform, and this seems as full and complete for the United States as for Great Britain. If other topics are as fully treated in the *Britannica*, it will be invaluable to me in preparation for general information papers for civil service examinations." And he will be right. For instance, the government employe must know more about the government and its machinery and history than does the average "man in the street",—and he can learn this from the *Britannica*.

As has already been pointed out, the main treatment of the government of the United States in the *Britannica* is by James Bryce. This means that it is authoritative and that it is interesting and that in both these qualities it is far superior to the usual text book of "civics" or "civil government." It occupies pp. 646-661 of volume 27, and is equivalent to about 50 pages of this Guide—so that it is more than a bare outline. And it is followed by a valuable bibliography of the subject to guide the student to the best books on any special topic which he may wish to pursue further.

But this is far from being all the information in the Britannica on the subject. The contribution of Mr. Bryce is only a part of the article UNITED STATES. The entire article would take up nearly 400 pages if printed in the style of this Guide. It treats the physical geography, geology, climate, fauna and flora, population, industries and commerce, government, finance, army and history of the country—the equivalent of 225 pages of this Guide is devoted to *History* alone. All parts of this article contain valuable information about the country; and this article is supplemented by hundreds of others:—

(a) Articles on each of the states, arranged much as in the article UNITED STATES with sections on history and government serving as an authoritative summary of the salient facts, and making up a complete course on state "civics," government and history;

(b) Articles on cities and towns with similar treatment of the distinctive elements in the government of each, and of the main points in their history;

(c) Separate articles on the important rivers, lakes, mountains and other topics in physical geography;

(d) Separate articles on topics in American history and government: such as NULLIFICATION, STATE RIGHTS, FUGITIVE SLAVE LAWS, ELECTORAL COMMISSION; and

(e) Biographies of great Americans, famous in war, politics, administration, business, science, art, religion,—in short all fields of activity.

In brief, whether for an examination on general information, on civics, on history, or on the special branch of the civil service to which the student wishes to be appointed, no book will give as valuable and complete information as the Britannica.

## CHAPTER XXIX

### FOR ARMY OFFICERS

IT is often said of an article in the Britannica that it is "*the last word* on the subject," so thoroughly has the authority of the book been recognized. This is quite as true of military articles as of those in any other field; but of the military articles it may also be said that they are the *first word*. Of course, there

#### A New Departure

have been, in previous editions of the Britannica and, to a less degree in minor works of general reference, articles on military history and biography. But in the new Britannica, for the first time, all branches of military knowledge are included, and the spirit of the entire treat-

ment is comparative and critical. The military student will find a discussion not merely of Napoleon's influence on army organization or Frederick's influence on cavalry (in the articles on these two leaders), but also of the influence of army organization on Napoleon (in the articles on the French Revolutionary Wars and the Napoleonic Campaigns), and of cavalry drill on the peculiar generalship of Frederick (in such articles as Seven Years' War, on Hohenfriedberg, and on Rossbach). Put more concretely, the novelty consists in the inclusion of articles on wars, campaigns and battles, chosen because of their importance in military as well as in political history,

and treated from the point of view of the military critic and with particular attention to the lessons they contain for the modern army officer. The care with which the battles and campaigns of the American Civil War are analyzed and criticized will be of singularly great interest to the American soldier, who will immediately notice among the contributors to the military department of the Britannica such names as those of Capt. C. F. Atkinson, author of *The Wilderness and Cold Harbour*, Major G. W. Redway, author of *Fredericksburg: A Study in War*, Col. G. F. R. Henderson, author of *Stonewall Jackson and the American Civil War*, and Col. F. N. Maude, lecturer in military history, University of Manchester.

The best starting point for a study of military affairs in the Britannica is the article **ARMY** (Vol. 2, p. 592; equivalent to more than 100 pages of this Guide). This "key" article may be outlined as follows:

#### General History

Early Armies—*Egypt* (chariots, infantry, archers). *Babylon* and *Assyria* (horsemen, charioteers, etc.). *Persian*, largely cavalry; the first "organized" army. *Greece*,—compulsory service; citizen militia; heavy infantry the strong arm; phalanx, the Greek formation. *Sparta*,—a nation in arms. *Greek mercenaries*. *Epaminondas* and *Thebes*—new phalanx tactics, "oblique order"; development of cavalry. *Alexander* and *Macedon*—a modified Theban system. *Carthage*—mercenary troops led by great generals, with modification of phalanx for greater elasticity. *Rome*—army under the Republic; its characteristics; under the Empire; see also separate article **ROMAN ARMY** (Vol. 28, p. 471), by Professor F. J. Haverfield of Oxford. The *Dark Ages*, the Byzantines, and the development of Feudalism. Medieval Mercenaries. Infantry in Feudal Times. *The Crusades*. *The Period of Transition* (1290-1490), development of English archers and of professional sol-

diery, — *condottieri*, *Swiss*, *Landsknechts*. *The Spanish army*: "at the disposal of its sovereign, trained to the due professional standard and organized in the best way found by experience." *The Sixteenth Century*—rise of the heavy cavalry armed with pistols, and fall of the pikemen. *Dutch System*—attention to minute detail; William the Silent and Maurice of Nassau. *Thirty Years' War*—the *Werbesystem*, small standing army to be increased by levy at time of need. *The Swedish Army*—conscription and feudal *indelta*; Gustavus. *The English Civil War*—real national armies; Cromwell and the "New Model" only an incident without influence on army organization. *Standing Armies*. French pre-eminence after Rocroi. Small field armies, well-fed and sheltered for economy's sake. *18th Century organization*: "linear" formation and its negative results. *Frederick the Great*: the art of war a formal science. *The French Revolution*: a "nation in arms," a war-machine more powerful than Frederick's. The conscription in France. *Napoleon*—his attempt to make a dynastic army out of the "nation in arms." *The Grande Armée* of 1805-1806; development of artillery; the army corps. The Wars of Liberation: new Prussian army; excellent Austrian organization. *Armies of 1815-1870*. *American Civil War*,—its slow decision. Contrast between French and Prussian staff systems in 1870. *Modern Developments*: German model followed slavishly except in Great Britain and the United States.

*Present Day Armies*: The general accounts of existing armies, and of the past organizations of each country, are supplemented by detailed information in the articles on different countries. Especial attention should be given to the military information in the article on Japan. *Army Systems: Compulsory Service; Conscription; Voluntary Service; Militia*.

#### Army Organization

The three chief arms—their relative importance: proportion on peace foot-

ing—5 or 6 guns per 1000 men, 16 cavalry soldiers to 1000 men of other arms; proportion in war—Russian (1905) 8½ guns per 1000 men of other arms, 60 cavalry to 1000 infantry; Japanese (1905), 2½ field guns per 1000 men, 87 cavalry to 1000 infantry. *Command: Brigade; Division; Army Corps, its constitution; Army; Chief Command of group of armies; chief of general staff and his relations to commander-in-chief*—for example, von Moltke and King William. *Branches of Administration*—war office and general staff.

*Table: Comparative strength of Various Armies.*

*British Army, Indian Army, Canadian Forces.*

*Austrian Army.*

*French Army.*

*German Army.*

*Italian Army.*

*Russian Army.*

*Spanish Army.*

*Turkish Army.*

*United States Army.*

*Armies of minor countries.*

*Bibliography (2000 words)*

Next in order the student should turn to the article WAR (Vol. 28, p. 305; equivalent to 40 pages of this Guide), by

### Theory and Practice

Col. G. F. R. Henderson, well known for his books on the American Civil War (*Fredericksburg, Stonewall Jackson, etc.*), with a section on *Laws of War*, by Sir Thomas Barclay. Col. Henderson's article lays down important general principles. An analysis of modern conditions shows that improved methods of communication have made war a much speedier process, in which the victorious general cannot make mistakes at the outset. That intellect and education count for more than stamina and courage was the lesson of the Franco-Prussian War—a lesson learned by the Prussians before that war. Modern war is a science and the amateur has little chance; in this respect things have changed. "It is im-

possible to doubt that had the Boers of 1899 possessed a staff of trained strategists, they would have shaken the British Empire to its foundations." There must be a concert between diplomacy and strategy. Civilian war ministers cannot solve strategic problems. The greater deadliness of modern warfare, and the greater moral effect of being under fire call for better foresight, strategy and *morale*. The relation of army and navy is discussed and the new doctrine of "sea-power" explained. (See the chapter *For Naval Officers* in this Guide). The remaining topics in the article are: weakness of allied armies; railways and sea as lines of operation; amphibious power; value of unprofessional troops and the need of professional leaders.

In the articles INFANTRY (Vol. 14, p. 517; 2 plates; equivalent to 35 pages of this Guide) and ARTILLERY (Vol. 2, p.

### Arms of Service

685; 2 plates; equivalent to 30 pages of this Guide), both by Capt. Atkinson, and in the article CAVALRY (Vol. 5, p. 563; illustrated with 2 plates and 1 cut; in length equivalent to 30 pages of this Guide), by Col. F. N. Maude, the student will find an elaborate treatment of the history, organization and tactics (especially since 1870) of each of these arms. For details of their organization and equipment he should read the articles ENGINEERS, STAFF, MOUNTED INFANTRY, SUPPLY AND TRANSPORT (MILITARY), OFFICERS, AMBULANCE, FORTIFICATION, MACHINE GUNS, COAST DEFENCE, ORDNANCE, BALLISTICS, SIGHTS, RIFLE, GUN, PISTOL, EXPLOSIVE, GUNPOWDER, GUNCOTTON, CORDITE and NITRO-GLYCERINE. In many geographical articles there are descriptions of the world's great fortifications, e. g., PARIS, ANTWERP, and VERDUN. Other topics of a more miscellaneous character are covered by the articles ARMY SIGNALING, PIGEON POST, SIGNALS, WAR GAME, MANOEUVRES, KITE, etc.



The military use of aeroplanes and balloons is very fully shown in the articles **FLIGHT** and **AERONAUTICS**.

Before taking up a systematic course in military history, there are two general articles that the military student should read: **TACTICS** (Vol.

**Strategy and Tactics** 26, p. 347; equivalent in length to 20 pages of this Guide),

by Maj. Neill Malcolm, editor of the *Science of War*; and **STRATEGY** (Vol. 25, p. 986; equivalent to 35 pages of this Guide), by Col. F. N. Maude. The former article should be compared with the sections on tactics in the articles **INFANTRY**, **CAVALRY** and **ARTILLERY**. Major Malcolm makes much of the continuity of military history, comparing Metaurus and Ramillies with the fighting in Manchuria, and Wellington at Maya with Oyama in his contest with Kuro-patkin. The mistakes that have been made once should not be made again; at least the careful student of tactical history may see to it that if they are repeated, it is done by his opponent and not by himself. Modern tactics are different from ancient because of greater fire-power and improved methods of transportation. Cavalry tactics are in an uncertain condition; there is no recent practice to serve as a guide, since neither in South Africa in the Boer war nor in Manchuria during the Russo-Japanese conflict was cavalry much used. Infantry must co-operate to make artillery bombardment effective. An interesting discussion of offensive and defensive fighting is summed up in the words "To the true general the purely defensive battle is unknown" and as evidence are adduced Wellington at Salamanca and Oyama at Sha-ho. Oyama's victory in the latter battle, it is pointed out, shows the increased ease of the process of envelopment, which has resulted in discarding corps artillery in favour of divisional artillery. The importance—and the possibility—of the counter stroke;

the danger of using for the relief of one's own troops forces which might better be launched at the enemy's weakest spot; and the similar unwisdom of any negative tactics, adopted to avoid loss, as in "holding attacks"—are the other principal points made in the article.

The article **STRATEGY** should be read in conjunction with the articles **ARMY** and **WAR**. It is impossible to summarize or outline it here, but it is worth noting that the article closes with a definition and discussion of the following terms: *Base; Line of Communication; Line of Operations; Exterior Lines; Obstacles*.

For a reasoned history of warfare in more detail than has been given in the general articles

**Military History and Criticism** already alluded to, the reader will find some outline like the

following valuable, the arrangement being roughly chronological and all words in *Italics* being titles of articles in the Britannica.

*Marathon; Darius; Miltiades; Herodotus.*

*Thermopylae; Leonidas; Salamis.*

*Peloponnesian War; Pericles; Cleon; Pylos; Brasidas; Alcibiades; Critias; Thucydides; Xenophon.*

*Epaminondas; Mantinea.*

*Philip II of Macedon; Olynthus; Chaeroneia; Alexander the Great; Arrian.*

*Pyrrhus.*

*Roman Army; Caudine Forks; Punic Wars; Carthage; Hanno; Hannibal; Hasdrubal; Mago; Trasimene; Fabius (Cunctator); Cannae; Scipio Africanus; Scipio Aemilianus; Aemilius Paulus; Perseus; Marius; Jugurtha; Sulla; Sertorius; Pompey; Caesar; Antonius (Mark Antony).*

*Charles Martel.*

*Charlemagne.*

*William I (of England); Hastings; Standard, Battle of.*

*Crusades (equivalent to 90 pages of this Guide); Godfrey of Bouillon; Raymund of Toulouse; Richard I (of*

England); *Philip II* (of France); *Saladin*; *Henry VI* (Roman Emperor); *Baldwin I*; *Frederick II*; *Louis IX* (of France).

*Bouvines.*

*Bannockburn*; *Robert Bruce.*

*Hundred Years' War*; *Philip VI*; *Edward III*; *Crécy*; *John of Bohemia*; *Edward* (the Black Prince); *Calais*; *Poitiers*; *John II* (of France); *Lancaster, House of* (for John of Gaunt); *Bertrand Du Guesclin*; *Henry V* (of England); *Agincourt*; *Joan of Arc*; *1st Duke of Bedford* (John Plantagenet); *Count of Dunois.*

*Wars of the Roses*; *St. Albans*; *Towton*; *Earl of Warwick* (Richard Neville); *Edward IV.*

*Ravenna, battle of*; *Bayard* (the chevalier); *Gaston de Foix*; *Pescara*; *Navarro*; *Marignan*; *Francis I* (of France).

*Flodden*; *James IV* (of Scotland); *Norfolk, 3rd Duke.*

*St. Quentin* (1557); *Coligny*; *Montmorency* (constable); *Emmanuel Philibert.*

*Alva*; *William the Silent* (Vol. 28, p. 672); *Maurice of Nassau*; *Farnese* (duke of Parma).

*Thirty Years' War*; *Maximilian I* (of Bavaria); *Frederick V* (elector palatinate; Vol. 11, p. 59); *Mansfeld*; *Tilly*; *Wallenstein*; *Gustavus Adolphus*; *Breitenfeld*; *Lützen*; *Bernhard of Saxe-Weimar*; *duc de Rohan*; *Frederick Henry*; *Gallas*; *Banér*; *Piccolomini*; *Turenne*; *Torstensson*; *Condé*; *Freiburg*; *Mercy*; *Nördlingen*; *Wrangel* (1618-1676); *Fronde.*

*Great Rebellion* (English Civil Wars of 1642-52); *Charles I* (of England); *Prince Rupert*; *Essex* (2nd Earl, Vol. 9, p. 782); *Edgehill*; *John Hotham*; *Baron Hopton*; *Sir William Waller*; *Duke of Newcastle* (1592-1676); *Fairfax of Cameron* (2nd and 3rd Barons); *Sir Bevil Grenville*; *Oliver Cromwell*; *Manchester, 2nd Earl of* (Vol. 17, p. 548); *Marston Moor*; *Leven*; *Skippon*; *Argyll, 8th Earl*; *Montrose*; *Lord Newark*; *Goring*; *Naseby*; *John Lambert*; *Charles Fleetwood*; *Dunbar*; *Thomas Harrison.*

*Dutch Wars*; *Louis XIV*; *Condé*; *Frederick William of Brandenburg*; *Turenne*; *Montecucculi*; *William III* (of England); *Duke of Luxembourg*; *Charles of Lorraine* (Vol. 17, p. 11).

*Vauban.*

*Grand Alliance, War of*; *Catinat*; *Luxembourg*; *Vauban*; *Fleurus*; *Louvois*; *Duc de Boufflers*; *Coehoorn*; *William III of England*; *Steenkirk*; *Neerwinden*; *Villeroi.*

*Spanish Succession*; *Marlborough*; *Eugene of Savoy*; *Villars*; *Peterborough*; *Ruvigny*; *Catinat*; *Vendôme*; *Blenheim*; *Ramillies*; *Oudenarde*; *Malplaquet*; *Berwick.*

*Polish Succession War.*

*Austrian Succession*; *Frederick the Great*; *Count von Schwerin*; *L. A. Khevenhüller*; *Duc de Broglie*; *Traun*; *Charles* (of Lorraine; Vol. 5, p. 936); *Seckendorf*; *George II* (of England); *Noailles*; *Conti* (Vol. 7, p. 28); *Hohenfriedberg*; *Fontenoy*; *comte de Saxe* (marshal); *Duke of Cumberland*; *Ligonier*; *Belle-Isle.*

*Seven Years' War* (with 5 diagrams); *Frederick the Great*; *Clive*; *Amherst*; *Wolfe*; *comte de Lally*; *Montcalm*; *Count von Browne*; *Ferdinand* (of Brunswick); *Daun*; *Zieten*; *F. E. J. Keith*; *Seydlitz*; *Roszbach*; *Soubise* (1715-1787); *Leuthen*; *Loudon*; *Kuneradorf*; *Finck*; *Minden*; *Sackville, 1st Viscount*; *Granby.*

*American War of Independence*; *Lexington*; *Concord*; *Bunker Hill*; *Joseph Warren*; *Israel Putnam*; *Thomas Gage*; *William Howe*; *Ethan Allen*; *Ticonderoga*; *George Washington*; *Benedict Arnold*; *Richard Montgomery*; *Long Island*; *Rufus Putnam*; *William Alexander*; *Trenton and Princeton*; *Henry Knox*; *Brandywine*; *Germanatown*; *Burgoyne*; *Bennington*; *John Stark*; *Saratoga*; *George Rogers Clark*; *Sir Henry Clinton*; *Monmouth*; *John Sullivan*; *Anthony Wayne*; *William Moultrie*; *Charleston* (S. C.); *Francis Marion*; *Thomas Sumter*; *Andrew Pickens*; *Horatio Gates*; *Nathaniel Greene*; *Cornwallis*; *Kalb*; *Camden*; *King's Mountain*; *Daniel Mor-*

gan; Henry Lee; Tarleton; Eutawville; Lafayette; Yorktown.

*French Revolutionary Wars* (with 6 diagrams); Dumouriez; Kellerman (1785-1820); Custine; Jemappes; Gribeauval; Neerwinden (1793); Clerfayt; Vendée; L. N. M. Carnot; Jourdan; Wattignies; Joubert; Frederick Augustus, Duke of York; Souham; Moreau; Kray von Krajova; Vandamme; Pichegru; Marceau; Charles, archduke of Austria (Vol. 5, p. 985); Masséna; Napoleon; Augereau; Serurier; Joubert; Sir W. Sidney Smith; Kléber; Alexandria; Oudinot; Suvarov; Borodino; Macdonald; Marengo; Murat; Lannes; Berthier; Bautzen.

*Napoleonic Campaigns* (9 diagrams; and see, on p. 238 of Vol. 19, "The Military Character of Napoleon"); Napoleon; Wrede; Murat; Charles XIV (Bernadotte); Marmont; Davout; Ney; Lannes; Soult; Berthier; Angereau; Dupont de l'Étang; Austerlitz; Kutusov; Hohenlohe (Vol. 18, p. 572); Blücher; Lasalle; Massenbach; Kalckreuth; Scharnhorst; Lefebvre-Desnoëttes; Count von Bennigsen; Eylau; Friedland; Grouchy; Mortier; Senarmon; Oudinot; Massena; Aspern-Essling; Charles, archduke of Austria; Bellegarde; Wagram; Beauharnais; Macdonald; Jerome Bonaparte (Vol. 4, p. 195); Barclay de Tolly; Bagration; Victor-Perrin; Yorck von Wartenburg; Lauriston; Wittgenstein; Bautzen; Schwarzenberg; Gouvion St. Cyr; Dresden (battle).

*Peninsular War*; Junot; Murat; Dupont de l'Étang; Moncey; Palafox y Melzi; Wellington; Sir John Moore; Sir David Baird; Talavera; Suchet; Sebastiani; Foy; Lord Hill; Lord Lynedoch; W. C. Beresford; Salamanca; Clausel; O'Donnell; Vitoria; Sir William Napier.

*American War of 1812*; Isaac Brock; Dearborn; Baltimore; Washington; New Orleans; Andrew Jackson; Jacob Brown; James Wilkinson; and for sea-fighting the titles in the chapter of this Guide: *For Naval Officers*.

*Waterloo Campaign* (with 8 maps);

Napoleon; Murat; Schwarzenberg; Barclay de Tolly; Wellington; Blücher; Lord Hill; Anglesey; D'Erlon; Gneisenau; Gérard; Grouchy; Vandamme; Thielmann; Bülow (1755-1816); Ney; Exelmans; Pajol; Picton.

*Greek Independence*; Ypsilanti; Mavrocordato; Coraës; Dundonald; Sir Richard Church.

*Russo-Turkish Wars* (1828-29); Paskevich; Diebitsch (1877-78); Osman; Skobelev; Plevna (with diagram); Todleben; Shipka Pass.

*Crimean War* (with 2 diagrams); Gorchakov; Hess; Raglan; Saint Arnaud; Canrobert; Pelissier; Menshikov (1787-1869); Bosquet; Todleben; Alma; Balaklava; Scarlett; Cardigan; Inkerman; Sir George Brown; Sir George Cathcart; Kinglake.

*Italian Wars* (1848-1870); Radetzky; Charles Albert of Sardinia (Vol. 5, p. 988); Durando; Pepe; Victor Emmanuel; Pelissier; Canrobert; La Marmora; Napoleon III; Forey; MacMahon; Bazaine; Wimpffen; Benedek; Niel; Custozza; Cialdini.

*American Civil War*; Bull Run; McDowell; Beauregard; J. E. Johnston; R. E. Lee; Rosecrans; Lexington, Mo.; Fremont; Nathaniel Lyon; F. P. Blair, Jr.; Pope; Burnside; B. F. Butler; McClellan; A. S. Johnston; G. H. Thomas; U. S. Grant; C. F. Smith; Lew Wallace; McClelland; Halleck; O. M. Mitchel; Shiloh; N. P. Banks; T. J. (Stonewall) Jackson; Shenandoah; Fair Oaks; Seven Days; A. P. Hill; D. H. Hill; J. E. B. Stuart; Braxton Bragg; Longstreet; Bull Run (second battle); Ewell; Sigel; Hooker; Kearny; Fitz-John Porter; Antietam; E. V. Sumner; Hood; Burnside; Van Dorn; Fredericksburg; W. B. Franklin; John F. Reynolds; D. N. Couch; Stone River; Hardee; A. McD. McCook; T. L. Crittenden; G. H. Thomas; J. C. Breckinridge; McPherson; Chancellorville; T. F. Meagher; Meade; Gettysburg; O. O. Howard; Doubleday; Early; Hancock; Sickles; Vicksburg; J. H. Morgan; Chickamauga; N. B. Forrest; Chattanooga; Sheridan; Wilderness (4 diagrams); Fitz-Hugh

*Lee; J. H. Wilson; G. K. Warren; John Sedgwick; Merritt; R. H. Anderson; Spottsylvania; Cold Harbor; Petersburg; Shenandoah Valley; Cedar Creek; W. T. Sherman; Marietta; Atlanta; Slocum; Schofield; Joseph Wheeler; J. A. Logan; Nashville; Richmond; Appomatox Court-House; Durham, N. C.*

*Seven Weeks' War* (with 2 diagrams): *William I* (of Germany); *Moltke; Benedek; Frederick III* (of Germany); *Frederick Charles* (of Prussia; Vol. 11, p. 61); *Steinmetz; Blumenthal; Hohenlohe - Ingelfingen* (Vol. 18, p. 578b); *Goeben*; and see *Italian Wars* above.

*Franco-German War; Napoleon III; Niel; Moltke; William I* (of Germany); *Steinmetz; Frossard; MacMahon; Wörth* (with plan); *Bazaine; Metz* (2 plans); *Alvensleben; Canrobert; Bourbaki; Leboeuf; Manteuffel; Caprivi; Prince Frederick Charles; Sedan* (with plan); *Vinoy; Wimpffen; Gallifet; Werder; Gambetta; Freycinet; Aurelle de Paladines; Orleans; Bourbaki; Le Mans; Chanzy; Faidherbe; Belfort; Clinchant; Paris.*

*Servo-Bulgarian War; Alexander of Bulgaria* (Vol. 1, p. 544); *Milan of Servia.*

*Greco-Turkish War; Edhem Pasha. Spanish-American War; Joseph*

*Wheeler; F. V. Greene; Roosevelt; Miles.*

*Transvaal* (Vol. 27, pp. 208 sqq. for Boer War of 1899-1902); *Kruger; Cronje; P. J. Joubert; Sir George White; Buller; Lord Roberts; Lord Kitchener; J. H. De la Rey; Christian DeWet; Louis Botha.*

*Russo-Japanese War* (with 4 diagrams); *Kuroki; Kuropatkin; Inouye; Oku; Nozu; Oyama.*

The military student will see from what has already been said that the Britannica is not merely a general work of

reference but a valuable aid in the study of military history, biography, theory, practice and phraseology. The following

alphabetical list names only the chief of the articles in the Britannica which make it a military cyclopaedia. As has been noticed above, many articles are special treatises in themselves dealing with many related topics, and—for instance—articles on wars or campaigns contain elaborate descriptions of separate battles. Many topics are treated in the Britannica, even if they are not in the following list, and their whereabouts may be readily learned by turning to the Index volume.

|                              |                              |                                   |                  |
|------------------------------|------------------------------|-----------------------------------|------------------|
| Abatis                       | Allan, Ethan                 | Army Corps                        | Bailey           |
| Accoutrement                 | Alma                         | Army Signalling                   | Baird, Sir David |
| Acinaces                     | Alva                         | Arnold, Benedict                  | Balaklava        |
| Adjutant                     | Alvensleben                  | Arquebus                          | Baldwin I        |
| Adjutant-general             | Ambush                       | Arrian                            | Ballistics       |
| Adye, Sir John Miller        | Ammunition                   | Arsenal                           | Bandolier        |
| Aelian (Aelianus Tacticus)   | American Civil War           | Artillery                         | Banér            |
| Aemilius, Paulus             | American War of 1812         | Asclepiodotus                     | Banks, N. P.     |
| Aeneas Tacticus              | American War of Independence | Aspern-Essling                    | Bannockburn      |
| Aeronautics                  | Amherst                      | Assegai                           | Barbette         |
| Agincourt, Battle of         | Anderson, R. H.              | Atlanta                           | Barclay de Tolly |
| Aide-de-camp                 | Anglesey                     | Augereau                          | Barracks         |
| Albert, Charles, of Sardinia | Antietam                     | Augsburg, War of the League of    | Barricade        |
| Alcibiades                   | Antonius (Mark Antony)       | Augustus, Frederick, Duke of York | Basinet          |
| Alexander                    | Antwerp                      | Aurelle de Paladines              | Bastion          |
| Alexander the Great          | Archery                      | Austerlitz                        | Batta            |
| Alexander, William           | Argyll, 8th Earl             | Austrian Succession, War of the   | Battalion        |
| Alexander of Bulgaria        | Arriet                       | Aventail or Avantaille            | Battering Ram    |
| Alexandria                   | Arms and Armour              | Bagration                         | Battle           |
| Alignment                    | Army                         |                                   | Bautzen          |
|                              |                              |                                   | Bayonet          |
|                              |                              |                                   | Bazaine          |

|                                |                              |                       |                                  |
|--------------------------------|------------------------------|-----------------------|----------------------------------|
| Bayard (the Chevalier)         | Caltrop                      | Colonel               | Echelon                          |
| Beauharnais                    | Camden                       | Colours, Military     | Edgehill                         |
| Beauregard                     | Camp                         | Colour-sergeant       | Edhem Pasha                      |
| Bedford, 1st Duke of           | Campaign                     | Commander             | Edward (the Black Prince)        |
| Belfort                        | Canadian Forces              | Commandeer            | Edward III                       |
| Bellegarde                     | Cannae                       | Commando              | Edward IV                        |
| Belle-Isle                     | Cannon                       | Commissariat          | Emmanuel Philibert               |
| Benedek                        | Canrobert                    | Concord               | Emmanuel, Victor                 |
| Bennigsen, Count von           | Canteen                      | Condé                 | Enceinte                         |
| Bennington                     | Cantonment                   | Condottiere           | Enfilade                         |
| Beresford, W. C.               | Capitulation                 | Conscription          | Engineers, Military              |
| Bernhard of Saxe-Weimar        | Caponier                     | Conti                 | Ensign                           |
| Berthier                       | Capri                        | Coraés                | Epaminondas                      |
| Berwick                        | Captain                      | Cordite               | Epaulette                        |
| Bivouac                        | Carabiniers                  | Cormontaigne, Louis   | Essex                            |
| Blair, F. P., Jr.              | Carbine                      | Cornwallis            | Eugene of Savoy                  |
| Blenheim                       | Cardigan                     | Corporal              | Eutawville                       |
| Blockhouse                     | Carnot, L. N. M.             | Corps                 | Ewell                            |
| Blücher                        | Carronade                    | Couch, D. N.          | Exelmans                         |
| Blumenthal                     | Carthage                     | Counterscarp          | Explosives                       |
| Blunderbuss                    | Cartridge                    | Countersign           | Eylau                            |
| Bomb                           | Carrington, H. B.            | Court Marshal         | Fabius (Cunctator)               |
| Bombardier                     | Casemate                     | Cox, J. D.            | Faidherbe                        |
| Bombardment                    | Case-Shot                    | Crécy                 | Fairfax of Cameron               |
| Bonaparte, Jerome              | Cashier                      | Crimean War           | Fair Oaks, Va.                   |
| Borodino                       | Castle                       | Critias               | Farnese (Duke of Parma)          |
| Bosquet                        | Catapult                     | Crittenden, T. L.     | Fascine                          |
| Botha                          | Catinar                      | Cromwell, Oliver      | Ferdinand (of Brunswick)         |
| Bouffiers, Duc de              | Caudine Forks                | Cronje                | Filibuster                       |
| Boulevard                      | Cavalry                      | Crusades              | Finck                            |
| Bourbaki                       | Cedar Creek, Va.             | Cuirass               | Fleetwood, Charles               |
| Bouvines                       | Chaeroneia                   | Cuirassiers           | Fleurus                          |
| Bragg, Braxton                 | Chancellorsville             | Cumberland, Duke of   | Flodden                          |
| Brandywine                     | Chanzy                       | Custine               | Flying                           |
| Brasidas                       | Chaplain                     | Custoza               | Flying Column                    |
| Breckinridge, J. C.            | Charlemagne                  | Cutlass               | Foix, Gaston de                  |
| Breitenfeld                    | Charles, Archduke of Austria | Dagger                | Folard, Jean Charles             |
| Brevet                         | Charles I (of England)       | Darius                | Fontenoy                         |
| Brialmont, H. A.               | Charles XIV (Bernadotte)     | Daun                  | Forey                            |
| Brigade                        | Charles Martel               | Davout                | Forlorn Hope                     |
| Brigandine                     | Charleston, S. C.            | Dearborn              | Forrest, N. B.                   |
| Benedetto Brin                 | Chassepot                    | Defile                | Fortification and Siegecraft     |
| Bronart von Schellendorf, Paul | Chattanooga, Tenn.           | Depot                 | Foy                              |
| Brown, Sir George              | Chesney, C. C.               | D'Erlon               | Francis I (of France)            |
| Brown, Jacob                   | Chesney, Sir G. T.           | De la Rey             | Franco-German War                |
| Brown Bess                     | Chevaux-de-frise             | Devolution, War of    | Franklin, W. B.                  |
| Browne, Count von              | Church, Sir Richard          | De Wet                | Frederick II                     |
| Bruce, Robert                  | Chickamauga Creek            | Diebitsch             | Frederick III (of Germany)       |
| Bullet                         | Chickamauga Creek            | Dirk                  | Frederick V                      |
| Buller                         | Cialdini                     | Division              | Frederick Charles (of Prussia)   |
| Bull Run                       | Circumvallation, Lines of    | Dodge, Theodore A.    | Frederick Henry                  |
| Bull Run (second battle)       | Clark, George Rogers         | Donelson, Fort        | Frederick the Great              |
| Bülow, Dietrich Heinrich       | Clausel                      | Doubleday             | Frederick William of Brandenburg |
| Bunker Hill                    | Clausewitz, Karl von         | Draagoon              | Fredericksburg, Va.              |
| Burgonet, or Burganet          | Claymore                     | Dresden               | Freiburg im Breisgau             |
| Burgoyne                       | Cleon                        | Du Guesclin, Bertrand | Fremont, J. C.                   |
| Burnside                       | Clerfayt                     | Dumouriez             | French Revolutionary Wars        |
| Busby                          | Clinchant                    | Dunbar                | Freycinet                        |
| Butler, B. F.                  | Clinch, Sir Henry            | Dundonald             | Friedland                        |
| Cadet                          | Clive                        | Dunes                 | Frigate                          |
| Cadre                          | Coast Defence                | Dunols, Count of      |                                  |
| Caesar                         | Coastguard                   | Dupont de l'Etang     |                                  |
| Calais                         | Coehoorn                     | Düppel                |                                  |
| Caliver                        | Cold Harbor                  | Durando               |                                  |
|                                | Cologne                      | Dutch Wars            |                                  |
|                                |                              | Early                 |                                  |



|                             |                              |                        |                           |
|-----------------------------|------------------------------|------------------------|---------------------------|
| Fronde                      | Henderson, G. F. R.          | Lafayette              | Marmont                   |
| Frossard                    | Henry V (of England)         | Lally, Comte de        | Marston Moor              |
| Fugleman                    | Henry VI (Roman Emperor)     | Lambert, John          | Martello Tower            |
| Fusilier                    | Herodotus                    | La Marmora             | Martial Law               |
| Gabion                      | Herrings, Battle of the      | Lancaster, House of    | Martinet                  |
| Gage, Thomas                | Hess                         | Lance                  | Masséna                   |
| Gallas                      | Hill, A. P.                  | Landsknecht            | Massenbach                |
| Gallifet                    | Hill, D. H.                  | Landsturm              | Massinissa                |
| Gambetta                    | Hill, Lord Rowland           | Landwehr               | Matross                   |
| Garrison                    | Hohenfriedberg               | Langlois, H.           | Maurice of Nassau         |
| Gates, Horatio              | Hohenlohe-Ingelfingen        | Lannes                 | Mavrocordato              |
| Gauntlet                    | Holster                      | Lasalle                | Maximilian I (of Bavaria) |
| General                     | Hood                         | Lauriston              | Meade                     |
| George II of England        | Hooker                       | Leboeuf                | Meagher, T. F.            |
| Gerard                      | Hopton, Baron                | Lee, Fitz-Hugh         | Menshikov                 |
| Germantown                  | Hostage                      | Lee, Henry             | Mercenary                 |
| Gettysburg                  | Hotham, John                 | Lee, R. E.             | Mercy                     |
| Gingal or Jingal            | Howard, O. O.                | Lefebvre-Desnoëttes    | Merritt                   |
| Glacis                      | Howe, William                | Legion                 | Metz                      |
| Gnelsenau                   | Howitzer                     | Le Mans                | Meuse Line                |
| Godfrey of Bouillon         | Hull, William                | Leonidas               | Milan of Servia           |
| Goeben                      | Hundred Years' War           | Leuthen                | Miles                     |
| Gorchakov                   | Hussar                       | Leven                  | Military Law              |
| Gorget                      | Infantry                     | Lexington              | Miltia                    |
| Goring                      | Inkerman                     | Ligonier               | Miltiades                 |
| Gouvion St. Cyr             | Inouye                       | Linstock               | Minden                    |
| Granby                      | Isly                         | Logan, J. A.           | Minute Men                |
| Grand Alliance, War of the  | Italian Wars                 | Long Island, N. Y.     | Mitchel, O. M.            |
| Grant, U. S.                | Jackson, Andrew              | Longstreet             | Moat                      |
| Grape                       | Jackson, T. J. ("Stonewall") | Lorraine, Charles of   | Moltke                    |
| Great Rebellion             | James IV (of Scotland)       | Loudon                 | Moncey                    |
| Greco-Turkish War           | Japan, Army                  | Louis IX (of France)   | Monmouth                  |
| Greek Fire                  | Jemappes                     | Louis XIV              | Montalembert              |
| Greek Independence, War of  | Joan of Arc                  | Louvois                | Montcalm                  |
| Greene, F. V.               | John of Bohemia              | Lützen                 | Montecuccoli              |
| Greene, Nathanael           | John II of France            | Luxembourg             | Montgomery, Richard       |
| Grenade                     | Johnston, A. S.              | Luxembourg, Duke of    | Montmorency (constable)   |
| Grenadier                   | Johnston, J. E.              | Lord Lynedoch          | Montrose                  |
| Grenville, Sir Bevil        | Jomini, Baron A. H.          | Lyon, Nathaniel        | Moore, Sir John           |
| Gribeauval                  | Joubert, P. J.               | McClellan              | Moreau                    |
| Grouchy                     | Jourdan                      | McClelland             | Morgan, Daniel            |
| Guards and Household Troops | Jugurtha                     | McCook, A. McD.        | Morgan, J. H.             |
| Guardship                   | Junot                        | Macdonald              | Morian                    |
| Guibert, Comte de           | Kalb                         | McDowell               | Mortier                   |
| Guichard, Karl Gottlieb     | Kalkreuth                    | McPherson              | Moselle Line              |
| Gun                         | Kearny                       | Macedon                | Moultrie, William         |
| Gun-cotton                  | Keith, F. E. J.              | Machine Gun            | Mounted Infantry          |
| Gunner                      | Kellermann.                  | MacMahon               | Murat                     |
| Gunpowder                   | Khaki                        | Mago                   | Musket                    |
| Gun-Room                    | Khevenhüller, L. A.          | Major                  | Muster                    |
| Gustavus Adolphus           | Kinglake                     | Malleson, George Bruce | Mutiny                    |
| Halbert                     | King's Mountain              | Malplaquet             | Napier, Sir William       |
| Halleck, H. W.              | Kitchener, Lord              | Mameluke               | Napoleon                  |
| Hamley, Sir Edward          | Kite                         | Manchester, 2d Earl of | Napoleonic Campaigns      |
| Hancock                     | Kléber                       | Military Manœuvres     | Napoleon III              |
| Hannibal                    | Knobkerrie                   | Mansfeld               | Naseby                    |
| Hanno                       | Knox, Henry                  | Manteuffel             | Nashville                 |
| Hardee                      | Kray von Krajova             | Mantineia              | Navarro                   |
| Harper's Ferry, W. Va.      | Kriegspiel                   | Marathon               | Needle-gun                |
| Harrison, Thomas            | Kruger                       | Marceau                | Neerwinden                |
| Hasdrubal                   | Kunersdorf                   | March                  | Newark, Lord              |
| Hastings                    | Kuroki                       | Marengo                | Newcastle, Duke of        |
| Haversack                   | Kuropatkin                   | Marietta, Ga.          | New Orleans               |
| Hellograph                  | Kutusov                      | Marignan               | Ney                       |
| Helmet                      | Laager                       | Marion, Francis        | Niel                      |
|                             |                              | Marius                 | Nitro-glycerine           |
|                             |                              | Marlborough            |                           |

|                         |                          |                            |                       |
|-------------------------|--------------------------|----------------------------|-----------------------|
| Noailles                | Pylos                    | Servo-Bulgarian War        | Thielmann             |
| Nördlingen              | Pyrrhus                  | Sérurier                   | Thirty Years' War     |
| Norfolk, 3rd Duke       | Quadrilateral            | Seven Days' Battle         | Thomas, G. H.         |
| Nozu                    | Quiver                   | Seven Weeks' War           | Thucydides            |
| O'Donnell, H. J.        | Radetzky                 | Seven Years' War           | Ticonderoga, N. Y.    |
| Officers                | Raglan                   | Seydlitz                   | Tilly                 |
| Oku                     | Ramillies                | Shenandoah Valley Campaign | Todleben              |
| Olynthus                | Range-finder, Tele-      | Sheridan                   | Torstensson           |
| Onosander               | meter or Position-finder | Sherman, W. T.             | Towton                |
| Ordnance                | Rapier                   | Shield                     | Transvaal             |
| Orleans                 | Rapparee                 | Shiloh                     | Trasimene             |
| Osman                   | Ravenna                  | Shipka Pass                | Traun                 |
| Oudenarde               | Raymund of Toulouse      | Sickles                    | Traverse              |
| Oudinot                 | Razia                    | Siege                      | Trébuchet             |
| Oyama                   | Reconnaissance           | Sigel                      | Trenton and Princeton |
| Pajol                   | Redan                    | Sights                     | Troop                 |
| Palafox y Melzi         | Redoubt                  | Signal                     | Turenne               |
| Panoply                 | Regiment                 | Silesian Wars              | Ulan                  |
| Parade                  | Retrenchment             | Sirdar                     | Uniforms              |
| Parados                 | Réveillé                 | Skippon                    | Vandamme              |
| Parallels               | Reynolds, John F.        | Skobelev                   | Van Dorn              |
| Paris                   | Richard I of England)    | Sling                      | Vauban                |
| Parole                  | Ricochet                 | Slocum                     | Vedette               |
| Partisan                | Richmond                 | Smith, C. F.               | Vegetius              |
| Paskevich               | Rifle                    | Smith, Sir W. Sidney       | Vendée                |
| Pasley, Sir C. W.       | Roberts, Lord            | Soubise                    | Vendôme               |
| Patrol                  | Rocket                   | Souham                     | Verdun                |
| Pavis, or Pavise        | Rohan, duc de            | Soul                       | Verdy du Vernois      |
| Pelissier               | Roosevelt                | Sowar                      | Veteran               |
| Peloponnesian War       | Ropes, J. C.             | Spahis                     | Vexillum              |
| Peninsular War          | Rosecrans                | Spanish-American War       | Vicksburg             |
| Pericles                | Roses, Wars of the       | Spanish Succession,        | Victor-Perrin         |
| Perseus                 | Rosbach                  | War of The                 | Villars               |
| Pescara                 | Rupert, Prince           | Spear                      | Villeroi              |
| Petard                  | Russo-Japanese War       | Spontoon                   | Vinoy                 |
| Peterborough            | Russo-Turkish Wars       | Spottsylvania              | Visor                 |
| Petersburg Campaign     | Rüstow, Friedrich W.     | Spur                       | Vitoria               |
| Petronel                | Ruvigny                  | Spy                        | Volunteers            |
| Petty-Officer           | Sackville, 1st Viscount  | Squadron                   | Wagram                |
| Phalanx                 | Saint Arnaud             | Staff, military            | Wallace, Lewis        |
| Phillip II (of Macedon) | St. Quentin              | Standard, Battle of        | Waller, Sir William   |
| Phillip II (of France)  | Salade, Sallet or Salet  | Stark, John                | Wallenstein           |
| Phillip VI              | Saladin                  | Steenkirk                  | Ward Room             |
| Piccolomini             | Salamanca                | Steinmets                  | War Game              |
| Pichegru                | Salamis                  | Stiletto                   | Warrant Officer       |
| Pickens, Andrew         | Saratoga, Battles of     | Stone River                | Warren, G. K.         |
| Picket                  | Saxe, Comte de (mar-     | Stony Point                | Warren, Joseph        |
| Picton                  | shal)                    | Strategy                   | Warwick, Earl of      |
| Pigeon Post             | Scabboard                | Strelitz                   | Washington, George    |
| Pike                    | Scarlett                 | Stuart, J. E. B.           | Waterloo Campaign     |
| Pistol                  | Scharnhorst              | Suchet                     | Wattignies            |
| Platoon                 | Schiavone                | Sulla                      | Wayne, Anthony        |
| Pneumatic Gun           | Schofield                | Sullivan, John             | Weapon                |
| Poitiers                | Schwarzenberg            | Sumner, E. V.              | Wellington            |
| Polish Succession, War  | Schwerin, Count von      | Sumter, Thomas             | Werder                |
| of the                  | Scimitar                 | Supply and Transport       | Wheeler, Joseph       |
| Polyaenus               | Scipio Aemilianus        | (Military)                 | White, Sir George     |
| Pompey                  | Scipio Africanus         | Sutler                     | Wilderness, Va.       |
| Poniard                 | Scout                    | Suvarov                    | Wilkinson, James      |
| Pontoon                 | Sebastiani               | Swold                      | William the Silent    |
| Pope                    | Seckendorf               | Sword                      | William I (of Eng-    |
| Porter, Fitz-John       | Sedan                    | Tactics                    | land)                 |
| Press Gang              | Sedgwick, John           | Talavera de la Reina       | William III (of Eng-  |
| Propellants             | Senarmont                | Target                     | land)                 |
| Punic Wars              | Sentinel or Sentry       | Tarleton                   | William I (of Ger-    |
| Purser                  | Serjeant                 | Tattoo                     | many)                 |
| Putnam, Israel          | Sertorius                | Thermopylae                | Wilson, J. H.         |
| Putnam, Rufus           |                          |                            | Wimpffen              |

Wittgenstein  
Wolfe  
Wood, Sir H. E.  
Worth

Wrangel  
Wrede  
Xenophon  
Yataghan

Yeomanry  
York von Warten-  
burg  
Yorktown, Va.

Ypsilanti  
Zieten  
Zouave

## CHAPTER XXX

### FOR NAVAL OFFICERS

**T**HE scope of a naval officer's professional interests is so broad that the present chapter of this Guide could not, without duplicating other chapters, indicate all the aspects of the Britannica with which he is directly concerned. And he will find that his use of the Britannica is simplified by the subdivisions about to be specified, which virtually present his subjects under four different heads. Of course he may be called upon, in the exercise of his duties, simultaneously to think and to act in all his capacities, to concentrate upon the swift solution of one problem his knowledge of warfare, of shipbuilding, of navigation and of mechanical engineering; but his reading upon these topics naturally divides itself into these four parts.

Inasmuch as army officers, even when they are at sea, are passengers, and, save in relation to the discipline of their troops,

#### Three Other Relevant Chapters

have nothing to do with the ship's management, it could not be assumed that the present chapter would appeal to them. But naval officers, when co-operating in a land expedition, need to employ every kind of knowledge that is of use to army officers, and as the chapter *For Army Officers* in this Guide would therefore in any case be read by them, it has seemed convenient to include in it the description of those articles in the Britannica which deal with war in general.

The chapter *For Marine Transportation Men* in this Guide is also one to which the naval officer should refer, as it deals with ships and navigation in general. The articles SHIP and SHIPBUILDING mentioned in that chapter are (except for the historical section of the former) by Sir Philip Watts, designer of the British "Dreadnoughts" and "Super-Dreadnoughts;" and the article SHIPPING is by Douglas Owen, of the Royal Naval War College at Portsmouth. Obviously these and many other articles described in that chapter are of the greatest importance to naval officers.

The chapter *For Engineers* in this Guide describes the articles dealing with steam engines, internal combustion engines, electrical machinery and fuels of all kinds; and it would be a waste of space to repeat in this chapter a summary of the Britannica treatment of these subjects.

All three of the chapters mentioned should therefore be treated as forming constituent parts of the general plan of this present chapter, in which the naval officer will find no repetition of their contents.

The article to which he will naturally first turn is NAVY AND NAVIES (Vol. 19, p. 299), by David Hannay,

**The Key Article** author of *A Short History of the Royal Navy*. This article is equivalent to 60 pages of this Guide in length. It contains:

*Naval Personnel.*

Sketches of the *Administrative History* of navies: *Athenian; Roman; Byzantine; Medieval; British*, with special attention to the period since the Restoration, and the reforms under James II when Samuel Pepys was secretary;

*French*—modern navy dating from the time of Richelieu;

*Spanish*—a great navy without an organization before the 18th century;

*Dutch*—good seamen and well-fed, led by able admirals, but unorganized, and unimportant after the 17th century;

*United States*—the first great extra-European power on the sea;

*Russian*—dating from the reign of Peter the Great, when it was organized and led by foreigners.

*The Balance of Navies in History*: influence of sea-power—"when Napoleon fell, the navy of Great Britain was not merely the first in the world; it was the only powerful navy in existence." *Modern Rivalry* between Italy and Germany (1871), United States (1890), Japan; England and the Dual Alliance—"naval scares" since 1874; British Naval Defence Act of 1889; Russia's navy crushed (1904); new navies rivalling Great Britain and France,—Italy, Germany, United States, Japan.

*Latest developments*: "Dreadnoughts"; Building Programmes.

*Bibliography* (about 1800 words).

*Naval Strategy and Tactics*.

*Historical evolution*: inter-relation of the ship's capacity and armament.

*Early history*: ramming demanded oars for propulsion; small warships, large fighting crews,—no blockade, short cruises;

*Greek and Roman methods*: boarding introduced by Romans; "bearding," that is, fortifying with iron bands across the bows, an early form of armor plate.

*Sailing ships*: ramming discarded; "line ahead" formation displaces "line abreast"; principles of fighting tac-

tics—order at beginning to be kept throughout, thus no advantage taken of enemy's disorder; Clerk's theories (1790-97)—not maximum safety but immediate mêlée the *desideratum*; Suffren, Rodney and Howe and their disregard of accepted tactics.

*Improved ship-building and modern times*: New problems—steam propulsion, its gain in speed, but its dependence on fuel; fleet in being; risk of transporting troops while enemy is unbeaten; ramming and pell-mell battles forbidden by torpedoes; searchlight as check to torpedoes; failure of attempts to "bottle up" harbours; gun-fire still the great factor; position; speed; submarines still an unknown factor.

*Bibliography.*

The first part of this article NAVY AND NAVIES should be supplemented by the article ADMIRALTY ADMINISTRATION (Vol. 1, p. 195), by Admiral Sir R. Vesey Hamilton, and, for the United States, the late Admiral W. T. Sampson. The American part of this article describes the divisions and the working of the Navy Department, its bureaus, judge advocate-general, office of naval intelligence, boards etc.; and there is additional information on the subject in such articles as DOCKYARDS, and UNITED STATES NAVAL ACADEMY.

For the legal side of naval administration the reader should study the article ADMIRALTY JURISDICTION (Vol. 1, p. 205), by Sir Walter Phillimore, former president of the International Law Association (and author of the Britannica article ADMIRALTY, HIGH COURT OF, and, for the United States, by J. Arthur Barrett; and also the general articles INTERNATIONAL LAW (Vol. 14, p. 694), by Sir Thomas Barclay, author of *Problems of International Practice and Diplomacy*, and INTERNATIONAL LAW, PRIVATE (Vol. 14, p. 701), by Dr. John Westlake, formerly professor of international law, Cambridge University, and member for the United King-

dom of the International (Hague) Court of Arbitration; as well as such special articles as SEARCH (Vol. 24, p. 560), by Sir Thomas Barclay, and SEA LAWS (Vol. 24, p. 535), by Sir Travers Twiss.

It has already been noticed that the closing part of the article NAVY AND NAVIES dealt with strategy and tactics in a general way. This subject

**Policy,** subject is treated in fuller detail by Admiral Sir Cyprian  
**Strategy,** detail by Admiral Sir Cyprian  
**Tactics** Bridge, G.C.B. (former Director of Naval Intelligence,

British Navy, author of *Sea-Power and other Studies*) in two articles SEA-POWER (Vol. 24, p. 548) and SEA, COMMAND OF THE (Vol. 24, p. 529). Each of these articles will be of great value and interest to the naval officer as a summary and criticism of the theories of Captain A. T. Mahan and Vice-Admiral P. H. Colomb; and this will be made evident by the brief outline of the two articles which follows.

Article, SEA-POWER — Use of the term to mean (1) a state pre-eminently strong at sea; and (2)—as in this article—the various factors in a state's naval strength. Thucydides as a forerunner of Mahan; he makes Pericles in comparing Athenian resources with those of her enemies comment on the importance of "sea-power."

The meaning of sea-power can only be learned historically. Although there have been more land-wars, "the course of history has been profoundly changed more often by contests on the water." Salamis saved Greece and held back Oriental invasion. The loss of the Peloponnesian War by Athens was due to her weakening sea-power. The First Punic War, Roman rather than Carthaginian control of the Mediterranean, was won by Roman naval predominance. Mahomedan conquest spread west in Africa only with the creation of a navy. The crusades could not have continued had not Mahomedan naval power sunk as the Venetian, Pisan, and Genoese grew. The defeat of Genoa by Venice gave the latter a right to perform the ceremony of

"wedding the sea" with a ring as token of "perpetual sway." Lepanto (1571) the end of Turkish sea-power.

Spanish and Portuguese sea-power crushed by English growth and the loss of the Armada. Early English naval history: the importance of the battle of Dover in 1217. Appearance of standing navies. The New World and its influence on sea-power. The sea-power of the Dutch; its sudden rise; its basis in foreign trade; the Dutch wars with England resulted in England's becoming the first great naval power, but did not crush the United Provinces because of their sea-power. Torrington and the "Fleet in Being" in 1690. Change in naval operations in 17th century—the scene thereafter in the enemy's waters, not near the coast of England.

The 18th century. Rise of Russia's sea-power — an artificial creation. Seven Years' War and its gains to Great Britain. War of American Independence: British mistakes — the enemy's coast *not* considered the frontier. Wars of the French Revolution and Empire: Great Britain's advantage not in organization, discipline or "science," but in sea-experience.

The War of 1812. "The British had now to meet the *élite* of one of the finest communities of seamen ever known. . . . In any future war British sea-power, great as it may be, should not receive shocks like those that it unquestionably did suffer in 1812."

Later Manifestations of Sea-Power. American Civil War—"By dominating the rivers the Federals cut the Confederacy asunder; and, by the power they possessed of moving troops by sea at will, perplexed and harassed the defence, and facilitated the occupation of important points." Russo-Turkish War of 1877-78—Turkish control of Black Sea forced Russians to invade by land through the difficult Balkans. Chilean Civil War of 1891—an army defeated by a navy. Chino-Japanese War of 1894-95—Japanese navy in transport work and in crushing last resistance. Spanish-American War: "Spaniards



were defeated by the superiority of the American sea-power."

Article, SEA, COMMAND OF THE—Sketch of Sovereignty of the Sea; Command different from Sovereignty or Dominion.

Attempts to gain Command: Dutch Wars.

Strategic Command or Control—largely the power of carrying out considerable over-sea expeditions at will. Seeking the enemy's fleet. Temporary command in smaller operations.

As for the army officer, so the Britanica has for the naval officer many separate articles on wars, campaigns, battles, generals, commanders.

**Special Historical Articles** The following list of articles will serve as a guide to a course of reading constituting a history of naval warfare, furnishing the concrete separate facts on which are based the articles already described.

#### Ancient History.

Greece: articles *Salamis*, *Themistocles*, *Xerxes I*, *Peloponnesian War*, *Pericles*.

Rome: articles *Punic Wars*, *Carthage*, *Pompey*, *Actium*.

#### Medieval History.

*Crusades*; *Swold*; *Dover*, *Battle of*; *Sluys*, *Battle of*; *Espagnols sur Mer* (and article *Edward III*), *Chioggia* (and articles *Venice* and *Genoa*).

#### 16th Century.

*Lepanto* (and article *Don John of Austria*).

*Armada* (and articles on *Howard*, *Hawkins*, *Drake*, *Frobisher*, *Raleigh*, *Richard Grenville*, and the other heroes of this first bright glow of England's naval glory).

#### The Era of Sailing Vessels.

*Dutch Wars* (and articles *Tromp*, *Robert Blake*, *Ayscue*, *De Ruyter*, *Cornelius De Witt*, *William Penn*, *George Monk*, *Sir John Lawson*, *James II*, *Prince Rupert*, *First Earl of Sandwich*, *Abraham Duquesne*).

*Grand Alliance, Naval Operations* (and articles *Earl of Torrington*, and *Beachy Head, Battle of*; *La Hogue, Earl of Oxford* [Edward Russell] and *Tourville*).

*Spanish Succession, Naval Operations* (and *Château-Renault*, *Benbow*, *Rooke*, *Cloudeley Shovel*, *Duguay-Trouin*, *Forbin*).

*Austrian Succession, Naval Operations* (and the articles *Edward Vernon*, *Lord Anson*, *Toulon, Battle of*, and *Thomas Mathews*, marking the official sanction in England of an absurd formal system of tactics).

*Seven Years' War, Naval Operations* (and *Boscawen*, *Byng*, *Hawke*, *Pocock*, *Quiberon*).

*American War of Independence, Naval Operations* (and *Essek Hopkins*, *John Paul Jones*, *Comte d'Estaing*, *Suffren St. Tropez*, *Thomas Truxtun*, *Lord Howe*, *John Byron*, *Hotham*, *Hyde Parker*, *Rodney*, *Guichen*, *Comte de Grasse*).

*French Revolutionary Wars, Naval Operations* (and *First of June, Battle of*, *Howe*, *Villaret de Joyeuse*, *Lord Bridport*, *Lord Hood*, *Earl of St. Vincent* [John Jervis], *St. Vincent, Battle of*, *Lord Keith*, *Lord Duncan*, *Nile*, *Nelson*, *Sir Thomas Troubridge*).

*Napoleonic Campaigns, Naval Operations* (and *Baron de Saumarez*, *Copenhagen, Battle of*, *Sir Hyde Parker*, *Sir Robert Calder*, *Villeneuve*, *Trafalgar*, *Lord Collingwood*).

*American War of 1812* (and *John Rodgers*, *Isaac Hull*, *William Bainbridge*, *Stephen Decatur*, *David Porter*, *Oliver Hazard Perry*, *Sir Philip Broke*, *Thomas Macdonough*).

And *Lissa* (1811), closely resembling *Trafalgar*, and *Navarino*, decisive for Greek Independence.

#### The Era of Steam.

*American Civil War* (and *Hampton Roads*, *Andrew Hull Foote*, *New Madrid*, *D. G. Farragut*, *D. D. Porter*, *W. B. Cushing*).

*Chile-Peruvian War.*  
*Chilean Civil War.*  
*Chino-Japanese War* (and see *Ito*).  
*Spanish-American War* (and see the articles *W. T. Sampson*, *W. S. Schley*, *George Dewey*, *Pascual Cervera y Topete Cervera*).  
*Russo-Japanese War* (and *Togo*, *Dogger Bank*, *Tsushima*).

The subject of *armaments* is treated in the articles SHIP and SHIPBUILDING (see

*chapter For Marine Transportation Men*),  
 ARMOUR PLATES, with illustrations, by Major William Eger-ton Edwards, late lecturer at the Royal Naval War College, Greenwich, ORDNANCE, AMMUNITION, TORPEDO, etc.

The following is an alphabetical list of articles in the Britannica of especial interest to naval officers or other students of naval warfare.

|                              |                           |                      |                        |
|------------------------------|---------------------------|----------------------|------------------------|
| Actium                       | Cushing, W. B.            | Hull, Isaac          | Range-finder           |
| Admiral                      | Decatur, Stephen          | International Law    | Rodgers, John          |
| Admiralty Administration     | d'Estaing                 | James II             | Rodney                 |
| Admiralty Jurisdiction       | De Ruyter                 | Jones, John Paul     | Rooke                  |
| American Civil War           | De Saumarez, Baron        | Keith, Lord          | Rupert, Prince         |
| American War of Independence | Dewey, George             | La Hogue             | Russo-Japanese War     |
| American War of 1812         | DeWitt, Cornelius         | Lawson, Sir John     | Saint-Bon              |
| Ammunition                   | Dockyards                 | Lepanto              | Saint Vincent          |
| Anson, Lord                  | Dogger Bank               | Liner                | Saints, Battle of the  |
| Armada                       | Dover, Battle of (1217)   | Lissa (1811, 1866)   | Salamis                |
| Armour Plates                | Drake                     | Macdonough, Thomas   | Sampson, W. T.         |
| Arms and Armour              | Duguay-Trouin             | Madrid, New          | Sandwich, 1st Earl of  |
| Ayscue                       | Duilius                   | Mahan                | Schley, W. S.          |
| Bainbridge, William          | Duncan, Lord              | Marines              | Sea, Command of the    |
| Beachy Head                  | Duquesne, Abraham         | Mathews, Thomas      | Sea Laws               |
| Benbow                       | Dutch Wars                | Meloria              | Seamanship             |
| Beresford                    | Edward III                | Miaoulis             | Sea-Power              |
| Blake, Robert                | Espagnols sur Mer         | Midshipman           | Search                 |
| Boscawen                     | Farragut, D. G.           | Monk, George         | Seven Years' War       |
| Bridport, Lord               | Fireship                  | Napoleonic Campaigns | Ship, Shipbuilding     |
| Broke, Sir Phillip           | First of June             | Nauarchia            | Shovel, Cloudesley     |
| Byng                         | Flagship                  | Naucrary             | Sluys                  |
| Byron, John                  | Fleet                     | Naval Operations     | Spanish-American War   |
| Calder, Sir Robert           | Flying Column             | Navarino             | Spanish Succession     |
| Camperdown                   | Foote, Andrew Hull        | Navy and Navies      | Squadron               |
| Carthage                     | Forbin                    | Nelson               | Submarine Mines        |
| Casemate                     | French Revolutionary Wars | Nile, Battle of the  | Suffren, St. Tropez    |
| Case-shot                    | Frigate                   | Ordnance             | Swold                  |
| Cervera                      | Frobisher                 | Oxford, Earl of      | Themistocles           |
| Château-Renault              | Genoa                     | Parker, Hyde         | Togo                   |
| Chile-Peruvian War           | Grand Alliance            | Parker, Sir Hyde     | Torpedo                |
| Chilean Civil War            | Grasse, Comte de          | Peloponnesian War    | Torrington             |
| Chino-Japanese War           | Grenville, Richard        | Penn, William        | Toulon, Battle of      |
| Chioggia                     | Greek Independence        | Pepys                | Tourville              |
| Coaling Stations             | Guardship                 | Perieles             | Trafalgar              |
| Coast Defence                | Guichen                   | Perry, Oliver Hazard | Tromp                  |
| Coast Guard                  | Hampton Roads             | Piracy               | Troubridge, Sir Thomas |
| Codrington                   | Hawke                     | Pocock               | Truxtun, Thomas        |
| Coligny                      | Hawkins                   | Pompey               | Tsu-shima              |
| Collingwood, Lord            | Hood, Lord                | Porter, David        | U. S. Naval Academy    |
| Colomb                       | Hopkins, Esek             | Porter, D. D.        | Venice                 |
| Commodore                    | Hotham                    | Privateer            | Vernon, Edward         |
| Copenhagen, Battle of        | Howard                    | Punic Wars           | Villaret de Joyeuse    |
| Crusades                     | Howe, Lord                | Quiberon, Battle of  | Villeneuve             |
|                              |                           | Raleigh              | Xerxes I               |

## **PART II**

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**COURSES OF EDUCATIONAL READING  
TO SUPPLEMENT OR TAKE THE  
PLACE OF SCHOOL OR  
UNIVERSITY STUDIES**



## CHAPTER XXXI

### MUSIC

**T**HE general articles on music in the Encyclopaedia Britannica provide an illuminative discussion of broad artistic principles which cannot fail to stimulate the musical sense and perception of the professional or the amateur. The technical and critical treatment of the subject was directed by Donald F. Tovey, composer, pianist, and author of *Essays in Musical Analysis*; and no one could be better fitted for the work of organizing this department of the Britannica. He was assisted by W. H. Hadow, the well-known musical writer and composer, J. A. Fuller Maitland, musical critic of *The Times* (London), E. J. Dent, author of *Alessandro Scarlatti and His Works*, R. H. Legge, principal musical critic on the *Daily Telegraph* (London), and others; and the section treating of musical instruments was organized and contributed by Miss Kathleen Schlesinger, the greatest living authority on the subject.

In mapping out courses of reading the subject is divided into sections as follows: (1) Evolution, (2) Theory, (3) Musical Forms, (4) Musical Instruments.

The article MUSIC (Vol. 19, p. 72), by Donald Tovey, which contains a masterly account of the development of the art from the earliest time down to the present day, provides the reader with just that general survey which enables him to see the whole picture in perspective. This he will naturally turn to first, but to fill out the picture there are a number of other articles which he will wish to read. In the following scheme the evolution of the art has been sketched in skeleton, so that the student may have before him a guide to the study of any period in which he is specially interested. This outline serves to show how very thoroughly the ground is covered in the new Encyclopaedia Britannica.

#### (1) EVOLUTION OF MUSIC

*Subject for Reading* *Article*

##### PRE-HARMONIC STAGE

|  |  |
|--|--|
| Primitive Music.   | MUSIC (Vol. 19, p. 72).<br>SONG (Vol. 25, p. 406).         |
| Musical sense first awakened by the rhythm of the dance. | DANCE (Vol. 7, p. 795); see also RHYTHM (Vol. 23, p. 278). |
| Legendary account of the invention of music by a Judean. | DAVID (Vol. 7, p. 859).                                    |
| Hebrew music: setting of the Psalms.                     | PSALMS, BOOK OF (Vol. 22, p. 589 and p. 586).              |
| Suggested Jewish origin of some Gregorian Tunes.         | PLAIN SONG (Vol. 21, p. 706).                              |



- Dawn of modern music in Greece. Connection of music with lyric poetry. Terpander of Lesbos (660 B.C.) adds 3 strings to the 4-stringed lyre, giving compass of octave. **GREEK LITERATURE** (Vol. 12, p. 509).
- Characteristics of Greek music. Pythagoras (6th century, B.C.) fixes the intervals of the harmonic series and of the diatonic scale. **MUSIC** (Vol. 19, p. 73); see also **PYTHAGORAS** (Vol. 22, p. 699).
- The Greek scale shows a latent harmonic sense, though octaves only allowed. **LYRE** (Vol. 17, p. 178); see also **ORCHESTRA** (Vol. 20, p. 168); **AULOS** (Vol. 2, p. 917); **CITHARA** (Vol. 6, p. 895).
- Pitch in Greek music. **HARMONY** (Vol. 13, p. 1).
- Other primitive systems without influence on modern music. Chinese adopted Pythagorean system; a lost art recovered in 3rd century, A.D. **PITCH, MUSICAL** (Vol. 21, p. 661).
- Indian music—Scale of 22 intervals. **CHINA, Literature** (Vol. 6, p. 228 and p. 215).
- Siamese music: 7 tone scale; orchestras perform in unison. **SANSKRIT** (Vol. 24, p. 181).
- The music of the North American Indian. **SIAM** (Vol. 25, p. 5).
- INDIANS, NORTH AMERICAN** (Vol. 14, p. 470).

Biographies of musicians of the primitive, non-harmonic, period in the Britannica are: TERPANDER, 7th century B.C.; PYTHAGORAS, 6th century B.C.; ARISTOXENUS, 4th century; ALYPIUS, 3rd century B.C.; ARISTIDES, QUINTILIANUS, 3rd century.

### HARMONIC ORIGINS

The Greeks found that by doubling the melody at the octave a greater sonority resulted. It was a great step from this to the discovery that two separate tunes could be combined which should be satisfying to the ear. With this discovery modern harmony may be said to have begun.

#### *Subject*

- Awakening of the harmonic sense.
- The Grecian modes modified into the ecclesiastical by Ambrose in the 4th century.
- Following Hucbald, "beatus Guido inventor musicae" in the 11th century, invents names for the notes and improves system of notation.

#### *Article*

- MUSIC** (Vol. 19, p. 74); **HARMONY** (Vol. 13, p. 1).
- PLAIN SONG** (Vol. 21, p. 705); see also **AMBROSE** (Vol. 1, p. 798), and **GREGORY** (Vol. 12, p. 567).
- GUIDO OF AREZZO** (Vol. 12, p. 687); see also **HUCBALD** (Vol. 13, p. 847).

- The Troubadour becomes a learned musician in the 13th century. ADAM DE LA HALE, 13th century (Vol. 1, p. 171); MACHAUT (Vol. 17, p. 233).
- After Dunstable of England and Dufay of the Netherlands had invented counterpoint comes the first great composer, heralding the advent of the "Golden Age." DES PRÉS, JOSQUIN (Vol. 8, p. 103); see also BINCHOIS, EGIDIUS (Vol. 8, p. 948).

### THE GOLDEN AGE

Composers were not long content with the simple combination of two tunes. They soon found that three tunes so treated afforded a yet richer texture, and the extension to the elaborate polyphony of 16th century choral music was an inevitable step. An elaborate system of prohibitions, based on the limitations of the human voice, and the difficulty of attacking certain intervals, shackled the composer at every turn and formed the basis of theories of counterpoint which endured almost to our time. Despite the restrictions imposed by their rules, the structure raised by the great composers of the first half of the 16th century was of amazing richness and complexity.

#### The First Great Climax

#### Subject of Reading

#### Article

- The Riot of Choral Polyphony in the 16th century. MUSIC, *The Golden Age* (Vol. 19, p. 75); see also HARMONY (Vol. 13, p. 2); INSTRUMENTATION, *Vocal Styles of 16th Century* (Vol. 14, p. 651).
- Musical forms brought to great perfection in this period those in which texture holds first place. CONTRAPUNTAL FORMS, *Canonic Forms and Devices, Counterpoint on a Canto Fermo* (Vol. 7, p. 42); see also MASS, *Polyphonic Masses* (Vol. 17, p. 849); MADRIGAL (Vol. 17, p. 295); MOTET (Vol. 18, p. 905).
- Leaders of musical thought in the "Golden Age." LASSO, Orlando (Vol. 16, p. 237); TALLIS, T. (Vol. 26, p. 377); PALESTRINA (Vol. 20, p. 627).

Composers of the "Golden Age," following the polyphonic tradition of the early 16th century, biographies of whom appear in the *Britannica*, are: *Netherlandish*: ARCADELT, JACOB, 1514-1556; LASSO, ORLANDO, c. 1530-1594; *German*: FINCK, HERMANN, 1527-1558; ECCARD, JOHANN, 1558-1611; AICHINGER, GREGOR, leader of Reformation church music, c. 1565-1628; *French*: GOUDIMEL, C., c. 1510-1572; *English*: WILBYE, JOHN, 16th century, famous for his madrigals; MERBECK, JOHN, d. 1585; BENNETT, JOHN, d.c. 1614; BATESON, T., d. 1630, a composer of madrigals; TALLIS, T., c. 1515-1585, "father of English cathedral music"; FARRANT, R., c. 1530-1581; BYRD, WM., 1543-1623; MORLEY, T., 1557-1603; GIBBONS, ORLANDO, 1583-1625; *Italian*: ANIMUCCIA, GIOVANNI, c. 1490-1571; ZARLINO, GIOSEFFO, 1517-1590, fixed the diatonic scale as now accepted; PALESTRINA, GIOVANNI PIERLUIGI DA, 1526-1594; BANCHIERE, ADRIANO, c. 1557-1634, fought against monodist revolt—see below; ANERIO (brothers), c. 1560-1620; ARTUSI, G. M., 16th century, opposed Monteverdi's innovations—see below; *Spanish*: VICTORIA, TOMMASO L. DA, c. 1540-1613.

#### Composer of the Golden Age

## THE FIRST ROMANTIC MOVEMENT

The last word in polyphony seemed to have been said by such masters as Orlando Lasso, and Palestrina, and a change into new paths was inevitable. Moreover, men's minds were craving something more directly stimulating than the passionless web of ecclesiastical polyphony, which was the glory of the 16th century. Freedom was sought from the conventions of modal counterpoint. The monodist revolt was the result.

| <i>Subject</i>  | <i>Article</i>  |
|---|---|
| Revolt against the overelaboration of texture.  | MUSIC, <i>The Monodic Revolution</i> (Vol. 19, p. 76); HARMONY, <i>Modern Harmony</i> (Vol. 18, p. 4).                |
| Prominence given to solo part rather than to choral effect leads to development of the aria.                | SONG (Vol. 25, p. 406); ARIA (Vol. 2, p. 489).  |
| The leader in the new paths, the pioneer of modern harmony.   | MONTEVERDE, CLAUDIO (Vol. 18, p. 778).  |
| The first oratorio (1600).  | ORATORIO (Vol. 20, p. 161); see also CAVALIERE, EMILIO DEL (Vol. 5, p. 568).  |
| The first opera (1600).   | OPERA (Vol. 20, p. 121); see also PERI, JACOPO (Vol. 21, p. 144).   |
| The monodic impulse synchronizes with the startling development of the violin family by the Cremona makers. | VIOLIN (Vol. 28, p. 103); see also AMATI (Vol. 1, p. 788); GUARNIERI (Vol. 12, p. 660); STRADIVARI (Vol. 25, p. 977). |

Among distinguished composers of this period and school are: *English*: BULL, JOHN, c. 1562-1628; FORD, THOMAS, b. 1580; LAWES, HENRY, 1595-1662; *Italian*: CAVALIERE, E. DEL, c. 1550-1602; PERI, JACOPO, b. 1561; GABRIELE, GIOVANNI, 1557-c.

### Famous Monodists

1612, early experimenter in chromatic harmony; CACCINI, GIULIO, 1558-1615; MONTEVERDE, CLAUDIO, 1567-1643; ALLEGRI, GREGORIO, c. 1570-1652; FRESCOBALDI, GIROLAMO, 1588-1644, famous also as a teacher; AGOSTINO, P., 1598-1639; CAVALLI, F., 1596-1676, popularized opera; CARISSIMI, G., c. 1604-1674, popularized oratorio; ROSSI, LUIGI DE. All the above have separate articles assigned to them in the Britannica.

## THE 17th CENTURY AND AFTER

Those who revolted from the traditions of the polyphonic school went, as was inevitable, too far. A reaction was equally inevitable, for the language of the new music was unformed and was in danger of being stereotyped into the emptiest of formulas. The welding of the old and new ideas was all that was needed to prepare the way for the colossal achievement of a Bach or a Beethoven. It was a busy period when the rules of counterpoint were reviewed and revised, when theories of harmony as a distinct science took shape. But, save for the work of such men as Purcell, the Englishman (Vol. 22, p. 658), born 100 years before his time, the 17th century was mainly one of preparation. The next great climax came in the first half of the 18th century.

| <i>Subject</i>  | <i>Article</i>  |
|---|---|
| The renaissance of texture, the welding of polyphony and monody.  | MUSIC (Vol. 19, p. 77); HARMONY (Vol. 13, p. 4).  |
| Publication in 1715 of the famous <i>Gradus ad Parnassum</i> , the first complete theory of counterpoint. | FUX, JOHANN JOSEPH (Vol. 11, p. 375).   |
| The first systematic theory of harmony published in 1722.   | RAMEAU, J. P. (Vol. 22, p. 874).  |
| The second great climax in music.   | MUSIC, <i>Bach and Handel</i> (Vol. 19, p. 78).   |
| The achievement of Johann Sebastian Bach.   | BACH, J. S. (Vol. 3, p. 124); see also CONTRAPUNTAL FORMS (Vol. 7, p. 41); CONCERTO (Vol. 6, p. 825); OVERTURE (Vol. 20, p. 384); SUITE (Vol. 26, p. 51); ORATORIO (Vol. 20, p. 161); CANTATA (Vol. 5, p. 209); MASS, <i>Lutheran Masses</i> (Vol. 17, p. 850); VARIATIONS (Vol. 27, p. 912); INSTRUMENTATION, <i>Decoration and Orchestral Schemes</i> (Vol. 14, p. 651 and p. 655). |

Composers of the period who have separate notices in the *Britannica* are: *Italian*: CESTI, M. A., c. 1620-1669; COLONNA, GIOVANNI P., c. 1637-1695; PASQUINI, B., 1637-1710; STRADELLA, ALESSANDRO, 1645-1682; CORELLI, ARCANGELO, 1658-1713, first classic of the violin; STEFFANI, A., 1653-1728; SCARLATTI, ALESSANDRO, 1659-1725, largely created language of modern music; PITONI, G. O., 1657-1748; LOTTI, ANTONIO, c. 1667-1740; CLARI, G. C. M., c. 1669-1745; BONONCINI, G. B., c. 1672-1750; ALBINONI, T., c. 1674-1745; ASTORGA, EMANUELE D', 1681-1736; DURANTE, FRANCESCO, 1684-1755; MARCELLO, B., 1686-1739; VINCI, LEONARDO, 1690-1730; LEO, LEONARDO, 1694-1744; LOGROSCINO, NICOLA, c. 1700-1763; PERGOLESI, GIOVANNI BATTISTA, 1710-1736; ALBERTI, DOMENICO, c. 1710-1740; *French*: CAMBERT, R., 1628-1677; LULLY, JEAN-BAPTISTE, c. 1628-1687, inventor of the classical French opera style; *English*: LOCKE, MATTHEW, c. 1630-1677; BLOW, JOHN, 1648-1708; PURCELL, HENRY, 1658-1695; CROFT, WILLIAM, 1678-1727; HANDEL, GEORGE FREDERICK, 1685-1759; GREENE, MAURICE, 1695-1755; *German*: BACH, JOHANN SEBASTIAN, 1685-1750; HASSE, JOHANN A., 1699-1788; EBERLIN, J. E., 1702-1762.

### THE RISE OF THE SONATA

Bach, like Palestrina, seemed to have closed a period; and for nearly a hundred years after his death his influence on the course of musical development was astonishingly small. Again men sought new channels of expression and found them in instrumental music. But a structure less loosely knit than the suite form was needed if the new ideas were to be adequately stated, and the sonata grew into being, a form which has sufficed to this day as a medium for the noblest thoughts of the great composers. The 18th century saw, too, the reform of the opera by Gluck, a great development of orchestral resources, and the rise of the string quartette in chamber music.

#### The Third Great Climax

| <i>Subject</i>  | <i>Article</i>  |
|---|---|
| The new language: evolution of the sonata from the suite.                     | MUSIC (Vol. 19, p. 79); SONATA, <i>Sonata Style</i> (Vol. 25, p. 394); see also SCARLETTI, DOMINICO (Vol. 24, p. 802); and BACH, K. P. E. (Vol. 3, p. 180).           |
| Reform of the opera.  | OPERA (Vol. 20, p. 123); see also GLUCK (Vol. 12, p. 138); PICCINNI (Vol. 21, p. 579); MOZART (Vol. 18, p. 951).  |
| The rise of the symphony and the string quartette, development of the sonata. | MUSIC, <i>The Symphonic Classes</i> (Vol. 19, p. 78); SONATA FORMS (Vol. 25, p. 395); SYMPHONY (Vol. 26, p. 290); see also HAYDN (Vol. 13, p. 110).                   |
| The growth of the orchestra.  | INSTRUMENTATION, <i>Symphonic</i> (Vol. 14, p. 652); see also HAYDN (Vol. 13, p. 110).  |
| The third great climax. The perfection of the sonata form.                    | BEETHOVEN, L. VON (Vol. 3, p. 644); see also SONATA FORMS (Vol. 25, p. 397); INSTRUMENTATION (Vol. 14, p. 653); VARIATIONS (Vol. 27, p. 913); MASS (Vol. 17, p. 850). |

Biographies of the following composers of the period appear in the *Britannica*: *German and Austrian*: BACH, KARL PHILIPP EMANUEL, 1714-1788; GLUCK, C. W., 1714-1787; HILLER, J. A., 1728-1804; HAYDN, FRANZ JOSEPH, 1732-1809; DITTERS-DORF, KARL DITTERS VON, 1739-1799; WINTER, P., c. 1755-1825; MOZART, WOLFGANG AMADEUS, 1756-1791; HIMMEL, F. H., 1765-1814; BEETHOVEN, LUDWIG VAN, 1770-1827; *French*: GOSSEC, F. J., 1734-1829; GRETRY, A. E. M., 1741-1813; MEHUL, ETIENNE H., 1763-1817; LESUEUR, JEAN FRANÇOIS, c. 1763-1837; BOIELDIEU, F. A., 1775-1834; *English*: ARNE, T. A., 1710-1778, preserved English tradition in face of Handelian obsession; BOYCE, WILLIAM, 1710-1779; JACKSON, W., 1730-1803; BATTISHILL, J., 1738-1801; ARNOLD, S., 1740-1802; DIBDIN, C., 1745-1814; SHIELD, W., 1748-1829; STORACE, S., 1763-1796; ATTWOOD, T., 1765-1838; WESLEY, SAMUEL, 1766-1837, father of modern organ playing; *Italian*: SCARLATTI, DOMENICO, 1685-1757; MARTINI, G. B., 1706-1784; GALUPPI, BALDASSARE, 1706-1785; JOMMELLI, N., 1714-1774; GUGLIELMI, P., 1727-1804; PICCINNI, N., 1728-1800; SARTI, GIUSEPPE, 1729-1802; SACCHINI, A. M. G., 1734-1786; PAISIELLO, G., 1741-1816; BOCCHERINI, LUIGI, 1743-1805, last real master of suite form; CIMAROSA, D., 1749-1801; SALIERI, A., 1750-1825; CHERUBINI, 1760-1842; PAER, F., 1771-1839.

### NEW PATHS

Early in the 19th century the wave of romanticism broke over Europe. The effect on music was not nearly so violent as was the monodic revolt of the 16th-17th centuries, since the resources and technique of the art had now been developed; but it was nevertheless striking and showed itself in several directions, but mainly in two: lyrical and dramatic. The short compositions of Field, Schumann, and Chopin, and the development of the art song are instances of the former; the whole range of programme music, of which the symphonic poem is the prototype, is evidence of the latter; while in opera the reforms started by Gluck were carried to their logical conclusion by Wagner. Two other movements are also significant; the return to Bach and a recognition of his amazing modernity, and the pronounced revival of national characteristics in music, as shown particularly in the new English, Russian, and Bohemian Schools.



| <i>Subject</i>  | <i>Article</i>  |
|---|---|
| The Romantic Period.  | MUSIC, <i>From Beethoven to Wagner</i> (Vol. 19, p. 79).  |
| The Romantic in opera.  | WEBER, CARL MARIA F. E. VON (Vol. 28, p. 455); SONG (Vol. 25, p. 409).  |
| The first great lyrical song writer.  | SCHUBERT, FRANZ PETER (Vol. 24, p. 379); SONG (Vol. 25, p. 409).  |
| The Romantic in the symphony.   | PROGRAMME MUSIC (Vol. 22, p. 424); see also BERLIOZ, HECTOR (Vol. 3, p. 791).   |
| The rediscovery of Bach.  | BACH, J. S. (Vol. 2, p. 124); MENDELSSOHN (Vol. 18, pp. 121-124).   |
| Development of song forms.  | SONG (Vol. 25, p. 410); see also SCHUMANN, ROBERT (Vol. 24, p. 384); WOLF, HUGO (Vol. 28, p. 771); BRAHMS, J. (Vol. 4, p. 390). |
| Discontent with the sonata form.  | SYMPHONIC POEM (Vol. 26, p. 289); LISZT, F. (Vol. 16, p. 780).  |
| Gluck's idea realised; union of music with drama.                                 | MUSIC (Vol. 19, p. 80); OPERAS, <i>Leit-Motif</i> (Vol. 20, p. 125); WAGNER, W. RICHARD (Vol. 28, p. 236).                      |
| The last of the royal line of German composers shows vitality of the sonata form. | BRAHMS, JOHANNES (Vol. 4, p. 389); SONATA FORMS, <i>Sonata since Beethoven</i> (Vol. 25, p. 398).                               |
| Modern Tendencies.  | MUSIC (Vol. 19, p. 82); see also STRAUSS, RICHARD (Vol. 25, p. 1003); DEBUSSY, ACHILLE (Vol. 7, p. 906).                        |

Composers of this period, who have had separate articles assigned to them in the Britannica, follow: the growth of national schools will be noted.

*German and Austrian:* GANSBACHER, J. B., 1778-1844; KREUTZER, K., 1780-1849; SPOHR, LUDWIG, 1784-1859; WEBER, CARL MARIA F. E. VON, 1786-1886; MEYERBEER, G., 1791-1868; HAUPTMANN, M., 1792-1868; LÖWE, J. K. G., 1796-1869; SCHUBERT, FRANZ PETER, 1797-1828; LORTZING, G. A., 1801-1851; STRAUSS, JOHANN, 1804-1849, king of valse composers; MENDELSSOHN-BARTHOLDY, J. L. F., 1809-1847; NICOLAI, OTTO, 1810-1849; SCHUMANN, ROBERT ALEXANDER, 1810-1856; HILLER, F., 1811-1885; WAGNER, RICHARD, 1813-1883; HELLER, STEPHEN, 1815-1888; FRANZ, ROBERT, 1815-1892, song composer; ABT, FRANZ, 1819-1885, art folk-song; SUPPE, F. VON, 1820-1895; RAFF, J. J., 1822-1882; CORNELIUS, CARL AUGUST PETER, 1824-1874, song writer; BRUCKNER, ANTON, 1824-1896, Wagnerian symphonist; REINECKE, C. H. C., 1824-1910; LASSEN, EDUARD, 1830-1904; JOACHIM, JOSEPH, 1831-1907; BRAHMS, JOHANNES, 1833-1897; BRUCH, MAX, b. 1838; RHEINBERGER, J. G., 1839-1901; GOETZ, HERMANN, 1840-1876; NESZLER, V., 1841-1890; HUMPERDINCK, E., b. 1854; WOLF, HUGO, 1860-1903; STRAUSS, RICHARD, b. 1864.

*French:* AUBER, D. F. E., 1782-1871; HEROLD, L. J. F., 1791-1833; HALEVY, J. F. F. E., 1799-1862; BERLIOZ, HECTOR, 1803-1869; DAVID, F., 1810-1876; THOMAS, C. L. AMBROISE, 1811-1896; GOUNOD, C. F., 1818-1893; OFFENBACH, J., 1819-1880; FRANCK, CESAR, 1822-1890, founder of Modern French School; LALO, E., 1823-1892; REYER, E., b. 1823; LECOCQ, A. C., b. 1832; BENOIT, P. L. L., 1834-1901; SAINT-SAËNS, CHARLES CAMILLE, b. 1835; DUBOIS, F. C. T., b. 1837; BIZET, GEORGES, 1838-1875; JONCIÈRES, V., 1839-1903; CHABRIER, A. E., 1841-1894; AUDRAN, E., 1842-1901; MASSENET, J. E. F., 1842-1912; FAURE, GABRIEL, b., 1845; WIDOR, CHARLES MARIE, b. 1845; GODARD, BENJAMIN L. P., 1849-1895; PLAN-

QUETTE, R., b. 1850; D'INDY, P. M. T. V., b. 1851; MESSENGER, A. C. P., b. 1853; BRUNEAU, ALFRED, b. 1857; CHAMINADE, CÉCILE, b. 1861; BEMBERG, HERMAN, b. 1861; DEBUSSY, CLAUDE ACHILLES, b. 1862.

*Belgian:* The violinist Ysaye, b. 1858.

*Italian:* SPONTANI, G. L. P., 1774-1851; ROSSINI, G. A., 1792-1868; DONIZETTI, G., 1798-1848; BELLINI, V., 1801-1835; VERDI, GIUSEPPE, 1813-1901; PONCHIELLI, AMILCARE, 1834-1886, on whom have modelled themselves, Mascagni, Leoncavallo, etc.; BOITO, ARRIGO, b. 1842; SGAMBATI, G., b. 1848; LEONCIVALLO, R., b. 1858; PUCCINI, G., b. 1858; MASCAGNI, P., b. 1863.

*British:* HORSLEY, WM., 1774-1858; SMART, SIR GEORGE T., 1776-1867; BISHOP, SIR H. R., 1786-1855; PEARSALL, R. L. DE, 1795-1856; FIELD, JOHN, 1782-1887, inventor of the nocturne; GOSS, SIR JOHN, 1800-1880; HATTON, J. L., 1800-1886; BARNETT, J., 1802-1890; BENEDICT, SIR JULIUS, 1804-1885; BALFE, M. W., 1808-1870; WESLEY, S. S., 1810-1876; HULLAH, JOHN P., 1812-1884; MACFARREN, SIR G. A., 1813-1887; WALLACE, WM. V., 1814-1865; PIERSON, H. H., 1815-1873; BENNETT, SIR WM. STERNDAL, 1816-1875; OUSELEY, SIR F. A. G., 1825-1889; BACHE, F. E., 1833-1858; CLAY, F., 1838-1889; BARNDY, SIR J., 1888-1896; STAINER, SIR JOHN, 1840-1901; SULLIVAN, SIR ARTHUR S., 1842-1900; CELLIER, ALFRED, 1844-1891; MACKENZIE, SIR A. C., b. 1847; PARRY, SIR C. HUBERT H., b. 1848, on whom fell the mantle of Purcell; THOMAS, ARTHUR GORING, 1850-1892; COWEN, F. J., b. 1852; STANFORD, SIR CHARLES VILLIERS, b. 1852; ELGAR, SIR EDWARD, b. 1857; MACCUNN, HAMISH, b. 1868.

*Bohemian:* SMETANA, F., 1824-1884, founder of modern Bohemian School; DVOŘÁK, ANTON, 1841-1904.

*Hungarian:* GUNG'L, JOSEF, 1810-1889; LISZT, FRAZ, 1811-1886; GOLDMARK, KARL, b. 1832; PADEREWSKI, I. J., b. 1860.

*Polish:* CHOPIN, FREDERIC FRANÇOIS, 1810-1849; MOSZKOWSKI, MORITZ, b. 1854.

*Russian:* GLINKA, M. IVANOVICH, 1803-1857, founder of national school; DARGOMIJSKY, A. SERGEIVICH, 1813-1869; RUBINSTEIN, ANTON, 1829-1894; BORODIN, A. PORFYRIEVICH, 1834-1887; MOUSSORGSKY, M. PETROVICH, 1835-1881; BALAKIREV, M. ALEXEVICH, b. 1836; TSCHAIKOVSKY, PETER ILICH, 1840-1893; RIMSKY-KORSAKOV, N. ANDREIEVICH, 1844-1908; GLAZUNOV, A. CONSTANTINOVICH, b. 1865.

*Norwegian:* The violinist BULL, OLE, 1810-1880; KJERULF, HALFDAN, 1815-1868; SVENDSEN, J. S., b. 1840; GRIEG, EDVARD HAGERUP, 1843-1907.

*Danish:* GADE, NIELS W., 1817-1890.

*Sweden:* WENNERBERT, G., 1817-1901, song writer.

*American:* EMMETT, D. D., started "negro minstrels," 1815-1904; FOSTER, STEPHEN C., 1826-1864, song writer; EICHBERG, JULIUS, 1824-1893, founded Boston Conservatory of Music; BUCK, DUDLEY, 1839-1909; MACDOWELL, EDWARD ALEXANDER, 1861-1908. For notices of other modern composers and their tendencies—see MUSIC, *Recent Music* (Vol. 19, p. 82).

Famous musical historians and writers on music, whose biographies are in the Encyclopaedia Britannica, are: ARISTOXENUS, 4th century B.C.; PRAETORIUS, M., 1571-1621; PERUSCH, J. C., 1667-1752; BARNARD, JOHN, 17th century; HAWKINS, SIR JOHN, 1710-1789; GERBERT, M., 1720-1798; BURNEY, CH., 1726-1814; GERBER, 1746-1819; FORKEL, J. N., 1749-1818; BAINI, G., 1775-1844; NOVELLO, V., 1781-1861; CALLCOTT, J. W., 1766-1821; FETIS, F. J., 1784-1871; CHORLEY, H. F., 1808-1872; CHAPPELL, WM., 1809-1888; DWIGHT, JOHN S., 1813-1893; AMBROS, A. W., 1816-1876; GROVE, SIR GEORGE, 1820-1900.

## Musical Historians

## (2) THEORETICAL ARTICLES

"In the beginning," said Hans von Bülow, "was rhythm," and as RHYTHM (Vol. 23, p. 277) is the skeleton of every musical phrase and formula, the interesting article by Donald Tovey on rhythm in music may well serve as an introduction to the other subjects in this section. Passing to the elements, the articles SOUND, *Diatonic Scale* (Vol. 25, p. 448) and PLAIN SONG (Vol. 21, p. 705) should be read. In the former article the physical basis of the modern scale is determined, while in the latter an account is given of the modes which for centuries were the vehicles of musical expression. In the article MUSICAL NOTATION (Vol. 19, p. 86) the steps by which the present system of recording music was reached are noted, and in PITCH, MUSICAL (Vol. 21, p. 660), the whole of this interesting and vexed subject is reviewed by Alfred J. Hipkins, a high authority, formerly hon. curator of the Royal College of Music. The article MELODY (Vol. 18, p. 96) contains in addition to a discussion of the terms a series of useful definitions (e.g., conjunct and disjunct motion) and several musical examples. This brings us to the main articles of this section—COUNTERPOINT (Vol. 7, p. 315), HARMONY (Vol. 13, p. 1) and INSTRUMENTATION (Vol. 14, p. 651). All are by Donald Tovey and all are brilliant. In particular the article HARMONY deserves the most careful study, especially interesting being the sections *Tonality* and *Key-relationship*. The article on counterpoint is mainly

a definition of the principles involved and is introductory both to Harmony and to Contrapuntal Forms. In INSTRUMENTATION the question of colour is discussed from the historical and aesthetic aspects, accompanied by valuable analysis of the colour schemes of various composers from the choral writers of the "Golden Age" down to Wagner and Richard Strauss.

Famous theorists who have helped to establish the grammar of music are the following: TERPANDER, 7th century B.C., founder of Greek music  
**Theorists** (Vol. 26, p. 647); PYTHAGORAS, 6th century, B.C., said to have discovered numerical relation governing the harmonic series (Vol. 22, p. 699); ALYPPIUS, 3rd century B.C. (Vol. 1, p. 776); ARISTIDES, QUINTILIANUS, 3rd century A.D.; HUCBALD, c. 840-980, inventor of new notation (Vol. 13, p. 847); GUIDO OF AREZZO, c. 995-1050, "Beatus Guido, inventor musicae," (Vol. 12, p. 687); AGRICOLA, MARTIN, c. 1500-1556; ZARLINO, G., 1517-1590, fixed the diatonic scale; ARTUSI, G. M., 16th century, opposed monodist revolt; FUX, J. J., wrote the famous *Gradus ad Parnassum*; RAMEAU, J. P., 1683-1764, to whom the first systematic theory of harmony is due; ALBRECHTSBERGER, J. G., 1736-1809, the teacher of Beethoven; REICHA, A. J., 1770-1836; RICHTER, E. F. E., 1808-1879; CURWEN, J., 1817-1880, inventor of tonic sol-fa system; BERLIOZ HECTOR, whose text book on instrumentation is classic. On all these separate articles will be found in the Britannica.

## (3) MUSICAL FORMS

In making a detailed study of any particular form, reference should be made to the critical sections of the biographies of those masters who have done most towards its development. As has been

seen in the historical section of this chapter, the CONTRAPUNTAL FORMS (Vol. 7, p. 41) were the first to attain to a high standard of organization in the hands of such masters as ORLANDO LASSO (Vol. 16, p. 237) and PALESTRINA (Vol. 20, p. 627). The articles MASS

(Vol. 17, p. 849), MOTET (Vol. 18, p. 905), MADRIGAL (Vol. 17, p. 295), CANON (Vol. 5, p. 190), CHORALE (Vol. 6, p. 269), cover the ground of early choral music. In tracing their development reference should be made to the articles on BACH, J. S. (Vol. 3, p. 127), BEETHOVEN (Vol. 3, p. 649), BRAHMS (Vol. 4, p. 390). ORATORIO (Vol. 20, p. 161) and CANTATA (Vol. 5, p. 209) had their beginning in the work of the followers of Monteverde in the early 17th century, and their development may be traced in the work of CAVALIERE (Vol. 5, p. 563), CARISSIMI (Vol. 5, p. 338), PURCELL (Vol. 22, p. 658), BACH (Vol. 3, p. 127), HANDEL (Vol. 2, p. 912), BRAHMS (Vol. 4 p. 390), CÉSAR FRANCK (Vol. 11, p. 3), and SIR C. HUBERT PARRY (Vol. 20, p. 865).

In instrumental music, the SUITE (Vol. 26, p. 51), of which BOCCHERINI (Vol. 4, p. 105) was the last master, most

### Suite and Sonata

nearly foreshadowed the Sonata (SONATA FORMS, Vol. 25, p. 394), and together

they tell the tale of the development of absolute music up to modern experiments in the more elastic SYMPHONIC POEM (Vol. 26, p. 289) of which LISZT (Vol. 16, p. 780) was the first to see the possibilities. In addition to the articles SONATA and SONATA FORMS the reader should carefully study that part of the article BEETHOVEN beginning on page 647 of Vol. 3; also the article HARMONY, *Key Relationships* (Vol. 13, p. 5) which contains analyses of several striking key systems, and further reference should also be made to the articles VARIATIONS (Vol. 27, p. 912), SYMPHONY (Vol. 26, p. 290).

To the Romantic movement of the early part of the 19th century may be traced the attempt to escape from the

### Programme Music

apparent restrictions of the Sonata Form, and SCHUMANN'S (Vol. 24, p. 384) many

*Fantasia-Stücke* and CHOPIN'S lyrical

compositions (Vol. 6, p. 268) are prototypes in little of the tendencies of the time. On a larger canvas are the Ton-dramen of Liszt and the symphonic poems and the elaborate programme music of modern composers such as RICHARD STRAUSS (Vol. 25, p. 1003); and though BRAHMS (Vol. 4, p. 389) showed clearly enough that the classical sonata form was a framework sufficiently elastic to hold the most elaborate and modern ideas, the direction in which music has tended is towards the Symphonic Poem in which, by such devices as the transformation of themes and the *Leitmotif* (OPERA, Vol. 20, p. 125) a still greater elasticity is sought in form with a greater continuity of idea in substance. See PROGRAMME MUSIC (Vol. 22, p. 424).

Supplementing the article OPERA (Vol. 20, p. 121) are several which should be consulted. ARIA (Vol. 2, p. 489), OVERTURE (Vol. 20, p. 384), and Opera especially GLUCK (Vol. 12, p. 139), MOZART (Vol. 18, p. 951), WEBER (Vol. 28, 457), and WAGNER (Vol. 28, p. 237). These, with the biographical notices of operatic composers, which include almost every Italian composer from the days of PERI (Vol. 21, p. 144), and French composers from LULLY (Vol. 17, p. 121), give a mass of information bearing on the development of this popular form.

SONG (Vol. 25, p. 400), the oldest of art forms, and almost the last to be rescued from the too narrow formalism

of which the classical ARIA Song (Vol. 2, p. 489) is the beautiful

example, is so much the most generally popular that the article on it in the Britannica will probably be more widely read than any other on musical subjects. Written by W. A. J. Ford, a scholarly musician and teacher of singing at the Royal College of Music (London), it provides a brilliant survey of the evolution of the song from its earliest beginnings. In connection with

it the reader will find much to interest him in the biographical notices of two famous troubadours of the 13th and 14th centuries, ADAM DE LA HALE (Vol. 1, p. 171) and MACHAUT, G. DE (Vol. 17, p. 233); of MONTEVERDE (Vol. 18, p. 778), the pioneer of the monodist revolt at the end of the 16th century, of SCARLATTI, ALESSANDRO (Vol. 24, p. 302), 17th century, who perfected the aria form, of PURCELL, HENRY (Vol. 22, p. 658), the great English composer of the 17th century, of JOHANN SEBASTIAN BACH (Vol. 3, p. 126) 18th century, of SCHUBERT (Vol. 24, p. 380), the creator of the modern song, of SCHUMANN (Vol. 24, p. 384) who brought a yet greater intimacy into the form, of HUGO WOLF

(Vol. 28, p. 771), the most clairvoyant of song writers, of SIR HUBERT PARRY (Vol. 20, p. 865), and SIR CHARLES VILLIERS STANFORD (Vol. 25, p. 773), who have respectively done the best modern work in the English and Irish tradition, and of the American MACDOWELL (Vol. 17, p. 214). Reference should also be made to the articles MELODY (Vol. 18, p. 96), ACCOMPANIMENT (Vol. 1, p. 122), RHYTHM (Vol. 23, p. 277). Suggestive also are the articles BALLADS (Vol. 3, p. 264), POETRY (Vol. 21, p. 889). On the technique of singing the article VOICE (Vol. 28, p. 172) by Dr. J. G. McKendrick, will be found very helpful, especially the section on the *Physiology of Voice Production*.

#### (4) MUSICAL INSTRUMENTS

One branch of the subject yet remains, that of musical instruments. Here the editor of the Britannica had the advantage of the assistance of Miss Kathleen Schlesinger (author of *The Instruments of the Orchestra*, and the greatest authority on the subject), who contributed practically all of the articles in the book on musical instruments. A list of them is given below, classified under their most convenient groupings. From these articles in the Encyclopaedia Britannica the reader will get a full account of every known musical instrument whether modern or ancient, with its compass, and scale, and of its connection with other instruments of the same class; so that the evolution of every type is clearly brought out. As a preliminary to a general study of the subject, the articles ORCHESTRA (Vol. 20, p. 168), and INSTRUMENTATION (Vol. 14, p. 651) may conveniently be read. In the former Miss Schlesinger gives a summary of the development of the various classes of instruments and of their concerted use. In the article INSTRUMENTATION, on the other hand, Donald Tovey illus-

trates the *principles* which govern their use. This article closes with an interesting survey of the orchestral schemes at different periods in the history of the art. The following classified list of separate articles on musical instruments in the Britannica, shows how very completely this work covers the field:

**Stringed Instruments** (Vol. 25, p. 1088).

*Strings Plucked by Fingers or Plectrum:* ASOR; BALALAIKA; BANJO; BARBITON; CHELYS; CITHARA; CITOLE; CITTERN; EPIGONION; GUITAR; HARP; HARP-LUTE; KINNOR; KISSAR; LUTE; LYRE; MANDOLINE; NANGA; PANDURA; PSALTERY; REBAB; ROTTA; SAMBUCA; THEORBO; TRIGONON; ZITHER. *Strings Set in Vibration by Friction of the Bow:* CROWD; DOUBLE BASS; FIDDLE; GEIGE; GUITAR-FIDDLE; GUSLA; NAIL VIOLIN; PHILOMEL; RAVANASTRON; REBAB; REBEC; TROMBA MARINA; VIELLE; VIOL; VIOLA; VIOLIN; VIOLONCELLO. *Strings Struck by Hammers or Tangents:* CLAVECIN; CLAVICEMBALO; CLAVICHORD; CLAVICYTHERIUM; DULCIMER; HARMONICHORD; HARPSICHORD; PIANOFORTE; SPINET; VIRGINAL. *Strings Set in Vibration by Friction of a Wheel:* HURDY-GURDY; ORGAN-



ISTRUM. *Strings Set in Vibration by the Wind*: AEOLIAN HARP. *Appliances*: BOW; MONOCHORD; MUTE; MOUTHPIECE; KEYBOARD; SORDINO.

**Wind Instruments** (mouth blown) (Vol. 28, p. 709.

*Wood Wind.*

*The Pipe Class*: EUNUCH FLUTE; FIFE; FLAGEOLET; FLUTE; NAY; PICCOLO; PIPE AND TABOR; RECORDER; SYRINX. *Single Reed Class* (cylindrical bore): REED INSTRUMENTS; ARGHOUL; AULOS; BASS CLARINET; BASSET HORN; BATYPHONE; CLARINET; PEDAL CLARINET. *Double Reed Class* (conical bore): REED INSTRUMENTS; AULOS; BASSOON; BOMBARD; CONTRAFAGOTTO; COR ANGLAIS; OBOE; POMMER; SHAWM; CLARINA; HOLZTROMPETE; CROMORNE; RACKETT; SAXOPHONE; SORDINO; TIBIA. To reed instruments also belong the *Bagpipe Class*: ASKAULES; BAGPIPE; BINIOU; CHORUS; DRONE; PLATERSPIEL; SYMPHONIA.

*Brass Wind.*

BOMBARDON; BUCCINA; BUGLE; COR-

NET; EUPHONIUM; HELICON; HORN; LITUUS; OPHICLEIDE; SACKBUT; SAXHORN; SERPENT; TROMBONE; TRUMPET; TUBA; to which may be added, though not of brass or metal: ALPENHORN; OLIPHANT; SHOFAR; see also MOUTHPIECE; MUTE; VALVES.

**Wind Instruments** (mechanically blown).

ACCORDION; BARREL-ORGAN; CONCERTINA; HARMONIUM; ORCHESTRION; ORGAN; PHYSHARMONICA; PORTATIVE ORGAN; POSITIVE ORGAN; REGAL; to which, though mouth blown, may be added CHENG. See also FREE REED VIBRATION; KEYBOARD.

**Instruments of Percussion.**

*Sounding a Sensible Note*: BELL; BUMBULUM; CARILLON; GLOCKENSPIEL; GONG; HARMONICA; JEWS' HARP; MUSICAL BOX; PARSIFAL BELL-INSTRUMENT; XYLOPHONE. *Not Sounding a Sensible Note*: CASTANETS; CYMBALS; CHINESE PAVILION; DRUM; KETTLE DRUM; NACAIRE; SISTRUM; TAMBOURINE; TIMBREL; TOM-TOM; TRIANGLE; TYMPANON.

## CHAPTER XXXII

### THE FINE ARTS: GENERAL AND INTRODUCTORY

**T**HE art-student and every other reader interested in the fine arts will find in the Britannica the material for courses of reading of very great range and of the utmost interest and value—whether he wishes to study theory, practice or history.

Of course no adequate treatment of the arts, or of any one of them, could logically, much less advantageously, separate theory, practice and Theory of history. But the theory Art of art, though it may be

inferred or deduced from many other articles in the book, including those the most devoted to the practical or historical, may best and most directly be studied in three articles, AESTHETICS, ART, and FINE ARTS. Of these, the first, AESTHETICS (Vol. 1, p. 277), equivalent to nearly 40 pages of this Guide, is written by Professor James Sully, late of University College, London, and author of *The Human Mind* and other psychological studies. It discusses the meaning of beauty and the problem of the nature of pleasure, especially "higher" pleasure, its relation to play, etc. And the article closes with a history of Aesthetic Theories, including those of the following philosophers, on all of whom the student will find separate and elaborate critical biographies in the Britannica: PLATO, who set beauty high, but thought art a mere trick of imitation and wished it be censured rather than encouraged in his model republic; ARISTOTLE, who sets

beauty above the useful and necessary, but whose aesthetic seems to be applied to poetry rather than to any other art; the German philosophers, KANT, SCHELLING, HEGEL, SCHOPENHAUER, who so deeply impressed their theories on the literature of their times, etc. The articles ART (Vol. 2, p. 657) and FINE ARTS are both by Sir Sidney Colvin, formerly keeper of prints and drawings, British Museum. The former begins with a contrast between art and nature—the contrast made famous by Pope, by Chaucer, repeatedly by Shakespeare and by Dr. Johnson in his definition of Art as "the power of doing something which is not taught by Nature or by instinct." This definition is in itself an excellent text for a discourse on the importance in the study of the fine arts of the best literature on the subject. But Sir Sidney Colvin points out that the definition is incomplete, since Art

is a name not only for the power of doing something, but for the exercise of the power; and not only for the exercise of the power, but for the rules according to which it is exercised; and not only for the rules, but for the result. Painting, for instance, is an art, and the word connotes not only the power to paint, but the act of painting; and not only the act, but the laws for performing the act rightly; and not only all these, but the material consequences of the act or the thing painted.

Art is then "*Every regulated operation or dexterity by which organized beings pursue ends which they know beforehand, together with the rules and the*

result of every such operation or dexterity."

And a consideration of the etymology of the words "Art" and "Kunst" is the basis of a discussion of the relation of Science and Art, which is summed up in these words:

Science consists in knowing, Art consists in doing. What I must do in order to know, is Art subservient to Science: what I must know in order to do, is Science subservient to Art.

After speaking of dancing, music, drawing, painting, sculpture, architecture, poetry, the author says:

Of all these arts, the end is not use, but pleasure, or pleasure before use, or at least pleasure and use conjointly. In modern language, there has grown up a usage which has put them into a class by themselves under the name of the Fine Arts, as distinguished from the Useful or Mechanical Arts. (See *ÆSTHETICS* and *FINE ARTS*.) Nay, more, to them alone is often appropriated the use of the generic word Art. . . . And further yet, custom has reduced the number which the class-word is meant to include. When Art and the works of Art are now currently spoken of in this sense, not even music or poetry is frequently denoted, but only architecture, sculpture and painting by themselves, or with their subordinate and decorative branches.

The article *FINE ARTS* (Vol. 10, p. 355; equivalent to 70 pages of this Guide) is divided into the following parts:

**Fine Arts** *General Definition*, with particular attention to the theory that makes the arts a form of play and to the definitions of Plato and Schiller; *Classification*—architecture, sculpture, painting, music and poetry classified as "shaping" and "speaking" or as imitative and "non-imitative," with definitions from the

aesthetic or philosophic point of view of sculpture and of painting; and *Historical Development*, with a criticism of Spencer's theory of the evolution and gradual separation of the arts and of Taine's natural history, as well as a critical and illuminating outline history of the arts.

Whether we include under the fine arts music and poetry, or with the more popular usage make the fine arts not five but three, architecture, painting and sculpture, the arts may be studied in the Britannica and there is the basis for this study in this Guide.

Music is the subject of a separate chapter.

Poetry is treated in the chapters on Literature, but it will be well to remind the student of the philosophy of art of the remarkable article *POETRY* (Vol. 21, p. 877; equivalent to 45 pages in this Guide) by Theodore Watts-Dunton, and of the articles on the different poetic forms, mostly by Edmund Gosse.

Architecture in the Britannica is outlined in this Guide in the chapter *For Architects*.

The two chapters immediately following this are devoted respectively to Painting, Engraving and Drawing and to Sculpture and the Subsidiary Arts. Of practical value to the art student as an introduction to these two chapters are the articles *ART SOCIETIES*, by A. C. Robinson Carter, editor of *The Year's Art*, and *ART TEACHING*, by Walter Crane, the English illustrator, who also contributed the article *ARTS AND CRAFTS*.

For an alphabetical list of articles on the fine arts see the end of the chapter on *Sculpture*.

## CHAPTER XXXIII

### PAINTING, DRAWING, ETC.

**T**HE article PAINTING (Vol. 20, p. 459; equivalent to 190 pages of this Guide) is an elaborate "key" article which may well be the starting point for more definite study. The art student who actually wishes to paint or draw—as distinct from the student of the history of art—will do well to read first in this great article its third section, *The Technique of Painting* (pp. 482-497), by Gerard Baldwin Brown, professor of fine art, Edinburgh, and author of *The Fine Arts*. The main topics in this part of the article are:

The Materials of Painting; The Surfaces Covered by the Painter; Binding Materials or Media; The Processes of Painting, and their Historical Uses; Painting with Coloured Vitreous Pastes (with bibliography)—on this method and on similar processes see the separate articles CERAMICS, with remarkably valuable and beautiful coloured illustrations; MOSAIC; ENAMEL; GLASS, STAINED. The following sections are Fresco Painting (with bibliography)—see Fig. 34, Plate X (facing p. 477); Fresco-Secco (with bibliography); Stereochromy or Water-Glass Painting (with bibliography); Spirit Fresco or the "Gambier Parry" Process, as improved by Professor Church (with bibliography); Oil Processes of Wall Painting; Tempera Painting on Walls; Encaustic Painting on Walls (with bibliography); Encaustic Painting in General (with bibliography); Tempera Painting (with bibliography); Water Colour Painting (with bibliography).

In connection with this part of the article—theoretically before it, perhaps,—the student should read the articles

**Drawing and Engraving**

**DRAWING and ENGRAVING.**

**DRAWING** (Vol. 8, p. 552), by John R. Fothergill, editor of *The Slade*, is a peculiarly interesting article in its denial of the possibility of conveying colour by drawing or monochrome, in its tracing the development of drawing from the "paperery" and flat first attempts on early Greek vases to the depth, length and breadth of the later Greeks or of a Michelangelo, for its criticism of the definition of artistic drawing as a process of selection and elimination from the forms of nature, and for its discussion of style or personality in drawing. See also the articles CARICATURE, CARTOON, ILLUSTRATION, POSTER, PLUMBAGO DRAWINGS.

**ENGRAVING** (Vol. 9, p. 645) is a short outline article to be supplemented by: **LINE-ENGRAVING** (Vol. 16, p. 721), by Philip Gilbert Hamerton, author of *Drawing and Engraving*, and more popularly known as the author of *The Intellectual Life, Human Intercourse* and other essays, and by M. H. Spielmann, formerly editor of the *Magazine of Art*; **WOOD ENGRAVING**, by the same authors; **MEZZOTINT**, by Gerald Philip Robinson, president of the Society of Mezzotint Engravers; and **ETCHING**.

Supplementing the section in the article PAINTING on *The Technique of Painting* are the separate articles: **CRAYON, PASTEL, PALETTE; AQUATINT, AQUARELLE, ENCAUSTIC PAINTING, FRESCO, GOUACHE, ILLUMINATED MANUSCRIPTS** (with 5 plates), by Sir E. Maunde Thompson, late director British Museum and author of *English Illuminated Manuscripts*; **MINIATURE** (with 19 illustrations in halftone), by the same author, and by G. C. Williamson, author of *History of Portrait Miniatures*, whose articles on the

miniature painters the CLOUETS, COSWAY, the HILLIARDS, GEORGE MORLAND, PETER OLIVER, the PETITOTS, PIERRE PRIEUR, JOHN SMART, etc., should also be read; PANORAMA, PASTEL, by M. H. Spielmann, PORTRAITURE, by Sir George Reid, the Scotch artist and late president of the Royal Scottish Academy, PREDELLA, TEMPERA and TRIPTYCH.

Although the articles enumerated in the last paragraph have primarily to do with technique, there is in them—es-

### History of Painting

pecially in such articles as MINIATURE and PORTRAITURE—much historical and critical information. And from them the student may well turn back to the article PAINTING to pursue there those topics which he has not yet covered. These are: *Part I.—A Sketch of the Development of the Art* (pp. 460-478); *Part II.—Schools of Painting*, a tabular scheme (pp. 479-481), and *Recent Schools of Painting* (pp. 497-518), by M. H. Spielmann, for British; Léonce Bénédite, keeper of the Luxembourg Museum, for French; Fernand Khnopff, painter and etcher, for Belgian; Prof. J. C. Van Dyck, Rutgers College, author of *History of American Art*, for the United States; and Prof. Richard Muther, Breslau University, author of *The History of Modern Painting*, on Dutch, German, Austrian, Italian, Spanish, Danish, Swedish, Norwegian, Russian and Balkan States.

These parts of the article are illustrated with ten plates containing 36 figures, including four prehistoric incised drawings of animals found in French caves and remarkable for their technical accuracy and life; two paintings, a boar and a bison, reproduced in colours, from the palaeolithic cave of Altamira—see also Plates II and III in the article ARCHAEOLOGY (between pp. 348 and 349, Vol. 2), Figs. 6, 7 and 8 in Plate accompanying ANTHROPOLOGY (opposite p. 118, Vol. 2), and the plates of American antiques in the article AMERICA (Vol. 1, pp. 808-

816); an excellent Egyptian drawing of birds; the François vase (Greek); a Pompeian wall painting—see also the reproduction in colours of a wall-painting from a Roman villa in the article MURAL DECORATION (Vol. 20, p. 22); a wall painting from Brunswick cathedral; and typical examples of the work of Hubert van Eyck, Giotto, Lorenzetti, Masaccio, Uccello, Pollaiuolo, Piero della Francesca, Ghirlandajo, Mantegna, Bellini, Giorgione, Michelangelo, Botticelli, Titian, Holbein, Watteau, Gainsborough, Rembrandt, Quintin Matsys, Brouwer, Ruysdael, Turner, Chardin.

“A rough division of the whole history of art into four main periods” gives “first . . . the efforts of the older Oriental peoples, best represented by the painting of the Egyptians; the second includes the classical and medieval epochs up to the beginning of the 15th century; the third the 15th and 16th centuries, and the fourth the time from the beginning of the 17th century onward. In the first period the endeavour is after truth of contour, in the second and third after truth of form, in the fourth after truth of space.”

The Egyptian artist was satisfied if he could render with accuracy, and with proper emphasis on what is characteristic, the silhouettes of things in nature regarded as little more than flat objects cut out against a light background. The Greek and the medieval artist realized that objects had three dimensions, and that it was possible on a flat surface to give an indication of the thickness of anything, that is, of its depth away from the spectator, as well as its length and breadth, but they cannot be said to have fully succeeded in the difficult task they set themselves. For this there was needful an efficient knowledge of perspective, and this the 15th century brought with it. During the 16th century the painter fully succeeds in mastering the representation of the third dimension, and during the next he exercises the power thus acquired in perfect freedom, producing some of the most convincing and masterly presentments of solid forms upon a flat surface that the art has to show. During this period, however, and to a more partial extent even in the earlier classical epoch, efforts were being made to widen the horizon of the art and to embrace within the



scope of its representations not only solid objects in themselves, but such objects as a whole in space, in due relation to each other and to the universe at large. It was reserved, however, for the masters of the 17th century perfectly to realize this ideal of the art, and in their hands painting as an art of representation is widened out to its fullest possible limits, and the whole of nature in all its aspects becomes for the first time the subject of the picture.

Following this classification, the article PAINTING, after commenting on primitive art among bushmen, Eskimo and Aus-

### Early Painting

tralians and on the remarkable cave drawings and paintings of Altamira, Gourdan and Lortet,—even the paintings are thought to be 50,000 years old,—discusses the painting of contour in Egypt and Babylonia, in prehistoric Greece, in ancient Greece and Italy, and in the early Christian and early medieval periods. Of particular interest is the criticism of Greek drawing.

It may be admitted that in many artistic qualities it was beyond praise. In beauty, in grace of line, in composition, we can imagine works of Apelles, of Zeuxis, of Protogenes, excelling even the efforts of the Italian painters, or only matched by the finest designs of a Raphael or a Leonardo. . . . The facts, however, remain, first, that the Greek pictures about which we chiefly read were of single figures, or subjects of a very limited and compact order, with little variety of planes; and second, that the existing remains of ancient painting are so full of mistakes in perspective that the representation of distance cannot have been a matter to which the artists had really set themselves. . . . The problem of representing correctly the third dimension of space . . . had certainly not been solved. . . . It is an additional confirmation of this view to find early Christian and early medieval painting confined to the representation of the few near objects which the older Oriental artists had all along envisaged.

For more detailed treatment of this period see the articles: EGYPT, *Art and Archaeology* (Vol. 9, pp. 65-77), with many illustrations both of painting and sculpture, by Dr. W. M. Flinders Petrie, the eminent Egyptologist; BABYLONIA AND ASSYRIA, particularly the two plates of illustrations (opposite pp. 104 and 105,

Vol. 3); AEGEAN CIVILIZATION, especially the illustrations (Vol. 1, pp. 246-251); GREEK ART (Vol. 12, pp. 470-492), by Percy Gardner, author of *Grammar of Greek Art*,—and, mostly by the same author, the articles AGATHARCHUS, PANAE-NUS, MICON, POLYGNOTUS, PROTOGENES, APELLES, ARISTIDES OF THEBES, PAUSIAS, THEON, ZEUXIS; ROMAN ART (Vol. 23, pp. 474-486), especially Plates V (p. 481) and VI (p. 484); and for the early Christian and early medieval periods such articles as ILLUMINATED MANUSCRIPTS, with illustrations, by Sir E. Maunde Thompson, late director British Museum, and MINIATURE. The reader should also consult the articles CHINA and JAPAN for the section on the art of each of these countries (Vol. 6, pp. 213-216, with two plates, 17 figures; and Vol. 15, pp. 172-190, with eight plates, 30 figures—see especially Plates I-IV, pp. 172-177), as Oriental art in general may be said to belong to this phase of effort after truth of contour and of form. See also the separate articles on Japanese artists, mostly by E. F. Strange, author of *Japanese Illustration, Hokusai*, etc.,—particularly KORIN, UTAMARO, HOKUSAI, HIROSHIGE, and YOSAI.

The first important individual names after those of the Greek painters mentioned above are those of the Proto-Renaissance of the 13th and 14th century.

For Italy see PIETRO CAVALLINI; in Florence, CIMABUE, by W. M. Rossetti, author of *Fine Art, Chiefly Contemporary*; GIOTTO, by Sir Sidney Colvin, late keeper prints and drawings, British Museum; GADDI, by W. M. Rossetti; ORCAGNA, by the late John Henry Middleton, Slade professor of fine arts, Cambridge, art director South Kensington Museum; SPINELLO ARETINO (Vol. 25, p. 685), and ANGELICO, by W. M. Rossetti; in Siena, SIMONE MARTINI; and for Flanders, the VAN EYCKS (Vol. 10, p. 90), by Sir Joseph Archer Crowe, author with G. B. Cavalcaselle, of *Early Flemish Painters*, etc.

With the 15th century, and particularly at Florence, begins the third of the four periods in the evolution of painting.

**15th Century:** "The father of modern painting is the Florentine Masaccio": see the article

on him (Vol. 17, p. 833), by W. M. Rossetti, who says "he led the way in representing the objects of nature correctly, with action, liveliness and relief. . . . All the greatest artists of Italy, through studying the Brancacci chapel, became his champions and disciples." For the other great Florentine names of the century see the articles: MASOLINO DA PANICALE, by Rossetti; BRUNELLESCHI, architect, student of perspective, and, with Masolino, master of Masaccio; the two earlier LIPPI, by Rossetti; BOTTICELLI, by Sir Sidney Colvin; GOZZOLI, by Rossetti; ROSSELLI; PIERO DI COSIMO (Vol. 21, p. 950); CASTAGNO; BALDOVINETTI, by Sir Sidney Colvin; POLLAIUOLO; GHIRLANDAJO, father and son, by W. M. Rossetti; and, marking the perfection of art on the formal side, BARTOLOMMEO, and Rossetti's article, ANDREA DEL SARTO (Vol. 1, p. 969).

As for the remainder of Italy, Sieneese art declines in this century, but there is an advance in Northern Italy and in Umbria. See the arti-

**15th Century:** cles: FRANCESCHI, by  
**Other Parts** Rossetti, MELOZZO,  
**of Italy** "the first who practised foreshortening with much success," and SIGNORELLI; Raphael's master, PERUGINO, by Rossetti; MANTEGNA, by the same author; LORENZO COSTA; FRANCIA, by Rossetti; and at Venice, GENTILE, the VIVARINI, ANTONELLO DA MESSINA, CARPACCIO, the BELLINI (Vol. 3, p. 700), by Sir Sidney Colvin.

In Germany and the Low Countries the art of the 15th and 16th centuries may be traced in the articles: for Germany—SCHONGAUER; DÜRER, by Sir Sidney Colvin; GRÜN; the HOLBEINS and

CRANACH, by Sir Joseph Archer Crowe; BURGKMAIR; GRÜNEWALD; and for the Low Countries—

**15th and 16th** ROGER VAN DER  
**Centuries:** WEYDEN; his greater  
**Northern Europe** pupil MEMLINC, by  
Sir J. A. Crowe and

P. G. Konody, art critic of the *Observer* and *Daily Mail*; GOES; GERARD DAVID, by P. G. Konody; LUCAS VAN LEYDEN (Vol. 17, p. 93); HEEMSKERK; MATSYS; BREUGHEL; MABUSE, by Sir J. A. Crowe; FLORIS; MORO; and BRIL.

Roughly contemporary with Dürer and Holbein the younger were the even greater masters of Italian painting. See

the articles: for Florence—LEONARDO DA VINCI (Vol. 16, p. 444, equivalent to 35 pages of this

Guide), and MICHELANGELO (Vol. 18, p. 362), both by Sir Sidney Colvin, and VASARI, painter and biographer of painters; for Rome—RAPHAEL SANZIO (Vol. 22, p. 900, with 7 cuts), by the late Prof. John Henry Middleton, and GIULIO ROMANO, by W. M. Rossetti; for North Italy—LUINI, CORREGGIO, PARMIGIANO, and MORONI, all by Rossetti, and MORETTO; and for Venice—GIORGIONE, by Sir Sidney Colvin; LOTTO and PALMA, TITIAN, TINTORETTO, and PAUL VERONESE (Vol. 20, p. 965), all by W. M. Rossetti.

We have now come to modern times so far as painting is concerned. The article PAINTING says:

By the 17th century the development of painting had passed through all its stages, and the picture was

#### The Fourth Period: 17th Century and After

no longer a mere silhouette or a transcript of objects against a flat background, but rather an

enchanted mirror of the world, in which might be reflected space beyond space in infinite recession. With this transformation of the picture there was connected a complete change in the relation of the artist to nature. Throughout all the earlier epochs of the art the painter had concerned himself not with nature as a whole, but with certain

selected aspects of nature that furnished him with his recognized subjects. These subjects were selected on account of their intrinsic beauty or importance, and as representing intrinsic worth they claimed to be delineated in the clearest and most substantial fashion. In the 17th century, not only was the world as a whole brought within the artist's view, but it presented itself as worthy in every part of his most reverent attention. In other words, the art of the 17th century, and of the modern epoch in general, is democratic, and refuses to acknowledge that difference in artistic value among the aspects of nature which was at the basis of the essentially aristocratic art of the Greeks and Italians. . . . The artist who was the first to demonstrate convincingly this principle of modern painting was Rembrandt. . . . Rembrandt in his later work attended to the pictorial effect alone, and practically annulled the objects by reducing them to pure tone and color. Things are not there at all, but only the semblance or effect, or "impression" of things. Breadth is in this way combined with the most delicate variety, and a new form of painting, now called "impressionism," has come into being.

See: RUBENS, by Henri Hymans, author of *Rubens: sa vie et son œuvre*, and P. G. Konody; REMBRANDT, by John Forbes White and P. G. Konody; and FRANS HALS, by P. G. Konody. These were the leaders of the great 17th century school—the Dutch. For the more immediate followers of Rembrandt see the articles: DOUW, EECKHOUT, FLINCK, MAES, HOOCH, MEER. For Rubens' great pupil and rival and his successors, the articles VAN DYCK and TENIERS, both by Henri Hymans and P. G. Konody, SNYDERS and the great animal painter FYT. See BROUWER for Hals' pupil and assistant. For the genre painters, the articles: TER BORCH, METSU, STEEN, WOUWERMANN, and the OSTADE family, by Sir J. A. Crowe and P. G. Konody. On the landscapists see the articles: KONINCK, GOYEN, NEER, by Sir J. A. Crowe and P. G. Konody; RUYSDAEL, HOBBEEMA, by Sir J. A. Crowe, and BERCHEM; and, for animal and landscape, A. VANDEVELDE, CUYP, by Sir J. A. Crowe, and POTTER, by P. G. Konody. The other important articles for the Dutch school of the 17th century are: HEEM, HEDA, HONDE-

COETER, WEENIX and HUYSUM, painters of still life, etc.; W. VANDEVELDE and BACKHUYSEN, marine painters; and at the close of the period, or marking its decline, MERIS and NETSCHER.

In the article on PAINTING this summary follows the outline of the general development of painting through the 17th century:

The fact that the Dutch painters have left us masterpieces in so many different

### Kinds of Painting

walks of painting, makes it convenient that we should add here some brief notes

on characteristic modern phases of the art on which they stamped the impress of their genius. The normal subject for the artist, as we have seen, up to the 17th century, was the figure-subject, generally in some connexion with religion. The Egyptian portrayed the men and women of his time, but the pictures, through their connexion with the sepulchre, had a quasi-religious significance.

*Portraiture* is differentiated from this kind of subject-picture through stages which it would be interesting to trace, but the portrait, though secular, is always treated in such a way as to exalt or dignify the sitter. Another kind of figure-piece, also differentiated by degrees from the subject-picture of the loftier kind, is the so-called *Genre Painting*, in which the human actors and their goings-on are in themselves indifferent, trivial, or mean, and even repellent; and in which, accordingly, intrinsic interest of subject has disappeared to be replaced by an artistic interest of a different kind. *Landscape*, in modern times so important a branch of painting, is also an outcome of the traditional figure-piece, for at first it is nothing but a background to a scene in which human figures are prominent. *Marine Painting* is a branch of landscape art differentiated from this, but supplied at first in the same way with figure-interest. The origin of *Animal Painting* is to be sought partly in figure-pieces, where, as in Egypt and Assyria, animals play a part in scenes of human life, and partly in landscapes, in which cattle, &c., are introduced to enliven the foreground. The *Hunting Picture*, combining a treatment of figures and animals in action with landscape of a picturesque character, gives an artist like Rubens a welcome opportunity, and the picture of *Dead Game* may be regarded as its offshoot. This brings us to the important class of *Still-life Painting*, the relation of which to the figure-piece can be traced through the genre picture and the portrait.

The article then proceeds to sketch the history and development of different kinds of painting:

#### *Portraiture:*

It is Gentile and Giovanni Bellini . . . who may be regarded as the fathers of modern portrait painting. Venetian art was always more secular in spirit than that of the rest of Italy, and Venetian portraits were abundant. . . . Some of the finest portraits in the world are the work of the great Venetians of the 16th century, for they combine pictorial quality with an air of easy greatness which later painters find it hard to impart to their creations. Though greatly damaged, Titian's equestrian portrait of Charles V. at Madrid (fig. 26, Plate VIII.) is one of the very finest of existing works of the kind. It is somewhat remarkable that of the other Italian painters who executed portraits the most successful was the idealist Raphael, whose papal portraits of Julius II. and Leo X. are masterpieces of firm and accurate delineation. Leonardo's "Monna Lisa" is a study rather than a portrait proper.

The realistic vein, which, as we have seen, runs through northern painting, explains to some extent the extraordinary merit in portraiture of Holbein, who represents the culmination of the efforts in this direction of masters like Jan van Eyck and Dürer. . . . Frans Hals of Haarlem, one of the most brilliant painters of the impressionist school that he did much to found, achieved remarkable success in the artistic grouping of a number of portraits. . . . As portraitists the other great 17th-century masters fall into two sets, Rembrandt and Velazquez contrasting with Rubens and his pupil Van Dyck. . . . In the 18th century, though France produced some good limners and Spain Goya, yet on the whole England was the home of the best portraiture. Van Dyck had been in the service of Charles I. and foreign representatives of his style carried on afterwards the tradition of his essentially courtly art, but there existed at the same time a line of native British portraitists of whom the latest and best was Hogarth. One special form of portraiture, the *miniature* (*q.v.*), has been characteristically English throughout. . . .

#### *Genre:*

Probably the most excellent painters of genre are Ter Borch, Metsu and Brouwer, the two first painters of the life of the upper classes, the last of peasant existence in some of its most unlovely aspects. The pictures of Brouwer are among the most instructive documents of modern painting. . . . He is best represented in the Munich Pinacotek, from which has been

selected fig. 30, Plate IX. Hardly less admirable are Teniers in Flanders; De Hooch, Ver Meer of Delft, Jan Steen, A. van Ostade, in Holland, while in more modern times Hogarth, Chardin, Sir David Wilkie, Meissonier, and a host of others carry the tradition of the work down to our own day (see Table VIII). . . .

#### *Landscape and Marine Painting:*

Several of the Dutch masters, even before the time of Rembrandt, excelled in the truthful rendering of the scenes and objects of their own simple but eminently paintable country; but it was Rembrandt, with his pupil, de Koningk, and his rival in this department Jacob Ruysdael, who were the first to show how a perfectly natural and unconventional rendering of a stretch of country under a broad expanse of sky might be raised by poetry and ideal feeling to the rank of one of the world's masterpieces of painting. Great as was Rembrandt in what Bode has called "the landscape of feeling," the "Haarlem from the Dunes" of Ruysdael (fig. 31, Plate IX.) with some others of this artist's acknowledged successes, surpass even his achievement. . . . Among Turner's chief titles to honour is the fact that he portrayed the sea in all its moods with a knowledge and sympathy that give him a place alone among painters of marine. . . .

#### *Animal Painting:*

In Holland, in the 17th century, the animal nature presented itself under the more contemplative aspect of the ruminants in the lush water-meadows. True to their principle of doing everything they attempt in the best possible way, the Dutch paint horses (Cuyp, Wouwerman) and cattle (Cuyp, Adrian Vandevelde, Paul Potter) with canonical perfection, while Hondekoeter delineates live cocks and hens, and Weenix dead hares and moor-fowl, in a way that makes us feel that the last word on such themes has been spoken. There is a large white turkey by Hondekoeter in which the truth of mass and of texture in the full soft plumage is combined with a delicacy in the detail of the airy filaments, that is the despair of the most accomplished modern executant.

But animals have been treated more nobly than when shown in Flemish agitation or in Dutch phlegmatic calm. Leonardo da Vinci was specially famed for his horses, which he may have treated with something of the majesty of Pheidias. . . .

#### *Still-Life Painting:*

There is no finer Rembrandt for pictorial quality than the picture in the Louvre representing the carcass of a flayed ox in a fletcher's booth. As illustrating the principle of modern painting this form of the



graphic art has a value and importance which in itself it could hardly claim. . . .

The way was prepared for it as has been noticed, by the minute and forcible rendering of accessory objects in the figure-pieces and portraits of the early Flemish masters, of Dürer, and above all of Holbein. The painting of flower and fruit pieces without figure interest by Jan Breughel the younger, who was born in 1601, represents a stage onward, and contemporary with him were several other Dutch and Flemish specialists in this department, among whom Jan David de Heem, born 1608, and the rather older Willem Klaass Heda may be mentioned. Their subjects sometimes took the form of a luncheon table with vessels, plate, fruit and other eatables; at other times of groups of costly vessels of gold, silver and glass, or of articles used in art or science, such as musical instruments and the like; and it is especially to be noted that the handling stops always short of any illusive reproduction of the actual textures of the objects, while at the same time the differing surfaces of stuffs and metal and glass, of smooth-rinded apples and gnarled lemons, are all most justly rendered. . . . In this form of painting the French 18th-century artist Chardin, whose impasto was fuller, whose colouring more juicy than those of the Dutch, has achieved imperishable fame (see fig. 33, Plate X.); and the modern French, who understand better than others the technical business of painting, have carried on the fine tradition which has culminated in the work of Villon. The Germans have also painted still-life to good result, but the comparative weakness in technique of British painters has kept them in this department rather in the background.

The history of painting since the 17th century may best be studied in the *Britannica* in the order in which "recent schools" are treated **National Schools** (Vol. 20, pp. 497-518), and this plan will be followed here in a brief outline, giving only a few out of many articles for each country.

British art in the 17th and 18th centuries is dependent largely on foreign and particularly Flemish influences—Van Dyck in especial. See Rossetti's articles on **LELY** and **KNELLER**, who, like Holbein and Van Dyck, were importations, but, unlike them, were pretty thoroughly Anglicized. For the first purely English

painter see Austin Dobson's article **HOGARTH** (Vol. 13, p. 566). For "the most prominent figure in the English school of painting" whose *Discourses* largely affected English notions of aesthetics, see **SIR JOSHUA REYNOLDS**; also the article on his rival **GEORGE ROMNEY**. And read Rossetti's article **GAINSBOROUGH**; and those on the portrait painters **RAEBURN** and **SIR THOMAS LAWRENCE**. On the Norwich school of landscapists see the articles **CROME**, **COTMAN** and **GEORGE VINCENT**. For foreign influences on landscape painting see **RICHARD WILSON** (Vol. 28, p. 695) for French influence, and **JOHN CONSTABLE** (Vol. 6, p. 982), by C. J. Holmes, author of *Constable and His Influence on Landscape Painting*, for German. With the article on the greatest of English landscapists **J. M. W. TURNER** (Vol. 27, p. 474), by Sir George Reid, the student should read Frederic Harrison's article on **JOHN RUSKIN**, himself an exquisite draughtsman, although unable to compose a picture, whose championship of Turner and general theories of art so strongly influenced British painting. See also the articles on the subject painter **THOMAS STOTHARD** and the landscapist **GIRTIN**; and on the genre painters, **SIR DAVID WILKIE**, by J. Miller Gray, late curator of the Scottish National Portrait Gallery, **MULREADY**, **WILLIAM COLLINS**, and **FRITH**. See the article **WILLIAM BLAKE**, by J. W. Comyns-Carr, author of *Essays on Art*, for an appreciation of that remarkable genius, who in his combination of painting and poetry may be reckoned a forerunner of the Pre-Raphaelites. On the P. R. Brotherhood see the articles: **D. G. ROSSETTI**, by F. G. Stephens, former art-critic to the *Athenaeum* and, for Rossetti's literary work, Theodore Watts-Dunton; **SIR J. E. MILLAIS** and **W. HOLMAN HUNT**, by Cosmo Monkhouse, the poet and critic; and **FORD MADOX BROWN**, by W. M. Rossetti, himself a member of the Brotherhood—see the article on **ROSSETTI**. Of much the same school were several later men. See,



for instance, the articles: LORD LEIGHTON, by Cosmo Monkhouse; WILLIAM MORRIS, by Arthur Waugh; BURNE-JONES, by Lawrence Binyon, poet and author of monographs on Blake, Crome, etc.; GEORGE FREDERICK WATTS, by Malcolm Bell, biographer of Burne-Jones; WALTER CRANE. On the "Newlyn" school, see the article NEWLYN; on the etchers, WHISTLER, by Frederick Wedmore, author of *Whistler's Etchings*, and WILLIAM STRANG and SIR F. S. HADEN, by Sir Charles Holroyd, artist and critic; on figure painters, SIR JOHN GILBERT, ALBERT MOORE, JOHN PETTIE, G. H. BOUGHTON, ALMA-TADEMA, SIR E. J. POYNTER and SIR W. B. RICHMOND; for painters of sentiment, MARCUS STONE, SIR LUKE FILDES and SIR HUBERT VON HERKOMER; among portrait painters, J. J. SHANNON, and C. W. FURSE; the decorator FRANK BRANGWYN; the realistic landscapists, H. W. B. DAVIS, DAVID MURRAY, SIR E. A. WATERLOW, VICAT COLE; the more imaginative and romantic painters of landscape, ALFRED W. HUNT, CECIL GORDON LAWSON, JOHN LINNELL, G. H. MASON, FREDERICK WALKER, SIR ALFRED EAST, J. BUXTON KNIGHT, GEORGE CLAUSEN; the "subjective landscapist" B. W. LEADER; the marine painters HENRY MOORE, C. NAPIER HEMY, JAMES CLARKE HOOK; the animal-painters BRETON, RIVIERE, J. M. SWAN, and, for the earlier period, LANDSEER; the Scottish artists ORCHARDSON, by Sir Walter Armstrong, director of National Gallery of Ireland; JOHN PETTIE, THOMAS FAED, DAVID MURRAY, ARTHUR MELVILLE, JOHN LAVERY, ROBERT BROUGH, SIR JAMES GUTHRIE, and SIR GEORGE REID, of whom we have already spoken as a contributor to the Britannica; and the water colorists SIR JOHN GILBERT, by F. G. Stephens, former art critic of the *Athenaeum*, HENRY MOORE, ALBERT MOORE, GEORGE CLAUSEN, E. J. GREGORY, BIRKET FOSTER, HAAG, KATE GREENAWAY, by M. H. Spielmann, biographer of Kate Green-

away. On English illustrators, besides those already named, Hogarth and Blake notably, see the articles THOMAS BEWICK, BARTOLOZZI, FLAXMAN, by Sir Sidney Colvin, CATTERMOLLE, SAMUEL PROUT, JAMES WARD, GILLRAY, BUNBURY, ROWLANDSON, CRUIKSHANK, JOHN LEECH, RICHARD DOYLE, TENNIEL, SIR JOHN GILBERT, AUBREY BEARDSLEY, by E. F. Strange, THOMAS CRESWICK, DU MAURIER, C. S. KEENE, FREDERICK WALKER, G. J. PINWELL, R. CALDECOTT, HARRY FURNISS, SIR F. C. GOULD, E. LINLEY SAMBOURNE, PHIL MAY, LEONARD RAVEN-HILL.

On French painting of the 17th century read: on landscape, POUSSIN, and CLAUDE OF LORRAINE (Vol. 6, p. 463), by W. M.

Rossetti; the historical and French religious painters LE BRUN and LE SUEUR; and the portraitist PHILIPPE DE CHAMPAIGNE. For the 18th century: the articles WATTEAU and FRAGONARD, by P. G. Konody; FRANÇOIS BOUCHER, LANCRET, VERNET the eldest, RIGAUD, CHARDIN, and GREUZE, by Lady Dilke, author of *French Painters of the 18th Century*.

In the 19th century came a classical reaction: see the article on its leader JACQUES LOUIS DAVID and his pupils and imitators J. B. REGNAULT, GIRODET, BARON GUÉRIN, PRUD'HON; then a mediate movement, on which see INGRES, by Lady Dilke, and GROS; and then a Romantic revolt—see DELACROIX, GÉRICAUT, ISABEY. Other important names are ZIEM, MEISSONIER and ROSE BONHEUR, both by Henri Frantz of the *Gazette des Beaux Arts*, CABANEL, BAUDRY, GÉRÔME, BOUGUEREAU, BENJAMIN CONSTANT, CORMON, BONNAT and HENNER. On the Barbizon school, see the articles BARBIZON, THEODORE ROUSSEAU, DAUBIGNY, COROT, and DIAZ, by D. Croal Thomson, author of *The Barbizon School*, J. F. MILLET, by Lady Dilke; DUPRÉ, FRANÇAIS and HARPIGNIES. Ranking with Corot and Millet in influence is COURBET; see the article on Cour-

bet, by Henri Frantz of the *Paris Gazette des Beaux Arts*, and on Courbet's followers, LEGROS, FANTIN-LATOURE, RIBOT, by Frederick Wedmore, CAROLUS-DURAN. Contrasted with these nature-lovers are the more mystic MOREAU, RICARD, DE-LAUNAY, FROMENTIN and CAZIN.

The later names we may classify: the decorative painter—PUVIS DE CHAVANES, by Henri Frantz; the impressionists—see the article IMPRESSIONISM (Vol. 14, pp. 343-346), by D. S. MacColl, keeper of the Tate Gallery, and author of *Nineteenth Century Art*, and in the article PAINTING the discussion on pp. 473-474 of Vol. 20—MANET, by Henri Frantz, MONET, DEGAS, RENOIR; the plein-airists JULES BRETON, BASTIEN-LEPAGE, by Henri Frantz; ROLL, GERVEUX; the symbolist GUSTAVE MOREAU; the military painters ALPHONSE DE NEUVILLE and DETAILLE; and the "neo-evangelist" CAZIN.

The art of Belgium and Holland in the 19th century is to be studied in Prof. Muther's sections on these two countries (pp. 506-509) in

**Belgium and Holland** the article PAINTING, and in such separate articles as LEYS, ALFRED STEVENS (to be distinguished from the English sculptor), BRAEKELEER, WILLEMS, CLAYS, PORTAELS, WAUTERS, CONSTANTIN MEUNIER, VERLAT, the DE VRIENDTS, KHNOPFF, already mentioned as a critic and a contributor to the *Britannica*,—all these are Belgians; and, in Holland, ISRAËLS, MARIS, MAUVE.

Going back to the close of the 18th century for German painters influenced by Winckelmann, the important articles are MENGES and CARSTENS.

**Germany** See OVERBECK, by J. Beav-  
ington Atkinson for the German "pre-Raphaelite" movement—and the articles, PETER VON CORNELIUS, by W. Cave Thomas, author of *Mural or Monumental Education*; the SCHADOWS, by J. B. Atkinson; VEIT, and SCHNORR. The other more important names before

1870 are: BETHEL, SCHWIND, ACHENBACH and PRELLER. The glorification of the Empire and of Prussia is the theme of the new historical school: see particularly MENZEL. The study of the old masters is to be seen in KAULBACH and LENBACH. Among the members of a more modern school are: LIEBERMANN, KALCKREUTH, KELLER, UHDE; of another reaction, FEUERBACH, THOMA, and BÖCKLIN, by Henri Frantz; and of a sculptural order KLINGER and STUCK.

As for Austria-Hungary, we may here mention only three Austria-Hungary articles: MAKART, PETTEKOFEN, and MUNKACSY, by E. F. Strange.

In Italy since the great days of the 17th century, we may mention TIEPOLO, CANALE and GUARDI before the 19th century, and in that era SEGANTINI, GIOVANNI COSTA, and MUZZIOLI.

The art of Spain has not been touched heretofore in this summary. For the 16th century see the articles COELLO, BECERRA, VINCENTE JOANES, **Spain** NAVARRETE, EL GRECO; and for the 17th, the Spanish century, HERRERA, his great pupil VELAZQUEZ, by J. Forbes White and P. G. Konody; CANO, and ZURBARAN and MURILLO, both by W. M. Rossetti. In the 18th century the only great Spanish artist was GOYA Y LUCIENTES, painter and etcher. On the 19th century see: FORTUNY, by Alfred Lys Baldry, art critic of the *London Globe*; PRADILLA; BENLLIURE Y GIL; SOROLLA Y BASTIDA; MADRAZO Y KUNT; ZULOAGA.

To the other countries of Europe, fully as their painting is treated in the *Britannica*, we can devote **Other European Countries** little space here. It may suffice to mention the Norwegian HANS DAHL and the Russians REPIN and VERESCHAGIN.

On painting in the United States, see the section in the article PAINTING, by

Prof. J. C. Van Dyke of Rutgers College  
(Vol. 20, pp. 518–519); and the articles  
**The United States** J. S. COPLEY, BEN-  
JAMIN WEST, JOHN

TRUMBULL, GILBERT STUART, JOHN VANDERLYN, WASHINGTON ALLSTON, REMBRANDT PEALE, J. W. JARVIS, THOMAS SULLY, THOMAS COLE, ASHER B. DURAND, J. F. KENSSETT, F. E. CHURCH, CHESTER HARDING, HENRY INMAN, WILLIAM PAGE, G. P. A. HEALY, DANIEL HUNTINGTON, W. S. MOUNT, W. M. HUNT, JOHN LA FARGE, GEORGE FULLER, EASTMAN JOHNSON, ELIHU VEDDER, LEONARD OCHTMAN, WINSLOW HOMER, A. H. WYANT, GEORGE INNESS, HOMER D. MARTIN, SWAIN GIFFORD, the MORANS, JERVIS McENTEE, D. W. TRYON, ALBERT BIERSTADT, W. H. BEARD, BLASHFIELD, J. W. ALEXANDER, W. M. CHASE, DUVENECK, CECILIA BEAUX, W. H. LOW, H. S. MOWBRAY, H. O. TANNER, E. C.

TARBELL, R. W. VONNOH,—and the Americans who have made their home and their fame in Europe, like WHISTLER, SARGENT, E. A. ABBEY and J. J. SHANNON, and those whose work is Continental, or even purely Parisian in tone, like W. T. DANNAT, GEORGE HITCHCOCK, GARI MELCHERS, C. S. PEARCE, E. L. WEEMS and WALTER GAY. On illustrators, see the articles: HOWARD PYLE, FREDERICK REMINGTON, C. S. REINHART, W. T. SMEDLEY, ROBERT BLUM, CHARLES DANA GIBSON, W. HAMILTON GIBSON, the wood-engraver TIMOTHY COLE, the etcher JOSEPH PENNELL; and for caricature the article THOMAS NAST and the section on the United States in M. H. Spielmann's article CARICATURE (Vol. 5, pp. 334–335).

For a fuller list of articles on painting, drawing, engraving, etc., with articles on sculpture, see the end of the next chapter *Sculpture*.

## CHAPTER XXXIV

### SCULPTURE

**T**HE Britannica article SCULPTURE (Vol. 24, p. 488; equivalent to 90 pages of this Guide) is a complete treatise on the technique and history of this branch of art by J. H. Middleton, late professor of Fine Art, Cambridge, M. H. Spielmann, former editor of the *Magazine of Art*, P. G. Konody, art critic of the *Observer* and *Daily Mail*, and, for French sculpture, Léonce Bénédite, keeper of the Luxembourg Museum and author of *Histoire des Beaux Arts*. It is illustrated with 10 full page plates as follows: I and II. *Medieval*, etc., with examples of the work of Jacopo della Quercia, Donatello (2), Andrea Pisano, Michelangelo, Verroc-

chio and Leopardò, Luca della Robbia, Benvenuto Cellini, **The Main Article** Peter Vischer, Bernini, Goujon, Canova, Houdon, Coysevox; III. IV. V. *Modern British*—Alfred Stevens, Sir George Frampton, Lord Leighton, Harry Bates, H. H. Armstead, G. F. Watts (2), A. Gilbert, F. W. Pomeroy, E. Onslow Ford, W. Hamo Thornycroft (2), Alfred Drury, F. Derwent Wood, Bertram Mackennal, Albert Toft, Havard Thomas, W. Goscombe John, W. R. Colton (2), Sir Charles Lawes-Wittewronge, Sir J. Edgar Boehm, Thomas Brock; VI. *American*—J. Q. A. Ward, D. C. French and E.

C. Potter, Augustus St. Gaudens, Frederick MacMonnies; VII. VIII. and IX. *Modern French*—Falguière, Barrias, Delaplanche, Idrac, Becquer, L. Gérôme, Marqueste, Longepied, Frémiet, Guillaume, Puech, Saint-Marceaux, Mercié, Rodin, Michel, Dalou, Aubé, Chapu, Bloche, Gardet, Bartholomé; and X. *Other Foreign Countries*—Sinding, Begas, Ximenes, Querol, Antokolski, Lambeaux, Meunier.

This article opens with an account of technical methods of sculpture which should be supplemented by other articles,

#### Other General Articles

which deal also with history and criticism: WOOD-CARVING (Vol. 28, p. 791), by Franklyn Arden Crallan, author of *Gothic Woodcarving*, with four plates and with descriptions not merely of Gothic and Renaissance work in Europe, but of Coptic, Mahomedan, Persian, Indian and Burmese, Chinese and Japanese, and the carving done by savage races; IVORY (Vol. 15, especially pp. 95-98, with 5 illustrations), by A. Maskell, author of *Ivories*; CHRYSSELEPHANTINE; METAL-WORK (Vol. 18, p. 205), with 9 text cuts and 2 full page plates), by Prof. J. H. Middleton, Cambridge, and John Starkie Gardner, author of *Armour in England* and *Iron Work*; GEM (Vol. 11, p. 560; with 2 full page plates containing 76 illustrations, mostly of antique gems, besides 10 cuts in the text) by Alexander Stuart Murray, author of *History of Greek Sculpture, Terra Cotta Sarcophagi*, etc., and Arthur Hamilton Smith, keeper of Greek and Roman Antiquities, British Museum; CAMEO; INTAGLIO; SEALS (Vol. 24, p. 539; with 9 illustrations), by Sir E. Maunde Thompson, late director British Museum; NUMISMATICS (Vol. 19, p. 869; equivalent to 120 pages of this Guide; with 6 plates—20 Greek coins, 27 Greek and Roman coins, 23 Roman and Medieval coins, 22 Oriental coins, 8 modern coins and medals, and 4 Italian medals—and 11

cuts illustrating modern coins) by Reginald Stuart Poole, formerly keeper department coins and medals, British Museum, Herbert Appold Grueber, keeper of the same department in 1906-1912, and George Francis Hill, assistant keeper of this department; MEDAL (Vol. 18, especially pp. 1 and 2, with 2 plates, showing 32 medals), by M. H. Spielmann; TERRA COTTA (Vol. 26, p. 652, with 2 plates, 12 illustrations), by William Burton, author of *English Stoneware and Earthenware* and H. Beauchamp Walters, assistant keeper Greek and Roman antiquities, British Museum; PLATE (Vol. 21, p. 789; with 31 illustrations), by H. R. H. Hall, author of *The Oldest Civilization of Greece*, H. Stuart Jones, author of *The Roman Empire*, and E. Alfred Jones, author of *Old English Gold Plate*, etc.; ALTO-RELIEVO; BASSO-RELIEVO; RELIEF and REPOUSSÉ, by M. H. Spielmann; WAX FIGURES; EFFIGIES, MONUMENTAL, by the late Charles Boutell, author of *A Manual of British Archaeology*, and M. H. Spielmann.

Early sculpture is separately treated. For "Classical" sculpture see the articles GREEK ART by Percy Gardner and

#### History of Sculpture

ROMAN ART by H. Stuart Jones, both elaborately illustrated and devoting particular attention to statuary, plate, etc. See also the illustrations in the articles mentioned in the last paragraph, —especially GEM, NUMISMATICS, TERRA COTTA; and those in the article ARCHITECTURE and subsidiary articles mentioned in the chapter of this Guide *For the Architect*. And on Greek art see the article PERGAMUM and the sketches of the great sculptors of Greece:

AGASIAS  
AGESANDER  
AGORACRITUS  
ALCAMENES  
ANTENOR  
APOLLONIUS OF TRALLES

ARCHERMUS  
 BATHYCLES  
 BOETHUS  
 BRYAXIS  
 BUPALUS AND ATHENIS  
 BUTADES  
 CALAMIS  
 CALLIMACHUS  
 CANACHUS  
 CEPHISODOTUS  
 CHARES  
 CRESILAS  
 CRITIUS AND NESIOTES  
 DAMOPHON  
 DEMETRIUS  
 DIPOENUS AND SCYLLIS  
 ENDOEUS  
 EUTYCHIDES  
 LEOCHARES  
 LYSIPPUS  
 LYSISTRATUS  
 MYRON  
 ONATAS  
 PAEONIUS  
 PASITELES  
 PHEIDIAS  
 POLYCLITUS  
 PRAXIAS AND ANDROSTHENES  
 PRAXITELES  
 RHOECUS  
 SCOPAS  
 SILANION  
 STRONGYLION  
 THRASYMEDES  
 TIMOTHEUS

See also the article **BYZANTINE ART**; and for sculpture elsewhere the sections *Art* in the articles **EGYPT**, **CHINA**, **JAPAN**.

For medieval sculpture, almost entirely an adjunct to architecture and particularly ecclesiastical architecture, see, besides the treatment

**Medieval** in the historical part of the article **SCULPTURE** (pp. 490-496), the articles **ARCHITECTURE** and **EFFIGIES**, **MONUMENTAL**, comparing with the latter the article **BRASSES**, **MONUMENTAL** (with 13 illustrations).

The close of the medieval period and

the beginning of the more individualistic Renaissance are marked by the occurrence of the names **Renaissance** of great individual artists, whose biographies are the best summary of the sculpture of the period.

See on Italy: the articles **NICCOLA PISANO** (Vol. 20, p. 648); **VITTORE PISANO** (Vol. 20, p. 649); **ANDREA PISANO** (Vol. 20, p. 647) and the article immediately following on his son, **GIOVANNI PISANO**; each of these four with an illustration; **VITTORE PISANO OF PISANELLO**; **AGOSTINO AND AGNOLO DA SIENA** (Vol. 1, p. 381); **ORCAGNA**, "the last great master of the Gothic period," by J. H. Middleton; **DELLA QUERCIA**, who "heralds . . . the boldest and most original achievements of two generations hence," by E. T. Strange, assistant keeper, South Kensington; **GHIBERTI**, "the first of the great sculptors of the Renaissance"; **DONATELLO**, by P. G. Konody; **MICHELOZZO**; **DELLA ROBBIA** family (with 3 illustrations), by J. H. Middleton and William Burton, author of *English Stoneware and Earthenware*; **LEONARDO**, by Sir Sidney Colvin; **VERROCCHIO**, by J. H. Middleton; **LEOPARDO**; **POLLAIUOLO**; **MICHELANGELO**, by Sir Sidney Colvin; **BANDINELLI**; **AMMANATI**; and in the 16th century period of decline **GIOVANNI DA BOLOGNA**, **LOMBARDO** family, **CELLINI**, by W. M. Rossetti and E. Alfred Jones, author of *Old English Gold Plate*, etc.

On the Renaissance in France: **JEAN GOUJON**, **SARRAZIN**.

—In Germany: **VEIT STOSS**, **ADAM KRAFFT**, the **VISCHERS**.

—In England: the Italian **TORRIGIANO**.

—In Spain: **ALONZO CANO**, **MONTAÑES**, **PEDRO DE MENA**, **ZARCILLO**.

Some of the names just mentioned are those of 17th century artists. But

**17th and 18th Century** the rococo character of the period is best seen in Italy:

see the articles **BERNINI**, **ALGARDI**, and, for France, **GIRAR-**



DON and PUGET. With the 18th century came a classical revival for which the great names are CANOVA and THORWALDSEN: see the articles on these sculptors, that on Canova being by W. M. Rossetti. See also the articles on Thorwaldsen's followers, SERGEL, BYSTRÖM and FOGELBERG. The more important articles on French sculpture in this period are PIGALLE and HOUDON, the latter known to Americans by his portraits of our Revolutionary worthies. For English sculpture in the 17th and 18th centuries see: NICHOLAS STONE, ROUBILIAC, by M. H. Spielmann, SCHEEMAKERS, NOLLEKENS, JOHN BACON, and, possibly most important, JOHN FLAXMAN, by Sir Sidney Colvin. For Germany: ANDREAS SCHLÜTER.

On the 19th century in Germany see the articles: SCHADOW, RAUCH, RIETSCHEL, DANNECKER, SCHWANTHALER, and marking a sharp reaction, REINHOLD BEGAS, and the younger men, known also as painters, FRANZ STUCK and MAX KLINGER.

On modern British sculpture see the articles: JOHN GIBSON, E. H. BAILY, THOMAS BANKS, SIR RICHARD WESTMACOTT, and ALFRED STEVENS; and, for the last thirty years, JULES DALOU, LORD LEIGHTON, better known as a painter, E. ONSLOW FORD and ALFRED GILBERT, the most influential and important factors in the awakening, and THOMAS WOOLNER, MAROCHETTI, SIR EDWIN LANDSEER, SIR J. E. BOEHM, J. H. FOLEY, H. H. ARMSTEAD, THOMAS BROCK, W. HAMO THORNYCROFT, JOHN M. SWAN, HARRY BATES, G. F. WATTS. Scores of others are criticized and their work summarized on pp. 501-508 in the article SCULPTURE.

The 19th century in France opened with a pseudo-Roman school, and among the names of this period are PRADIER, RUDE, P. J. DAVID, ETEX, and CARPEAUX and

BARYE, by Henri Frantz, who mark a transition. For the more modern period see GUILLAUME, DUBOIS, FALGUIÈRE, MERCIÉ, FRÉMIET, GUSTAVE CRAUCK, DALOU, RODIN.

In addition to the discussion of modern Belgian sculptors in the section on Belgium of the article SCULPTURE

there are separate articles on PAUL DE VIGNE, VAN DER STAPPEN, JEF LAMBEAUX, JULIEN DILLENS, and CONSTANTIN MEUNIER. For Italian sculpture in the 19th century see BARTOLINI, and the summary in the article SCULPTURE (Vol. 24, p. 513). Separate articles on Spanish sculptors are JOSE ALVAREZ and MANUEL ALVAREZ.

In the United States there was little sculpture of native origin, and virtually none of the slightest merit, before the 19th century. The following list of articles in rough chronological order will supplement the outline in the article SCULPTURE (Vol. 24, p. 516): HORATIO GREENOUGH, HIRAM POWERS, THOMAS CRAWFORD, HENRY KIRKE BROWN, WILLIAM RIMMER, E. D. PALMER, THOMAS BALL, L. W. VOLK, HARRIET G. HOSMER, J. Q. A. WARD, LAUNT THOMPSON, LARKIN G. MEAD, G. E. BISSELL, OLIN L. WARNER, W. R. O'DONOVAN, JONATHAN S. HARTLEY, AUGUSTUS SAINT-GAUDENS, D. C. FRENCH, J. J. BOYLE, C. H. NIEHAUS, LORADO TAFT, W. O. PARTRIDGE, CYRUS E. DALLIN, A. P. PROCTOR, CHARLES GRAFLY, F. W. MACMONNIES, GEORGE GRAY BARNARD, P. W. BARTLETT, HERMON A. MACNEIL, KARL BITTER, BORGLUM.

Other European Countries

American Sculpture

This chapter, and the one before, outline courses on these arts in the Britannica, but there are many articles on these topics to which no reference has been made in these pages. It may, therefore, be in-

Summary

teresting to the student of these forms of art to have before him a list, fairly complete, of articles in the Britannica dealing with painting and sculpture. The following is such a list in alphabetical arrangement. The student should remember that the absence from the list

—or from any similar list in the Guide—of a topic on which he wishes information does not mean that there is no information on the subject in the Britannica, but merely that there may be no separate article on the subject. In such cases let him turn to the general index (Vol. 29).

#### LIST OF THE PRINCIPAL ARTICLES DEALING WITH THE FINE ARTS

- |                              |                             |                         |  |
|------------------------------|-----------------------------|-------------------------|--|
| Abati, N.                    | Apollodorus                 | Bellini (family)        | Bril, Paul                               |
| Abbey, E. A.                 | Apollonius of Tralles       | Bellows, Albert F.      | Briosco, Andrea                          |
| Abildgaard, N. A.            | Appiani, Andrea             | Benlliure y Gil, José   | Brock, Thomas                            |
| Achenbach, Andreas           | Aquarelle                   | Benson, F. W.           | Bronzino, Il                             |
| Acroliths                    | Aquatint                    | Berchem, Nicolaas       | Brough, Robert                           |
| Adam, L. S.                  | Archerms                    | Bernini, G. L.          | Brouwer, Adrian                          |
| Adams, Herbert               | Aristides of Thebes         | Besnard, P. A.          | Brown, Ford Madox                        |
| Aertszén, Pieter             | Armstead, H. H.             | Beverley, W. R.         | Brown, Henry Kirke                       |
| Aetion                       | Asper, Hans                 | Bewick, Thomas          | Brown, John George                       |
| Agasias                      | Asselyn, Hans               | Bierstadt, Albert       | Browne, Hablôt Knight                    |
| Agatharchus                  | Audran (family)             | Bissell, G. E.          | Brush, G. de Forest                      |
| Ageladas                     | Bacon, John                 | Bitter, K. T. F.        | Bry, T. (Dirk) de                        |
| Agesander                    | Backhuysen, Ludolf          | Blackburn, Jonathan     | Bryaxis                                  |
| Agoracritus                  | Badalocchio, Sisto          | Blake, William          | Bunbury, H. W.                           |
| Agostino and Agnolo da Siena | Baer, William Jacob         | Blakelock, R. A.        | Bupalus and Athenis                      |
| Agricola, C. L.              | Bagnacavallo, B.            | Blanche, J. E.          | Burckhardt, Jakob                        |
| Aikman, William              | Baily, E. H.                | Blashfield, E. H.       | Burgkmair, Hans                          |
| Albani, Francesco            | Baldinucci, Filippo         | Bloemaert, Abraham      | Burne-Jones, Sir E. B.                   |
| Albertinelli Mariotto        | Baldovinetti, Alessio       | Bloemen, J. F. van      | Burton, Sir F. W.                        |
| Alcamenes                    | Ball, Thomas                | Blum, R. F.             | Busch, Wilhelm                           |
| Aldegrevér, Heinrich         | Bandinelli, B.              | Böcklin, Arnold         | Butadeo                                  |
| Alexander, Francis           | Banks, Thomas               | Boehm, Sir J. E.        | Byström, Johan Niklas                    |
| Alexander, John White        | Barbieri, G. F.             | Boethus                 | Cabanel, Alexandre                       |
| Alfani, Domenico             | Barbizon                    | Bologna, Giovanni       | Calamis                                  |
| Algardi, Alessandro          | Barnard, G. G.              | Bone, Henry             | Calcar (Kalcker), de                     |
| Allan, David                 | Barocci, Federigo           | Bonfigli, Benedetto     | Caldecott, Randolph                      |
| Allan, Sir William           | Barry, James                | Bonheur, Rosa           | Calcott, Sir A. W.                       |
| Allori, Alessandro           | Bartels, Hans von           | Bonnat, L. J. F.        | Callimachus                              |
| Allston, Washington          | Bartlett, P. W.             | Bordone, Paris          | Callot, Jacques                          |
| Alma-Tadema, Sir L.          | Bartolini, Lorenzo          | Borglum, S. H.          | Calvart, Denis                           |
| Altdorfer, Albrecht          | Bartolommeo di Pagholo, Fra | Borgognone, Ambrogio    | Calvert (3 artists)                      |
| Alto-Relievo                 | Bartolozzi, Francesco       | Bosch, Jerom            | Cambiasi, Luca                           |
| Alvarez, Don José            | Barye, A. L.                | Bossi, Giuseppe         | Camphausen, Wilhelm                      |
| Alvarez, Don Manuel          | Bassano, Jacopo da Ponte    | Botticelli, Sandro      | Camphuysen, D. R.                        |
| Amalteo, Pomponio            | Basso-Relievo               | Bouchardon, Edme        | Campi, Giulio                            |
| Amman, Jost                  | Bastien-Lepage, Jules       | Boudin, François        | Camuccini, Vincenzo                      |
| Ammanati, Bartolomeo         | Bates, Harry                | Boudin, Eugène          | Canachus                                 |
| Amsler, Samuel               | Bathycles                   | Boughton, G. H.         | Canale, A. (Canaletto)                   |
| Andrea del Sarto             | Batoni, P. G.               | Bouguereau, A. W.       | Canini, G. A.                            |
| Andreani, Andrea             | Baudry, P. J. A.            | Boulanger (family)      | Cano, Alonzo                             |
| Andrieu, Bertrand            | Beard, William H.           | Boulogne                | Canova, Antonio                          |
| Angelico, Fra                | Beardsley, Aubrey V.        | Bourse, Esaias          | Cantarini, Simone                        |
| Anguier, François and Michel | Beaux, Cecilia              | Boyle, John J.          | Caracci, Lodovico, Agostino and Annibale |
| Angussola, Sophonisba        | Beccafumi, Domenico di Pace | Bracquemond, Felix      | Caran d'Ache                             |
| Anichini, Luigi              | Becerra, Gaspar             | Bradford, William       | Caravaggio, M. A. da                     |
| Anna, Baldassarre            | Beck, David                 | Braekeleer, H. J. A. de | Caravaggio, P. C. da                     |
| Ansdell, Richard             | Beckwith, J. C.             | Brangwyn, Frank         | Carducci, Bartholomew                    |
| Antenor                      | Beechey, Sir William        | Brascassat, J. R.       |  |
| Antiphilus                   | Begas, Karl                 | Bredael, J. F. van      |  |
| Antonello da Messina         | Begas, Reinhold             | Breton, Jules A. A. L.  |  |
| Apelles                      |                             | Breughel, Pieter        | Caricature                               |
|                              |                             | Bridgman, F. A.         | Carolus-Duran                            |
|                              |                             | Brierly, Sir O. W.      | Carpaccio, Vittorio                      |

- Carpeaux, J. B.  
 Carpi, Girolamo da  
 Carpi, Ugo da  
 Carstens, A. J.  
 Cartoon  
 Carving  
 Cassana, Niccolo  
 Castagno, Andrea del  
 Castello, Bernardo  
 Castello, G. B.  
 Castello, Valerio  
 Castiglione, G. B.  
 Cattermole, George  
 Cavallini, Pietro  
 Cavedone, Jacopo  
 Cazin, J. C.  
 Cephisodotus  
 Cesari, Giuseppe  
 Cespedes, Pablo de  
 Chalmers, G. P.  
 Chambers, George  
 Champagne, Philippe  
 de  
 Chantrey, Sir F. L.  
 Chardin, J. S.  
 Chares  
 Charlet, N. T.  
 Chase, W. M.  
 Chassériau, Théodore  
 Chiaroscuro  
 Chodowiecki, D. N.  
 Chryselephantine  
 Church, F. E.  
 Cibber, C. G.  
 Cicognara, Count Leopoldo  
 Cignani, Carlo  
 Cigoli, L. C. da  
 Cimabue, Giovanni  
 Cimon of Cleonae  
 Cipriani, G. B.  
 Civerchio, Vincenzo  
 Clarke, T. S.  
 Claude of Lorraine  
 Clausen, George  
 Clays, Paul Jean  
 Clouet, François  
 Clouet, Jean  
 Clovio, G. G.  
 Cockx, Hieronymus  
 Coello, A. S.  
 Cole, Thomas  
 Cole, Timothy  
 Cole, Vicat  
 Colin, Alexandre  
 Collaert, Hans  
 Collins, William  
 Colman, Samuel  
 Colman, Sidney  
 Conca, Sebastiano  
 Conder, Charles  
 Constable, John  
 Constant, Benjamin  
 Conway, Sir W. Martin  
 Cooper, Abraham  
 Cooper, Alexander  
 Cooper, Samuel  
 Cooper, Thomas Sidney  
 Copley, John Singleton  
 Coques (Cocx), Gonzales  
 Corenzo, Belisario  
 Cormon, Fernand  
 Cornelius, P. von  
 Corot, J. B. C.  
 Correggio  
 Cort, Cornelius  
 Costa, Giovanni  
 Costa, Lorenzo  
 Cosway, Richard  
 Cotman, J. S.  
 Cottet, Charles  
 Courbet, Gustave  
 Courtois, Jacques and Guillaume  
 Cousin, Jean  
 Cousins, Samuel  
 Coustou (family)  
 Couture, Thomas  
 Cox, David  
 Cox, Kenyon  
 Coxie, Michael  
 Coypel  
 Coysevox, C. A.  
 Cranach, Lucas  
 Crane, Walter  
 Crauck, Gustave  
 Crawford, Thomas  
 Crayer, Gaspard de  
 Crayon  
 Credi, Lorenzo di  
 Cresilas  
 Crespi, Daniele  
 Crespi, Giovanni B.  
 Crespi, Giuseppe M.  
 Creswick, Thomas  
 Critius and Nesiotes  
 Crivelli, Carlo  
 Crombe, John  
 Cropsey, J. F.  
 Crowe, Sir J. A.  
 Cruikshank, George  
 Cuypp  
 Dahl, Hans  
 Dahl, J. C.  
 Dahl, Michael  
 Dallin, Cyrus E.  
 Dalou, Jules  
 Damophon  
 Danby, Francis  
 Daniell, Thomas  
 Dannat, William T.  
 Dannecker, J. H. von  
 Daubigny, C. F.  
 Daumier, Honoré  
 David, Gerard  
 David, J. L.  
 David, Pierre Jean  
 Davis, C. H.  
 Davis, H. W. B.  
 De Camp, Joseph  
 Decamps, A. G.  
 Degas, H. G. E.  
 De Haas, M. F. H.  
 De Keyser, Thomas  
 Delacroix, F. V. E.  
 Delaroche, H. (Paul)  
 Delaunay, Elie  
 Della Bella, Stefano  
 Della Colle, Raffaellino  
 Della Quercia, Jacopo  
 Della Robbia  
 De Louthembourg, P. J.  
 Demetrius  
 Desiderio da Settignano  
 Detaille, J. B. E.  
 Dewing, T. W.  
 De Wint, Peter  
 Diamante, Fra  
 Diaz, N. V.  
 Dielmann, Frederick  
 Diepenbeck, A. van  
 Dies, C. A.  
 Dietrich, C. W. E.  
 Dillens, Julien  
 Dipoenus and Scyllis  
 Dobson, William  
 Dolci, Carlo  
 Domenichino, Zampieri  
 Donatello  
 Doré, L. A. Gustave  
 Douw, Gerhard  
 Downman, John  
 Doyen, G. F.  
 Doyle, Richard  
 Drawing  
 Drouais, J. G.  
 Dubois, Paul  
 Du Maurier, G. L. P. B.  
 Dumont (family)  
 Dumont, François  
 Duncan, Thomas  
 Dupré, Jules  
 Durand, Asher Brown  
 Dürer, Albrecht  
 Duveneck, Frank  
 Dyce, William  
 Eakins, Thomas  
 Earle, Ralph  
 Earlom, Richard  
 East, Alfred  
 Eastlake, Sir C. L.  
 Eaton, Wyatt  
 Eckersberg, Kristoffer  
 Edelinck, Gerard  
 Eeckhout, G. van den  
 Effigies, Monumental  
 Egg, A. L.  
 Encaustic Painting  
 Endoeus  
 Engleheart, George  
 Engraving  
 Enneking, J. J.  
 Etching  
 Etex, Antoine  
 Etyy, William  
 Euphranor  
 Euphronius  
 Eupompus  
 Eutyehides  
 Everdingen, Allart van  
 Fyck, Van  
 Faed, Thomas  
 Faithorne, William  
 Falcone, Aniello  
 Falconet, E. M.  
 Falguière, J. A. J.  
 Fantin-Latour, I. H. T.  
 Farinato, Paolo  
 Feltre, Morto da  
 Fernow, K. L.  
 Ferrari, Gaudenzio  
 Ferri, Ciro  
 Feuerbach, Anselm  
 Fielding, A. V. Copley  
 Fildes, Sir Luke  
 Finden, William  
 Fiorenzo di Lorenzo  
 Fiorillo, J. D.  
 Fisher, Alvan  
 Flandrin, J. Hippolyte  
 Flaxman, John  
 Flink, Govert  
 Floris, Frans  
 Fontana, Lavinia  
 Fontana, Prospero  
 Fogelberg, B. E.  
 Foley, J. H.  
 Foppa, Vincenzo  
 Forain, J. L.  
 Ford, E. Onslow  
 Forster, François  
 Fortuny, M. J. M. B.  
 Foster, M. Birket  
 Foucquet, Jean  
 Fragonard, J. H.  
 François, F. L.  
 Franceschi, Piero d.  
 Franceschini, Baldassare  
 Francia  
 Franciabigio  
 Franck  
 Francken (family)  
 Frémiet, Emmanuel  
 French, Daniel C.  
 Frère, P. E.  
 Fresco  
 Fresnoy, C. A. du  
 Frith, W. P.  
 Fromentin, Eugène  
 Frost, W. E.  
 Fruytiers, Philip  
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 Fuller, George  
 Furniss, Harry  
 Furse, C. W.  
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 Gauermann, Friedrich  
 Gaul, G. W.  
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 Gay, Walter  
 Geddes, Andrew  
 Geikie, Walter  
 Genelli, G. B.  
 Genza, Girolamo  
 Gentile da Fabriano

- Gentileschi, Artemisia  
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 Gérard, J. I. I.  
 Géricault, J. L. A. T.  
 Gérôme, Jean Léon  
 Gervex, Henri  
 Ghiberti, Lorenzo  
 Chirlandajo, Domenico  
 Ghirlandajo, Ridolfo  
 Gibson, C. Dana  
 Gibson, John  
 Gibson, W. H.  
 Gifford, R. S.  
 Gifford, S. R.  
 Gilbert, Alfred  
 Gilbert, Sir John  
 Gillot, Claude  
 Gillray, James  
 Giordano, Luca  
 Giorgione  
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 Giotto  
 Girardon, François  
 Girodet de Roussy, A. L.  
 Girtin, Thomas  
 Giulio Romano  
 Giunta Pisano  
 Giusto da Guanto  
 Gleyre, M. C. G.  
 Goes, Hugo van der  
 Goldschmidt, Hermann  
 Goltzius, Hendrik  
 Gordon, Sir J. W.  
 Gouache  
 Goujon, Jean  
 Gould, Sir F. C.  
 Goya y Lucientes, F.  
 Goyen, J. J. Van  
 Gozzoli, Benozzo  
 Grafty, Charles  
 Granet, F. M.  
 Grant, Sir Francis  
 Gray, Henry Peters  
 Greco, El  
 Green, Valentine  
 Greenaway, Kate  
 Greenough, Horatio  
 Gregory, Edward John  
 Greuze, J. B.  
 Grimaldi, G. F.  
 Grisaille  
 Gros, Antoine Jean  
 Grün, Hans Baldung  
 Grünewald, Mathias  
 Guardi, Francesco  
 Guariento (Guerriero)  
 Guérin, J. B. P.  
 Guérin, P. N.  
 Guido of Siena  
 Guido Reni  
 Guillaume, J. B. C. E.  
 Guthrie, Sir James  
 Haag, Carl  
 Haden, Sir F. Seymour  
 Hals, Frans  
 Hamerton, P. G.  
 Hamon, Jean Louis  
 Harding, Chester  
 Harding, J. D.  
 Harpignies, Henri  
 Harrison, T. A.  
 Hart, William  
 Hartley, Jonathan S.  
 Harvey, Sir George  
 Hassam, Childe  
 Haydon, B. R.  
 Hayter, Sir George  
 Head, Sir E. W.  
 Healy, G. P. A.  
 Heda, Willem Claasz  
 Heem, Jan Davidsz van  
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 Heim, F. J.  
 Helst, B. van der  
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 Henry, E. L.  
 Herkomer, Sir H. von  
 Herlen, Fritz  
 Herrera, Francisco  
 Hersent, Louis  
 Hess (family)  
 Heusch, Willem  
 Heyden, Jan van der  
 Hildebrandt, Eduard  
 Hildebrandt, Theodor  
 Hilliard, Lawrence  
 Hilliard, Nicholas  
 Hilton, William  
 Hiroshige  
 Hitchcock, George  
 Hobbema, Meyndert  
 Hoefnagel, Joris  
 Hogarth, William  
 Hokusai  
 Holbein, Hans (elder)  
 Holbein, Hans (younger)  
 Holl, Frank  
 Hollar, Wenzel  
 Holroyd, Sir Charles  
 Homer, Winslow  
 Hondecoeter, M. d'  
 Hone, Nathaniel  
 Honthorst, Gerard van  
 Hooch, Pieter de  
 Hoogstraten, S. D. van  
 Hook, James Clarke  
 Hoppner, John  
 Horsley, J. C.  
 Hoskins, John  
 Hosmer, Harriet G.  
 Hotho, Heinrich G.  
 Houbraken, Jacobus  
 Houdon, J. A.  
 Hovenden, Thomas  
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 Hunt, Alfred William  
 Hunt, William Henry  
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 Jameson, George  
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 Jarvis, J. W.  
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 Johnson, Eastman  
 Jordaens, Jacob  
 Jouvenet, Jean  
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 Kauffmann, Angelica  
 Kaulbach, Wilhelm von  
 Kay, John  
 Keene, C. S.  
 Keller, Albert  
 Kensett, J. F.  
 Khnopff, F. E. J. M.  
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 Knight, D. R.  
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 Krafft, Adam  
 Kyosai, Sho-fu  
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 Lahire, Laurent de  
 Lambeaux, Jef  
 Lancret, Nicolas  
 Landon, C. P.  
 Landseer, Sir E. H.  
 Lantara, S. M.  
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 Largillière, Nicolas  
 Lathrop, Francis  
 La Tour, Quentin de  
 Lavery, John  
 Lawrence, Sir Thomas  
 Lawson, Cecil Gordon  
 Leader, B. W.  
 Léandre, C. I.  
 Lear, Edward  
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 McEntee, Jervis  
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 MacNeil, Hermon A.  
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 Manet, Edouard  
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 Marcantonio  
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**Meunier, Constantin**  
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**Moore, Henry**  
**Mora, José**  
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**Moran, Thomas**  
**Moreau, Gustave**  
**Morelli, Giovanni**  
**Moretto, Il**  
**Morghen, R. S.**  
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**Moro, Antonio**  
**Moroni, Giambattista**  
**Mosler, Henry**  
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**Mowbray, H. S.**  
**Müller, W. J.**  
**Mulready, William**  
**Munkacsy, Michael von**  
**Murillo, B. E.**  
**Murphy, John Francis**  
**Murray, David**  
**Muziano, Girolamo**  
**Muzzioli, Giovanni**  
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**Nanteuil, Robert**  
**Nasmyth, Alexander**  
**Nast, Thomas**  
**Nattier, J. M.**  
**Navarrete, J. F.**  
**Neal, D. D.**  
**Neer, van der**  
**Netscher, Gaspar**  
**Neuville, Alphonse M.  
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**Niehaus, C. H.**  
**Nicholson, William**  
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**Nollekens, Joseph**  
**Northcote, James**  
**Oberlander, A. A.**  
**Ochtman, Leonard**  
**O'Donovan, W. R.**  
**Oliver, Isaac**  
**Oliver, Peter**  
**Onatas**  
**Opie, John**  
**Orcagna**  
**Orchardson, Sir W. Q.**  
**Orley, Bernard von**  
**Ostade**  
**Oudiné, E. A.**  
**Overbeck, J. F.**  
**Pacchia, Girolamo del,  
 a n d Pacchiarotto,  
 Jacopo**  
**Pacheco, Francisco**  
**Paeonius**  
**Page, William**  
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**Partridge, W. O.**  
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**Paton, Sir J. Noel**  
**Paul Veronese**  
**Pausias**  
**Peale, C. W.**  
**Peale, Rembrandt**  
**Pearce, C. S.**  
**Pennell, Joseph**  
**Penni, Gianfrancesco**  
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**Perkins, C. C.**  
**Perugino, Pietro**  
**Peruzzi, Baldassare**  
**Petitot, Jean**  
**Petitot, Jean Louis**  
**Pettenkofen, A. von**  
**Pettie, John**  
**Phedias**  
**Phillip, John**  
**Phillips, Thomas**  
**Picknell, W. L.**  
**Piero di Cosimo**  
**Pigalle, J. B.**  
**Piloty, Karl von**  
**Pinturicchio**  
**Pinwell, G. J.**  
**Piranesi, G. B.**  
**Pisano, Andrea**  
**Pisano, Giovanni**  
**Pisano, Niccola**  
**Pisano, Vittore**  
**Pissarro, Camille**  
**Plimer, Andrew**  
**Plimer, Nathaniel**  
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**Polygnotus**  
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**Poole, Paul Falconer**  
**Pordenone, Il**  
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**Porter, B. C.**  
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**Poussin, Nicolas**  
**Powers, Hiram**  
**Poynter, Sir E. J.**  
**Pradier, James**  
**Pradilla, Francisco**  
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**Praxiteles**  
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**Preller, Friedrich**  
**Prieur, Pierre**  
**Prinsep, V. C.**  
**Proctor, A. P.**  
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**Prud'hon, Pierre**  
**Puget, Pierre**  
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**Pythagoras**  
**Pyle, Howard**  
**Raeburn, Sir Henry**  
**Raffaellino del Garbo**  
**Raffet, D. A. M.**  
**Raimbach, Abraham**  
**Ramsay, Allan**  
**Ranger, H. W.**  
**Raoux, Jean**  
**Raphael Sanzio**  
**Raven-Hill, Leonard**  
**Rauch, C. D.**  
**Redgrave, Richard**  
**Regnault, Henri**  
**Regnault, J. B.**  
**Reid, Sir George**  
**Reid, Robert**  
**Reinhart, C. S.**  
**Reinhart, J. C.**  
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**Rembrandt**  
**Remington, Frederick**  
**Renoir, F. A.**  
**Repin, I. J.**  
**Restout, Jean**  
**Rethel, Alfred**  
**Reynolds, Sir Joshua**  
**Rhoecus**  
**Ribera, Giuseppe**  
**Ribot, Théodule**  
**Ricard, L. G.**  
**Ricciarelli, Daniele**  
**Richards, W. T.**  
**Richmond, Sir W. B.**  
**Richter, A. L.**  
**Rietschel, E. F. A.**  
**Rigaud, Hyacinthe**  
**Rimmer, William**  
**Riviere, Briton**  
**Robert, Hubert**  
**Robert, L. I.**  
**Robert-Fleury, J. N.**  
**Roberts, David**  
**Robinson, Theodore**  
**Rodin, Auguste**  
**Rogers, John**  
**Roll, A. P.**  
**Romney, George**  
**Rosselli, Félicien**  
**Rosa, Salvator**  
**Rosenthal, T. E.**  
**Rosselli, Cosimo**  
**Rossellino, Antonio**  
**Rossetti, D. G.**  
**Roubiliac, L. F.**  
**Rousseau, Jacques**  
**Rousseau, P. E. T.**  
**Rowlandson, Thomas**  
**Rubens, Peter Paul**  
**Rude, François**  
**Runciman, Alexander**  
**Russell, John**  
**Ruysdael, Jacob van**  
**Ryder, A. P.**  
**Ryland, W. W.**  
**Sacchi, Andrea**  
**Saint-Gaudens, A u -  
 gustus**  
**Sambourne, E. Linley**  
**Sandby, Paul**  
**Sandrart, Joachim von**  
**Sandys, Frederick**  
**Sansovino, Andrea C.  
 del Monte**  
**Sansovino, Jacopo**  
**Santarre, J. B.**  
**Sargent, J. S.**  
**Sarrazin, Jacques**  
**Sartain, John**  
**Satterlee, Walter**  
**Sayer, James**  
**Schadow**  
**Schadow, J. G. and R.**  
**Schalcken, Godfried**  
**Scharf, Sir George**  
**Schemakers, Peter**  
**Scheffer, Ary**  
**Schetky, J. C.**  
**Schiavonetti, Luigi**  
**Schirmer, Friedrich W.**  
**Schirmer, Johann W.**  
**Schlüter, Andreas**  
**Schnorr von Karolsfeld**  
**Schongauer, Martin**  
**Schreyer, Adolf**  
**Schwanthaler, I. M.**  
**Schwartz, Teresa**



- Schwind, Moritz von  
Scopas  
Scott, David  
Scott, William Bell  
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Sebastiano del Piombo  
Seddon, Thomas  
Segantini, Giovanni  
Sequeira, D. A. de  
Sergel, Johan Tobias  
Seyn, Joseph  
Shannon, C. H.  
Shannon, J. J.  
Sharp, William  
Shee, Sir M. A.  
Sherwin, J. K.  
Short, F. J.  
Sigalon, Xavier  
Signorelli, Luca  
Silanion  
Simon, Abraham  
Simon, Thomas  
Simmons, E. E.  
Simson, William  
Sisley, Alfred  
Slodtz, René Michel  
Smart, John  
Smedley, W. T.  
Smillie, J. D.  
Smirke, Robert  
Smith, Colvin  
Smith, John Raphael  
Smybert, John  
Snyders, Franz  
Sodoma, Il  
Solario, Antonio  
Sorolla y Bastida, J.  
Spagna, Lo  
Spinello, Aretino  
Stanfield, W. C.  
Stannard, Joseph  
Stark, James  
Steen, Jan Havicksz  
Steer, P. Wilson  
Stevens, Alfred  
Stevens, Alfred  
Stewart, Julius L.  
Stillman, W. J.
- Stone, Frank  
Stone, Marcus  
Stone, Nicholas  
Stoss, Veit  
Stothard, C. A.  
Stothard, Thomas  
Strang, William  
Strange, Sir Robert  
Strongylion  
Stuart, Gilbert  
Stuck, Franz  
Subleyras, Pierre  
Sully, Thomas  
Swan, J. M.  
Taft, Lorado  
Tait, A. F.  
Tanner, H. O.  
Tarbell, Edmund C.  
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Teniers (family)  
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Ter Borch, Gerard  
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Thayer, Abbott H.  
Theon of Samos  
Thoma, Hans  
Thompson, Launt  
Thomson, John  
Thornhill, Sir James  
Thornycroft, W. Hamo  
Thorwaldsen, Bertel  
Thrasymedes  
Tiepolo, G. B.  
Tiffany, L. C.  
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Timomachus  
Timotheus  
Tintoretto  
Tisio, Benvenuto  
Tissot, J. J. J.  
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Torrignano, Pietre  
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Troy, J. F. de  
Troyon, Constant  
Trumbull, John  
Tryon, D. W.  
Turner, Charles
- Turner, J. M. W.  
Uhde, F. K. H. Von  
Utamaro  
Vanderlyn, John  
Van der Stappen, C.  
Van der Weyden, R.  
Vandevelde, Adrian  
Vandevelde, William  
Van Dyck, Sir Anthony  
Vanloo, C. A.  
Vanloo, J. B.  
Varley, Cornelius  
Varley, John  
Vasari, Giorgio  
Vedder, Elihu  
Veit, Philipp  
Velazquez, D. R. de Silva y  
Verboeckhoven, E. J.  
Vereshchagin, V. V.  
Verlat, M. M. C.  
Vernet (family)  
Verrocchio, Andrea del  
Vertue, George  
Vien, J. M.  
Vierge, Daniel  
Vigée-Lebrun, M. A. E.  
Vigne, Paul de  
Vincent, George  
Vinton, F. P.  
Vischer (family)  
Vischer, F. T.  
Vivarini (family)  
Volk, L. W.  
Vonnoh, R. W.  
Vouet, Simon  
Vrancx, Sebastian  
Vriendt, J. J. de and A. F. L. de  
Waagen, G. F.  
Waldo, S. L.  
Walker, Frederick  
Walker, H. O.  
Walker, Horatio  
Walker, Robert  
Wappers, E. C. G.  
Ward, James
- Ward, E. M.  
Ward, J. Q. A.  
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Warner, Olin Levi  
Waterhouse, J. W.  
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Watteau, Antoine  
Watts, G. F.  
Wauters, Emile  
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Webster, Thomas  
Weeks, E. L.  
Weenix, J. B.  
Weir, R. W.  
Werner, A. A. von  
West, Benjamin  
Westall, Richard  
Westmacott, Sir R.  
Wheatley, Francis  
Whistler, J. A. McN.  
White, Robert  
Wiles, I. R.  
Wilkie, Sir David  
Willems, F. J. M.  
Willette, L. A.  
Willmore, J. T.  
Wilson, Richard  
Wohlgemuth, Michael  
Wolf, Joseph  
Woodbury, C. H.  
Wood Carving  
Wood Engraving  
Woollett, William  
Woolner, Thomas  
Wouwerman, Philip  
Wright, Joseph  
Wyant, A. H.  
Wylie, Robert  
Yosai  
Zarcillo y Alcaraz, F.  
Zeuxis  
Ziem, F. F. G. P.  
Zoffany, Johann  
Zuccarelli, Francesco  
Zuccaro, Taddeo  
Zuccaro, Federigo  
Zuloaga, Ignacio  
Zurbaran, Francisco

## CHAPTER XXXV

### LANGUAGE AND WRITING

ONE of the most interesting subjects of scientific study developed during the last century is that of primitive culture and the gradual advancement of primitive man from a state of savagery to comparative civilization. For this study there are no historical documents in the ordinary use of the words "historical" and "document." The story must be arrived at by analysis, deduction, even by guess-work, supplementing the studies of travelers among tribes which now are in the lowest stages of development and farthest from civilization, and therefore most resemble our remotest human ancestors. Almost the

very earliest of writers on Evolution evolution, the Roman poet LUCRETIVS (Vol. 17, p. 107), who died in 55 B.C., sketched general outlines of the development of this primitive civilization in much the same way as do modern ethnologists. But his description was imaginary and was fashioned to fit his and Epicurus's evolutionary theories.

The article CIVILIZATION (Vol. 6, p. 403) in the Britannica makes the development of speech the mark of the first period when mankind was in the lower stages of savagery. "Our ancestors of this epoch inhabited a necessarily restricted tropical territory and subsisted upon raw nuts and fruit." The next higher period in the progress of civilization began with the knowledge of the use of fire (p. 404).

This wonderful discovery enabled the developing race to extend its habitat almost

indefinitely, and to include flesh, and in particular fish, in its regular dietary. Man could now leave the forests and wander along the shores and rivers, migrating to climates less enervating than those to which he had previously been confined. Doubtless he became an expert fisher, but he was as yet poorly equipped for hunting. . . . Primitive races of Australia and Polynesia had not advanced beyond this middle status of savagery when they were discovered a few generations ago.

The next great ethnical discovery was that of the bow and arrow, a truly wonderful instrument.

The possessor of this device could bring down the fleetest animal and could defend himself against the most predatory. He could provide himself not only with food, but with materials for clothing and for tent-making, and thus could migrate at will back from the seas and large rivers. . . . The meat diet, now for the first time freely available, probably contributed, along with the stimulating climate, to increase the physical vigour and courage of this highest savage, thus urging him along the paths of progress. Nevertheless, many tribes came thus far, and no further, as witness the Athapascans of the Hudson's Bay Territory and the Indians of the valley of the Columbia.

After the use of fire and the discovery of the bow and arrow came the invention of pottery, the domestication of animals, and the smelting of iron, all successive stages in man's history which "in their relation to the sum of human progress, transcend in relative importance all his subsequent works,"—and this is even truer if there is included in this period the development of a system of writing, which may be reckoned either the end of the primitive period or the beginning of the period of *civilization proper*. These

two great steps in the story of civilization, language and writing, are closely connected in our minds, though so far separated in time of origin; and their story as told in the Britannica by the world's greatest authorities, English, American, German, French, Italian, Danish, etc., is an interesting one for the general reader, while the articles are invaluable to the specialist in linguistic study.

The starting point for a course of reading is the article **PHILOLOGY** (Vol. 21, p. 414; equivalent to 80 pages in this Guide), of which the first

**Philology** part, a general treatment, is by the greatest of American philologists, William Dwight Whitney, editor-in-chief of *The Century Dictionary*, and author of *Life and Growth of Language*, one of the most important scientific contributions to the subject. The second part, on the comparative philology of the Indo-European languages, is by Prof. Eduard Sievers of Leipzig and Prof. Peter Giles of Cambridge. Both these names are well known to students of the subject, the former as that of the author of numerous valuable works on Germanic phonetics and metric, and the latter as a writer on Greek language and as the author of *A Short Manual of Comparative Philology*.

The article begins with a definition of "philology," the science of language, and of "comparative philology," the comparison of one language with another, in order to bring out their relationships, their structures, and their histories. Prof. Whitney shows how much the recent development of linguistic science owes to the general scientific movement of the age. "No one," he says, "however ingenious and entertaining his speculations, will cast any real light on the earliest history of speech." But he notes the obvious analogy between speech and writing, and he puts stress on the "sociality" of man as the prime factor in his

development of speech. Other topics in this part of the article are:

**Instrumentalities of expression**—gesture, grimace, and voice; "language" means "tonguiness"—a mute would call it "handiness"; advantages of voice over gesture.

**Imitation as a factor in development of language and of writing; onomatopoeic origin of words.**

**Development of sign-making:** "Among the animals of highest intelligence that associate with man and learn something of his ways, a certain amount of sign-making expressly for communication is not to be denied; the dog that barks at a door because he knows that somebody will come and let him in is an instance of it; perhaps, in wild life, the throwing out of sentinel birds from a flock, whose warning cry shall advertise their fellows of the threat of danger, is as near an approach to it as is anywhere made."

**Brute speech and human speech:** "Those who put forward language as the distinction between man and the lower animals, and those who look upon our language as the same in kind with the means of communication of the lower animals, only much more complete and perfect, fail alike to comprehend the true nature of language, and are alike wrong in their arguments and conclusions. No addition to or multiplication of brute speech would make anything like human speech; the two are separated by a step which no animal below man has ever taken; and, on the other hand, language is only the most conspicuous among those institutions the development of which has constituted human progress."

**Language and culture:** "Differences of language, down to the possession of language at all, are differences only in respect to education and culture."

**Development of language signs:** the beginning slow, acceleration cumulative.

**The root-stage:** first signs must have been "integral, significant in their entirety, not divisible into parts."

Earliest phonetic forms: the simplest syllabic combination a single consonant with a following vowel. See the article HAWAII (Vol. 18, p. 88) for a similar language even now in existence: "Every syllable is open, ending in a vowel sound, and short sentences may be constructed wholly of vocalic sounds."

Character of early speech: "first language-signs must have denoted those physical acts and qualities which are directly apprehensible by the senses. . . . We are still all the time drawing figurative comparisons between material and moral things and processes, and calling the latter by the names of the former."

Development of language as illustrated in Indo-European speech.

Laws of growth and change: internal growth by multiplication of meanings; phonetic change—the principle of economy (euphony); borrowing and mixing of vocabularies.

Classification of languages by structural types: isolating (Chinese); agglutinative (Turkish, etc.); inflective (Indo-European); or—a more elaborate classification:

Indo-European: on which see part II of the article PHILOLOGY and the article INDO-EUROPEAN LANGUAGES (Vol. 14, p.

495; equivalent to Indo-European Languages (20 pages of this Guide), by Prof.

Peter Giles,—especially interesting for the attempt on a linguistic basis to reconstruct the original civilization and to discover the home of the ancestors of this language-stock which now occupies nearly all of Europe and is so intimately connected with the civilization of the last 2500 years. See:

GREEK LANGUAGE (Vol. 12, p. 496), by Professor Giles, and articles HOMER (Vol. 13, p. 626); DORIAN (Vol. 8, p. 423), etc.; but the main treatment of different Greek dialects is in the article GREEK LANGUAGE (Vol. 12, p. 496), to which the student should refer for Ar-

cadian and Cyprian, Aeolic, Ionic-Attic, and Doric dialects.

LATIN LANGUAGE (Vol. 16, p. 244), by Dr. A. S. Wilkins, late professor of Latin, Owens College, Manchester, and Dr. Robert S. Conway, professor of Latin, University of Manchester, with a peculiarly valuable summary of *The Language as Recorded*, which is a linguistic critique of the style and vocabulary of the great Roman authors and a comparison (p. 253) of Latin and Greek prose. And see the articles on the dialects of ancient Italy: ITALY, *Ancient Languages and People*; ETRURIA, *Language*; LIGURIA, *Philology*; SICULI; POMPEII, *Oscan Inscriptions*; SABINI; FALISCI; VOLSCI; OSCA LINGUA; IGVIVM; BRUTII; UMBRIA; PICENUM; SAMNITES, etc., by Prof. Conway, which will serve the student as a foundation for this subject, with more recent revision of all that is known than there is in Prof. Conway's books, in the works of C. D. Buck, or in other authorities.

For the descendants of Latin, the article ROMANCE LANGUAGES (Vol. 23, p. 504), by Dr. Wilhelm Meyer-Lübke, Professor of romance philology in the University of Vienna; and the following

### Romance Languages

separate articles:

ITALIAN LANGUAGE (Vol. 14, p. 888), by Graziadio I. Ascoli, professor of comparative grammar at the University of Milan, and Carlo Salvioni, professor of Romance languages in the same university, with a valuable summary of the dialects of modern Italy.

FRENCH LANGUAGE (Vol. 11, p. 103), by Henry Nicol and Paul Meyer, professor at the Collège de France; particularly interesting because treated comparatively with constant reference to English and French influence on English.

PROVENÇAL LANGUAGES (Vol. 22, p. 491), by Prof. Paul Meyer.

SPAIN: *Language* (Vol. 25, p. 573), by Alfred Morel-Fatio, professor of Romance languages at the Collège de France, and

James Fitzmaurice-Kelly, professor of Spanish, Liverpool University; describing the Catalan as well as the Castilian and the Portuguese.

**RUMANIA:** *Language* (Vol. 23, p. 843).

The general articles **SCANDINAVIAN LANGUAGES** (Vol. 24, p. 291), by Dr. Adolf Noreen, professor in the University of Upsala, with

**Teutonic Languages**

sections on Icelandic, Norwegian or Norse, Swedish, and Danish, and the Scandinavian dialects; and **TEUTONIC LANGUAGES** (Vol. 26, p. 673), by Hector Munro Chadwick, Librarian of Clare College, Cambridge.

More in detail on the Teutonic languages are the articles:

**ENGLISH LANGUAGE** (Vol. 9, pp. 587-600; equivalent to 45 pages of this Guide), by Sir James A. H. Murray, editor-in-chief of the (Oxford) *New English Dictionary*, and Miss Hilda Mary R. Murray, lecturer on English at the Royal Holloway College.

**DUTCH LANGUAGE** (Vol. 8, p. 717), by Prof. Johann Hendrik Gallée of the University of Utrecht.

**GERMAN LANGUAGE** (Vol. 11, p. 777), Dr. Robert Priebsch, professor of German philology, University of London, which deals with modern and ancient, new, middle, and old, high and low German.

For Indo-Iranian languages, see:

**PERSIA:** *Language and Literature* (Vol. 21, p. 246), by Dr. Hermann Ethé, professor of Oriental languages, University

**Persia and India** College, Wales, dealing with Zend, and Old, Middle and New Persian and

modern dialects of Persian.

**INDO-ARYAN LANGUAGES** (Vol. 14, p. 487), by George Abraham Grierson, formerly in charge of the Linguistic survey of India, who treats in this article the relations of Pisaca, Prakrit and Sanskrit, and contributes the separate articles **PISACA LANGUAGES, PRAKRIT, BENGALI, BIHARI, GUJARATI AND RAJASTHANI, HIN-**

**DOSTANI, KASHMIRI, and MARATHI.** More important than these minor dialects are **SANSKRIT LANGUAGE** (Vol. 24, p. 156), by Dr. Julius Eggeling, professor of Sanskrit, Edinburgh University,—an article equivalent in length to 90 pages of this Guide; and **PALI** (Vol. 20, p. 630), by Prof. T. W. Rhys Davids of Manchester University, president of the Pali Text Society.

**ARMENIAN LANGUAGE AND LITERATURE** (Vol. 2, p. 571), by Dr. F. C. Conybeare, author of *The Ancient Armenian Texts of Aristotle*, etc.

**LITHUANIANS AND LETTS, Language and Literature** (Vol. 16, p. 790); **SLAVS: Language** (Vol. 25, p. 233), by Ellis Hovell Minns, Lecturer in palaeography, Cambridge, with a table of alphabets; and supplementary information in the articles **RUSSIA, BULGARIA, SERBIA, POLAND, BOHEMIA, CROATIA-SLAVONIA, SLOVAKS, SLOVENES, SORBS, KASHUBES, POLABS.**

**ALBANIA, LANGUAGE** (Vol. 1, p. 485), by J. D. Bouchier, correspondent of *The Times* (London) in South-eastern Europe.

The material on the Semitic group is principally in the article **Semitic SEMITIC LANGUAGES** (Vol. 24, p. 617), by Theodor Nöldeke, late professor of Oriental languages at Strassburg. This article deals with:

Assyrian—see also **CUNEIFORM** (Vol. 7, p. 629);

Hebrew—see also **HEBREW LANGUAGE** (Vol. 13, p. 167), by Arthur Ernest Cowley, sub-librarian of the Bodleian, Oxford;

Phoenician—see also **PHOENICIA** (Vol. 21, p. 449), by the Rev. Dr. George Albert Cook, author of *Text Book of North-Semitic Inscriptions*, etc.;

Aramaic—and see the separate article **ARAMAIC LANGUAGES** (Vol. 2, p. 317);

Arabic, Sabaean, Mahri and Socotri, Ethiopic, Tigre and Tigrina, Amharic, Harari and Gurague.

And see the article **SYRIAC LANGUAGE**



(Vol. 26, p. 309), by Norman McLean, lecturer in Aramaic, Cambridge.

The article **HAMITIC LANGUAGES** (Vol. 12, p. 893) is by Dr. W. Max Müller, professor in the Reformed Episcopal Seminary, Philadelphia. See **Hamitic** also the article **EGYPT, Language and Writing** (Vol. 9, p. 57), by Dr. Francis Llewelyn Griffith, reader in Egyptology, Oxford; and the articles: **ETHIOPIA** (Vol. 9, p. 845), by Dr. D. S. Margoliouth, professor of Arabic, Oxford; **BERBER, Language** (Vol. 3, p. 766) and **KABYLES** (Vol. 15, p. 625) for the Libyan group of the Hamitic languages.

On the mono-syllabic languages see **CHINA, Language** (Vol. 6, p. 216), by Dr. H. A. Giles, professor of Chinese, Cambridge, and Lionel Giles, assistant Oriental Department, British Museum;

**JAPAN, Language** (Vol. 15, p. 167), by Captain Frank Brinkley, late editor of the *Japan Mail*; and

**TIBETO-BURMAN LANGUAGES** (Vol. 26, p. 928), by Dr. Sten Konow, professor in the University of Christiania.

The article **URAL-ALTAIC** (Vol. 27, p. 784), by Dr. Augustus Henry Keane, late professor of Hindustani, University College, London, gives a general account of the relationship of Turkish, Finno-Ugrian, Mongol and Manchu; and is supplemented by the articles **TURKS, Language** (Vol. 27, p. 472), by Sir Charles Eliot, vice-chancellor of Sheffield University; **FINNO-UGRIAN** (Vol. 10, p. 388), on language of Finns, Lapps and Samoyedes, **HUNGARY Language** (Vol. 13, p. 924), on Magyar, both by Sir Charles Eliot; and **MONGOLS, Language** (Vol. 18, p. 719), by Dr. Bernhard Jülg, late professor at Innsbruck.

On the non-Aryan languages of Southern Africa see the article **TAMILS** (Vol. 26, p. 388), by Dr. Reinhold Rost, late secretary of the Royal Asiatic Society.

For languages of Malay-Polynesia and

other Oceanic peoples see **MALAYS, Language** (Vol. 17, p. 477), by Sir Hugh Charles Clifford, colonial secretary of Ceylon, and joint-author of *A Dictionary of the Malay Language*; and the articles **POLYNESIA, SAMOA, JAVA, HAWAII**, etc.

On the Caucasian language see **GEORGIA** (Vol. 11, p. 758) and **CAUCASIA** (Vol. 5, p. 546).

On other European languages see **BASQUES** (Vol. 3, p. 485), by the late Rev. Wentworth Webster, author of *Basque Legends*, and Julien Vinson, author of *Le Basque et les langues Mericaines*; and for the Etruscan language **ETRURIA** (Vol. 9, p. 854), by Professor R. S. Conway.

On African languages see **BANTU LANGUAGES** (Vol. 3, p. 356), by Sir H. H. Johnston; **BUSHMEN** (Vol. 41, p. 871) and **HOTTENTOTS** (Vol. 13, p. 805); and, for the intermediate group, the article **HAUSA** (Vol. 13, p. 69).

On the languages of the North American Indians see the article **INDIANS, NORTH AMERICAN** (especially p. 457 of Vol. 14), by Dr. A. F. Chamberlain, professor of anthropology, Clark University, Worcester, Massachusetts.

This list of articles will serve the student as a guide for the purely linguistic articles. Besides the general treatment in the article **PHILOLOGY** from which we started, he should read articles on such general subjects as **PHONETICS** (Vol. 21, p. 458), by Dr. Henry Sweet, author of *A Primer of Phonetics, A History of English Sounds since the Earliest Period*, etc. This leads to a study of the article **ALPHABET** (Vol. 1, p. 723), equivalent to 30 pages of this Guide,

**Alphabet** written by Professor Peter Giles of Cambridge and illustrated with a plate and various fac-similes of early alphabets. This article is supplemented by Professor Giles's articles on all the letters of the alphabet, which deal with the history and form of the symbol, the character of the sound it stands for and, particularly, the develop-

ment and change of the sound in English and its dialects. For instance the article on the letter *N* describes four different sounds, of which there are two in English—usually distinguished as *n* and *ng*; explains that in the early Indo-European language some *n*'s and *m*'s could sometimes be pronounced as vowels; describes the opposite process, the nasalization of vowels, especially in French; and closes by saying: "It is possible to nasalize some consonants as well as vowels; nasalized spirants play an important part in the so-called Yankee pronunciation of Americans."

From alphabets the student may well turn to ideal languages in the article **UNIVERSAL LANGUAGES** (Vol. 27, p. 746),

by Professor Henry Sweet, which criticizes Volapük and Esperanto and the

**Artificial Languages** Idiom Neutral as being unscientific, not really international—even from a European point of view, and still less when one considers the growing importance of Japan and China in world-trade and world-history. Their being based on national languages Dr. Sweet thinks is a disadvantage. But in their comparative success he sees proof that a universal language is possible. See also Prof. Sweet's separate articles **VOLAPÜK** (Vol. 28, p. 178) and **ESPERANTO** (Vol. 9, p. 773).

The article **WRITING** (Vol. 28, p. 852) deals, chiefly from the anthropological standpoint, with primitive attempts to record ideas in an intelligible form, for example with

**Writing** "knot-signs," "message-sticks," picture-writing and the like. The needs, which led to the invention of these primitive forms of writing, were: mnemonic, recalling that something is to be done at a certain time—the primitive "tickler" was a knotted string or thong, like our knotted handkerchief as a reminder, and these knot-strings were finally used for elementary accountings, commercial or chronological,

like the use of the abacus in little shops, or of the similar system in scoring games of pool; to communicate with some one at a distance, for which marked or notched sticks, engraved or coloured pebbles, wampum belts, etc., were used; and, third, to distinguish one's own property or handicraft whence cattle-brands, trade-marks, etc. In Assyria, Egypt and China picture-writing developed into conventional signs: on these see **EGYPT** (Vol. 9, p. 60), and **CHINA** (Vol. 6, p. 218). All of these are of great interest to the general reader, but the article **CUNEIFORM** (Vol. 7, p. 629) by Dr. R. W. Rogers, professor of Hebrew and Old Testament exegesis, Drew Theological Seminary, Madison, New Jersey, has the sort of entertainment in it that there is in a good detective story, since it tells how the meaning of the mysterious wedge-shaped inscriptions on the rocks at Mount Rachmet in Persia was discovered.

The subject of writing is treated, also, in the articles:

**INSCRIPTIONS** (Vol. 14, p. 618); *Semitic*, aside from the Cuneiform, by Arthur Ernest Cowley, sub-librarian of the Bodleian, Oxford; *Indian inscriptions*, by John Faithfull Fleet, author of *Inscriptions of the Early Gupta Kings*, etc.; *Greek*, by Edward Lee Hicks, Bishop of Lincoln, author of *Manual of Greek Historical Inscriptions*, etc., and George Francis Hill, author of *Sources for Greek History*, etc.; and *Latin*, by Emil Hübner, late professor of classical philology at Berlin, author of *Römische Epigraphik*, etc., and Dr. W. M. Lindsay, of the University of St. Andrews, author of *The Latin Language*, etc.

**PALAEOGRAPHY** (Vol. 20, p. 556), equivalent to 75 pages of this Guide, by Sir Edward Maunde Thompson, late librarian of the British Museum and author of *Handbook of Greek and Latin Palaeography*, etc. The article is illustrated with 50 fac-similes of typical handwritings.

MANUSCRIPT (Vol. 17, p. 618), equivalent to 20 pages of this Guide, by the same author, with a description of the various forms of manuscripts, of the mechanical arrangement of writing in MSS., and of writing implements and inks. See, also, ILLUMINATED MANUSCRIPTS, POPYRUS, PAPER and other articles mentioned in the chapter in this Guide *For Printers*.

The student of language and literature and of writing will also find much valuable information in the article **TEXTUAL CRITICISM** (Vol. 26, p. 708), **Text Criticism** equivalent to 25 pages of this Guide, by Professor J. P. Postgate of the University of Liverpool, well-known to

Latinists as the brilliant editor of Tibullus and Propertius. The article gives examples of the classes of errors occurring in texts and the methods of restoring true readings—largely of course by conjecture—and illustrates such errors and their correction by the very poorly printed first editions of the English poet Shelley.

In the study of language and writing as in courses on other sciences and arts, the reader will find an additional interest in supplementing general and abstract articles by biographical sketches of the great men in the science.

The following is a partial list of the articles in the Britannica on great philologists:

- |                        |                          |                                |                         |
|------------------------|--------------------------|--------------------------------|-------------------------|
| Aasen, Ivar            | Corssen, W. P.           | Goodwin, W. W.                 | Legge, James            |
| Adelung, J. C.         | Cotgrave, Randle         | Greenough, J. B.               | Leitner, G. W.          |
| Ahrens, F. H. L.       | Creuzer, G. F.           | Grimm, J. L. C.                | Liddell, H. G.          |
| Ascoli, G. I.          | Csoma de Körös, A.       | Grimm, W. C.                   | Littré, M. P. E.        |
| Baehr, J. C. F.        | Darmesteter, J.          | Gudeman, Alfred                | Ludolf, Hiob            |
| Baiter, J. G.          | Delius, N.               | Gutschmid, Baron von           | Madvig, J. N.           |
| Bake, Jan              | Diez, F. C.              | Hadley, James                  | Malan, S. C.            |
| Barth, Kaspar von      | Döbrowsky, J.            | Hagen, F. H. von der           | March, F. A.            |
| Benfey, Theodor        | Döderlein, J. C. W. L.   | Haldeman, S. S.                | Max Müller, F.          |
| Bennett, Charles E.    | Donaldson, J. W.         | Hale, W. G.                    | Mayor, J. E. B.         |
| Bentley, Richard       | Drisler, Henry           | Halhed, N. B.                  | Ménant, Joachim         |
| Bernhardy, Gottfried   | Dunash                   | Hall, Fitzedward               | Meyer, P. H.            |
| Bhau Daji              | Ebel, H. W.              | Hall, Isaac Hollister          | Mezzofanti, Giuseppe C. |
| Blass, Friedrich       | Egger, Emile             | Hasden, B. P.                  | Miklosich, Franz von    |
| Bleek, W. H. I.        | Elias, Levita            | Haug, Martin                   | Mohl, Julius von        |
| Bloomfield, Maurice    | Ellis, A. J.             | Haupt, Moritz                  | Monier-Williams, Sir M. |
| Böhtlingk, Otto von    | Ellis, Robinson          | Henry, Victor                  | Morris, Richard         |
| Bopp, Franz            | Erasmus                  | Herbelot de Molainville, B. d' | Munro, D. B.            |
| Bosworth, Joseph       | Erpenius, Thomas         | Hervás y Panduro, I.           | Murray, Sir James       |
| Bréal, M. J. A.        | Ettmüller, E. M. L.      | Hoffmann, J. J.                | Nettleship, Henry       |
| Brown, Francis         | Facciolati, J.           | Hopkins, E. W.                 | Nöldeke, Theodor        |
| Bücheler, Franz        | Fairuzabadi              | Hottinger, J. H.               | Oppert, Julius          |
| Buck, C. D.            | Fleckeisen, C. F. W. A.  | Hübner, Emil                   | Paley, F. A.            |
| Bugge, Sophus          | Fleischer, Heinrich L.   | Humboldt, K. W. von            | Paris, B. P. G.         |
| Burmann                | Flügel, G. L.            | Ingram, James                  | Peerlkamp, P. H.        |
| Burnell, A. C.         | Flügel, J. G.            | Jauhari                        | Peile, John             |
| Burnouf, Eugène        | Forcellini, Egidio       | Jawaliqi                       | Petrarch                |
| Buttmann, Philipp Karl | Freund, Wilhelm          | Jirecek, Josef                 | Poggio                  |
| Carey, William         | Freytag, G. W. F.        | Jonah, Rabbi                   | Politian                |
| Casaubon               | Furnivall, F. J.         | Jones, Sir William             | Porson, Richard         |
| Caspari, K. P.         | Fürst, Julius            | Karajich, V. S.                | Pott, A. F.             |
| Castell, Edmund        | Gabelentz, H. C. von der | Kern, J. H.                    | Quatremère, E. M.       |
| Castiglione, Count     | Gaisford, Thomas         | Khalil ibn Amhad,              | Rask, R. C.             |
| Castrén, M. A.         | Gayangos y Arce, P. de   | Kimbi (family)                 | Reiske, J. J.           |
| Childers, R. C.        | Gildersleeve, B. L.      | Klaproth, H. J.                | Reland, Adrian          |
| Cleynaerts, Nicolas    | Goeje, M. J. de          | Kuhn, F. F. A.                 | Rémusat, J. P. A.       |
| Cobet, C. G.           | Goldstücker, T.          | Lachmann, Karl                 | Ribbeck, Otto           |
| Conington, John        | Goldziher, Ignaz         | Lanman, C. R.                  | Rieu, C. P. H.          |
| Cook, A. S.            | Goliuz, Jacobus          | Lassen, Christian              | Ritsche, F. W.          |
|                        |                          |                                | Rutherford, W. G.       |

Sale, George  
Salesbury, William  
Sanders, Daniel  
Sayce, A. H.  
Schafarik, P. J.  
Scheler, J. A. W.  
Schiefner, F. A.

Schleicher, August  
Schultens (family)  
Scott, Robert  
Sellar, W. Y.  
Skeat, W. W.  
Taylor, Isaac

Ten Brink, B. E. K.  
Teuffel, W. S.  
Thorpe, Benjamin  
Wally, N. F. de  
Walker, John  
Warren, Minton

Webster, Noah  
Whitney, W. D.  
Wilkins, Sir Charles  
Wordsworth, Christo-  
pher  
Zarncke, F. K. T.

## CHAPTER XXXVI

### LITERATURE, INTRODUCTORY AND GENERAL

**T**HE student of literature, like the student of painting, finds it as necessary to examine the great examples of the art as to study the laws which guide the artist, for the history of their development, and he will find that the articles which discuss literature in the Britannica are *themselves literature*, models of the form of artistic expression which they describe. A list of these contributors who deal with literary topics might, indeed, easily be mistaken for a list of such articles on the great contemporary writers as the student would most desire to read. Among these contributors are, for example: Edmund Gosse,

**Contributors** Theodore Watts-Dunton, Swinburne, A. C. Benson, John Morley, Austin Dobson, Arthur Symons, J. Addington Symonds, Frederic Harrison, Walter Besant, William Sharp ("Fiona Macleod"), Professor George Saintsbury, Sir Arthur T. Quiller-Couch ("Q"), William Archer, Israel Gollancz, Robert Louis Stevenson, Andrew Lang, Sir Leslie Stephen, E. V. Lucas, Arthur Waugh, Mrs. Craigie ("John Oliver Hobbes"), Alice Meynell, Mrs. Humphry Ward, and—among American names,—George E. Woodberry, Henry Van Dyke, Edward Everett Hale, T. W. Higginson, Brander Matthews, W. P. Trent, Charles Eliot Norton, Charles William Eliot, George W. Cable, Lyman

Abbott, Edmund Clarence Stedman, John Burroughs, Thomas Davidson, Horace E. Scudder, and Charles F. Richardson.

Before discussing the articles in which these and many other distinguished contributors deal with various aspects of literature, attention may be directed to the treatment of religious literature in the Britannica. The Bible is the subject of a separate chapter in this Guide on *Bible Study*, to which the reader is also referred for the whole literature of Biblical criticism. Religious literature based upon the Bible is discussed in the articles **LITURGY** (Vol. 16, p. 795), by the Rev. F. E. Warren; **SERMON** (Vol. 24, p. 673), by Edmund Gosse, and **HYMNS** (Vol. 14, p. 181), by Lord Selborne, equivalent to 35 pages of this Guide. The medieval miracle plays and mysteries, presenting incidents from Scripture, are described in the section on the *Medieval Drama* (Vol. 8, p. 497) of the article **DRAMA**. On the literature of other religions, see the chapter *For Ministers*.

The student of literature in general may begin his course of reading with the article **LITERATURE** (Vol. 16, p. 783), a concise critical summary by **General Articles** Dr. James Fitzmaurice-Kelly, professor of Spanish language and literature, Liverpool University, best known as the editor of Cervantes. Read, after the ar-



ticle LITERATURE, the same contributor's article TRANSLATION (Vol. 27, p. 183). The student who does not wish to approach literature from the philosophic side need not read the articles AESTHETICS and FINE ARTS; but even such a one should read the article STYLE (Vol. 25, p. 1055), by Edmund Gosse, essayist, poet, biographer and librarian of the House of Lords, and the article PROSE (Vol. 22, p. 450), by the same contributor.

There is a well-known and perfectly authentic anecdote of Edmund Gosse's predecessor as librarian of the House of Lords, who was once asked in the course of a newspaper symposium on education, "What were the principal factors in your education?" He replied by putting second only to his university training "the articles in the Encyclopaedia Britannica and in the *Athenaeum* by Theodore Watts-Dunton." Certainly the student will be well repaid by repeated study and analysis of Watts-Dunton's article POETRY (Vol. 21, p. 877; equivalent to 45 pages of this Guide). The same author's articles SONNET (Vol. 25, p. 414), MATTHEW ARNOLD (Vol. 2, p. 635), and WYCHERLEY (Vol. 28, p. 863) should be studied with the article POETRY as supplementing his literary philosophy.

The greatest of literary forms is amply represented by the space and the authority given to it in the Britannica. The article DRAMA (Vol. 8, p. 475; equivalent to 225 pages of this Guide) is mainly the work of Prof. A. W. Ward, master of Peterhouse, Cambridge, editor of the *Cambridge History of English Literature* and of the *Cambridge Modern History*; but some parts of the article are by William Archer, the dramatic critic, and by Auguste Filon ("Pierre Sandrié"). This elaborate article should be supplemented by the short article COMEDY (Vol. 6, p. 759) and by the biographical and critical sketches of the great dramatists.

Among the many other articles in the Britannica on the forms of literature are: SATIRE (Vol. 24, p. 228), by Richard

Garnett, late librarian British Museum, with which the student may well combine the articles HUMOUR and IRONY, the articles BALLADE, BALLADS (Lang), BUCOLICS, PASTORAL, CENTO, CHANT ROYAL (with Gosse's first English chant royal, "The Praise of Dionysus," transcribed in full), DESCRIPTIVE POETRY, ELEGY, EPIC POETRY, EPITHALAMIUM, HEROIC VERSE, IDYL, LIMERICK, LYRICAL POETRY, MACARONICS, NATIONAL ANTHEMS, ODE, OTTAVA RIMA, PANTUN, RIME ROYAL, RONDEAU, RONDEL, SESTETT, SESTINA, SONG, TRIOLET, VERS DE SOCIÉTÉ, VILANELLE, VIRELAY, and—a few of the prose forms, BIOGRAPHY, CONTE, CRITICISM, EPISTLE, ESSAY, EUPHUISM, NOVEL, PAMPHLET, PICARESQUE NOVEL, ROMANCE, TALE, TRACT,—nearly all these being by Edmund Gosse. Two articles of the utmost importance are DICTIONARY and ENCYCLOPAEDIA. Read the general article RHETORIC.

Periodical publications, especially those in the English and French languages, have contained a great part of the best literary

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| <p>Periodical<br/>Publications</p> | <p>criticism of miscellaneous essays published since the first French review appeared in 1665 and since the first English review, consisting wholly of original matter, was established in London in 1710. The latter was indebted to France not only for its model, but for its editor, who was a French Protestant refugee. Benjamin Franklin founded the first American monthly, the <i>Philadelphian General Magazine</i> in 1741. The article PERIODICALS (Vol. 21, p. 151), by H. R. Tedder, librarian of the Athenaeum Club, London, contains separate sections on the reviews and magazines of <i>England, the United States, Canada, South Africa, West India and the British Crown Colonies, India and Ceylon, France, Germany, Austria, Switzerland, Italy, Belgium, Holland, Denmark, Norway, Sweden, Spain, Portugal, Greece, Russia, Bohemia, Hungary and Japan.</i></p> |
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NEWSPAPERS (Vol. 19, p. 544), equivalent to 140 pages of this Guide, is an article in which the student will find a full account of the most fertile, if not the most studied, form of modern literature in all parts of the world. See also the chapter in this Guide *For Journalists and Authors*.

The reader should note that of the many articles on literary forms and rhetorical figures, only a few are given above, but they are listed more fully in the Index Volume, p. 929, where there are more than 350 such titles. He must remember also that there are more than 3,000 biographical and critical articles on authors in different languages and different periods. The following are "key" articles on national literatures:

ENGLISH LITERATURE, by Henry Bradley, joint-editor of the *New English Dictionary*; Prof. J. M. Manly, University of Chicago; Prof. Oliver Elton, University of Liverpool; Thomas Seccombe, author of *The Age of Johnson*.

AMERICAN LITERATURE, by G. E. Woodberry, formerly professor in Columbia University.

GERMAN LITERATURE, by Prof. J. G. Robertson, University of London, author of *History of German Literature*.

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| DUTCH LITERATURE            | } by<br>Edmund<br>Gosse. |
| FLEMISH LITERATURE          |                          |
| WALLOONS, <i>Literature</i> |                          |
| BELGIUM, <i>Literature</i>  |                          |
| DENMARK, <i>Literature</i>  |                          |
| SWEDEN, <i>Literature</i>   |                          |
| NORWAY, <i>Literature</i>   |                          |

ICELAND, *Literature, Classic*, by Prof. Frederick York Powell of Oxford; *Recent*, by Sigfús Blöndal, librarian of Copenhagen University.

FRENCH LITERATURE, by George Saintsbury.

PROVENÇAL LITERATURE, by Paul Meyer, Director of the École des Chartes, Paris, and Prof. Hermann Oelsner, Ox-

ford, author of a *History of Provençal Literature*.

ANGLO-NORMAN LITERATURE, by Prof. Louis Brandin of the University of London.

SPAIN, *Literature*, by Prof. J. Fitzmaurice-Kelly of the University of Liverpool, and A. Morel-Fatio, author of *L'Espagne au XVIe et au XVIIe siècles*.

PORTUGAL, *Literature*, by Edgar Prestage, editor of *Letters of a Portuguese Nun*, etc.

ITALIAN LITERATURE, by Prof. Hermann Oelsner, Oxford, and Prof. Adolfo Bartoli of the University of Florence, author of *Storia della letteratura Italiana*.

SWITZERLAND, *Literature*, by Prof. W. A. B. Coolidge.

HUNGARY, *Literature*, by Emil Reich, author of *Hungarian Literature*, and E. Dundas Butler, author of *Hungarian Poems and Fables for English Readers*, etc.

POLAND, *Literature*, by W. R. Morfill, late professor of Slavonic Languages, Oxford, author of *Slavonic Literature*, etc.

RUSSIA, *Literature*, also by Prof. Morfill.

ARABIA, *Literature*, by the late Prof. M. J. de Goeje, University of Leiden, and the Rev. G. W. Thatcher, warden of Camden College, Sydney, N. S. W.

PERSIA, *Literature*, by Prof. Karl Geldner, Marburg University, and Prof. Hermann Ethé, University College, Wales.

CHINA, *Literature*, by H. A. Giles, professor of Chinese, Oxford.

JAPAN, *Literature*, by Capt. Brinkley.

HEBREW LITERATURE, by Arthur Cowley, sub-librarian of the Bodleian, Oxford.

ARMENIAN LITERATURE, by F. C. Conybeare, author of *The Ancient Armenian Texts of Aristotle*.

SYRIAC LITERATURE, by Norman McLean, lecturer in Aramaic, Cambridge.

HINDOSTANI LITERATURE, by Sir Charles James Lyall.

SANSKRIT, *Literature*, by Prof. Julius Eggeling, Edinburgh.

CLASSICS, by Dr. J. E. Sandys, Cam-

bridge, author of *History of Classical Scholarship*.

**GREEK LITERATURE:** *Ancient*, by Sir R. C. Jebb, author of *Companion to Greek Studies*; *Byzantine*, by Prof. Karl Krumbacher, editor of *Byzantinische Zeitschrift* and *Byzantinisches Archiv*; and *Modern*, by J. D. Bouchier, correspondent of *The Times* (London) in South-Eastern Europe.

**LATIN LITERATURE**, by Prof. A. S. Wilkins, of Owens College, Manchester, and Prof. R. S. Conway, of the University of Manchester.

**CELT**, *Literature*, to which W. J. Gruffydd, lecturer in Celtic, University College, Cardiff, contributes the section on *Welsh* literature; and E. C. Quiggin, lecturer in Celtic, Cambridge, contributes the sections on *Irish*, *Manx*, *Breton* and *Cornish* literatures.

This list of the literatures of many tongues, from each of which translations have added to the common stock accessible even to those who can read with ease only one-language, indicates the existence of a bewildering mass of printed matter, and just as each language has its literature—using the word to signify output, so each subject upon which men write has its literature—using the word to signify material for any one branch of study.

**Bibliography** Bibliographies are the charts by which students are enabled to navigate these vast seas of knowledge. The articles **BIBLIOGRAPHY** (Vol. 3, p. 908), by A. W. Pollard, assistant librarian of the British Museum, and **INDEX** (Vol. 14, p. 373) describe the technicalities of cataloguing and classifying books and their contents.

The Britannica is itself the most complete index to the subjects treated by books and the most complete bibliographical manual for the student that could be imagined. The Index of 500,000 entries (Vol. 29) shows to what class any one of half a million facts belongs, by referring to the article in which that fact is

treated. At the end of the article a list of the best books on the subject shows the student who desires to specialize just where to go for further details. No less than 203,000 books are included in these lists appended to Britannica articles and many of them are, in themselves, substantial contributions to literature. The Shakespeare bibliography would, for example, fill 30 pages of the size and type of this Guide; the bibliography of English history, by A. F. Pollard, of the University of London, 13 pages, and the bibliography of French history, by Prof. Bémont of the Ecole des Hautes Etudes, Paris, 8 pages.

A group of articles of great interest to every student of literature deals with the methods and appliances by which writings are preserved and circulated. **MANUSCRIPT** (Vol. 17, p. 618) is by Sir E. Maunde Thompson, of the British Museum Library; **BOOK** (Vol. 4, p. 214); **BOOK-COLLECTING** (Vol. 4, p. 221) and **INCUNABULA** (Vol. 14, p. 369) are by A. W. Pollard, also of the British Museum Library. **LIBRARIES** (Vol. 16, p. 545), equivalent to 100 pages of this Guide, is by H. R. Tedder, librarian of the Athenaeum Club, London. The articles on printing, binding, publishing and similar subjects are described in the chapter of this Guide *For Printers*.

With this chapter to help him the student will have little difficulty in devising his own course of reading in any one literature—starting with the general treatment, going from this to the separate biographies of the great authors mentioned in the general article, and, when there is in the national literature that he is studying some special development of a literary *genre*, as of the sermon in the 17th or the satire in the 18th century, turning to the article in the Britannica dealing with this form of literature, **SATIRE**, **SERMON**, or whatever it may be. For example, what could be more illuminating to the student of 19th century literature than the following passages—discon-

nected here—from the article SATIRE?

Goethe and Schiller, Scott and Wadsworth, are now at hand, and as imagination gains ground satire declines. Byron, who in the 18th century would have been the greatest of satirists, is hurried by the spirit of his age into passion and description, bequeathing, however, a splendid proof of the possibility of allying satire with sublimity in his *Vision of Judgment*. . . . Miss Edgeworth skirts the confines of satire, and Miss Austen seasons her novels with the most exquisite satiric traits. Washington Irving revives the manner of *The Spectator*, and Tieck brings irony and persiflage to the discussion of critical problems. . . . In all the characteristics of his genius Thackeray is thoroughly English, and the faults and follies he chastises are those especially characteristic of British society. Good sense and the perception of the ridiculous are amalgamated in him; his satire is a thoroughly British article, a little over-solid, a little wanting in finish, but honest, weighty and durable. Posterity must go to him for the humours of the age of Victoria, as they

go to Addison for those of Anne's. . . . In Heine the satiric spirit, long confined to established literary forms, seems to obtain unrestrained freedom to wander where it will, nor have the ancient models been followed since by any considerable satirist except the Italian Giusti. The machinery employed by Moore was indeed transplanted to America by James Russell Lowell, whose *Biglow Papers* represent perhaps the highest moral level yet attained by satire.

In no age was the spirit of satire so generally diffused as in the 19th century, but many of its eminent writers, while bordering on the domains of satire, escape the definition of satirist. The term cannot be properly applied to Dickens, the keen observer of the oddities of human life; or to George Eliot, the critic of its emptiness when not inspired by a worthy purpose; or to Balzac, the painter of French society; or to Trollope, the mirror of the middle classes of England. If *Sartor Resartus* could be regarded as a satire, Carlyle would rank among the first of satirists; but the satire, though very obvious, rather accompanies than inspires the composition.

## CHAPTER XXXVII

### AMERICAN LITERATURE

THE list in the preceding chapter of the key articles dealing with national literatures shows that the Britannica separately treats the literary products of some 30 countries. To outline 30 courses of reading, mentioning the 3,000 critical and biographical articles, would make this Guide unwieldy. On pp. 929-937 of Vol. 29 the reader will find classified lists of these articles, and only four groups are selected here for detailed treatment: those on American, English, German and Greek literature. The main article in the literature of each of the other countries indicates the characteristic forms, the typical works of the leading writers discussed in special articles, so that courses of reading as systematic as these four can easily be planned for other countries by the reader.

#### *Topic of Study*

General Summary of the subject, with critical appreciation of main tendencies and great authors.

#### *Colonial Period.*

English writers, especially historical.

#### *Article and Contributor*

AMERICAN LITERATURE (Vol. 1, p. 831), by George E. Woodberry, formerly professor in Columbia University, biographer of Poe and Hawthorne, author of *America in Literature*, etc.

JOHN SMITH (Vol. 25, p. 264), by Prof. Edward Arber, editor of *English Garner*, etc.

- Colonial writers, especially of Puritan New England.
- Massachusetts governors and historical writing.
- The Clergy as writers of History, and of Theology of the Puritan School.
- The Mathers.
- Apostle to the Indians.
- Revolt against Puritanism.  
Ethical.  
Theological.
- New England Verse.
- The New England Diarist.
- The great New England Philosopher and Theologian; the first American author with a lasting and European reputation.  
Edwards's contemporaries.
- Edwards's followers, — the New England theology.
- The first newspaper in New York.
- A Virginia educator.
- The American Quaker preacher.
- A royal governor and historian.
- A New York statesman and philosopher.
- The first great American figure in secular literature,—essayist, pamphleteer, politician, autobiographer.
- Revolutionary Period.*
- The patriotic orators and Pamphleteers.
- "Common Sense."  
James Otis's Sister.
- The Declaration of Independence and its author.
- Prominent Patriots in New Jersey.
- A Connecticut Educator and Patriot.
- MASSACHUSETTS, *History* (Vol. 17, p. 858); CONNECTICUT, *History* (Vol. 6, p. 954).
- WILLIAM BRADFORD (Vol. 4, p. 370); JOHN WINTHROP (Vol. 28, p. 736).
- JOHN COTTON (Vol. 7, p. 255), by Prof. Williston Walker, Yale, author of *History of the Congregational Churches in the United States*; THOMAS HOOKER (Vol. 18, p. 674).
- COTTON, INCREASE, and RICHARD MATHER (Vol. 17, p. 883).
- JOHN ELIOT (Vol. 9, p. 278), by Prof. Walker.
- THOMAS MORTON (Vol. 18, p. 882).
- ROGER WILLIAMS (Vol. 28, p. 682).
- MICHAEL WIGGLESWORTH (Vol. 28, p. 626).
- SAMUEL SEWALL (Vol. 24, p. 738).
- JONATHAN EDWARDS (Vol. 9, pp. 3-6), by Prof. Harry Norman Gardiner, editor of *Jonathan Edwards—a Retrospect*, and Richard Webster.
- CHARLES CHAUNCY (Vol. 6, p. 18).
- JONATHAN MAYHEW (Vol. 17, p. 935).
- JOSEPH BELLAMY (Vol. 3, p. 694).
- SAMUEL HOPKINS (Vol. 18, p. 685).
- WILLIAM BRADFORD (Vol. 4, p. 370).
- JAMES BLAIR (Vol. 4, p. 84).
- JOHN WOOLMAN (Vol. 28, p. 817).
- THOMAS HUTCHINSON (Vol. 14, p. 18).
- CADWALLADER COLDEN (Vol. 6, p. 668).
- BENJAMIN FRANKLIN (Vol. 11, p. 24), by Richard Webster, late fellow Princeton University, editorial staff, *Encyclopaedia Britannica*.
- JAMES OTIS (Vol. 20, p. 366).
- PATRICK HENRY (Vol. 13, p. 300).
- JOHN ADAMS (Vol. 1, p. 176).
- JOSIAH QUINCY (Vol. 22, p. 753).
- JAMES WILSON (Vol. 28, p. 693).
- THOMAS PAINE (Vol. 20, p. 456).
- MERCY WARREN (Vol. 28, p. 330).
- INDEPENDENCE, DECLARATION OF (Vol. 14, p. 372), and THOMAS JEFFERSON (Vol. 15, p. 301), both by Dr. F. S. Philbrick.
- WILLIAM LIVINGSTON (Vol. 16, p. 813).
- JOHN WITHERSPOON (Vol. 28, p. 759).
- EZRA STILES (Vol. 25, p. 919).

- Opponents of Independence.  
 "A Westchester Farmer."  
 In Massachusetts.  
 In Maryland.
- Patriotic Poetry.  
 The "Hartford Wits."  
 Satire and Epic.  
 "Battle of the Kegs."  
 A Western Traveler.
- The National Period.*  
 The Constitution and its Pamphleteers — "The Federalist," the greatest application of elementary principles of government to practical administration.  
 Importance of the early national period on the development of American literature.
- The first professional "man of letters."
- First foreign vogue.  
 Essay and History: "The American Goldsmith."
- Fiction: "The American Scott."
- Poetry.
- The Knickerbocker School.
- New York as a literary centre.
- A Southern novelist and poet.  
 Cooper's successor as novelist of the sea.  
 Poetesses of the early 19th century.
- The "Literati."
- The short story.
- Traveler, Translator, Poet.
- New England in the 19th century.*  
 Boston and Cambridge.
- JOSEPH GALLOWAY (Vol. 11, p. 421).  
 SAMUEL SEABURY (Vol. 24, p. 581).  
 MATHER BYLES (Vol. 4, p. 896).  
 JONATHAN BOUCHER (Vol. 4, p. 312).  
 JOHN TRUMBULL (Vol. 27, p. 324).  
 TIMOTHY DWIGHT (Vol. 8, p. 741).  
 JOEL BARLOW (Vol. 3, p. 406).  
 FRANCIS HOPKINSON (Vol. 13, p. 685).  
 JONATHAN CARVER (Vol. 5, p. 487).
- JAMES MADISON (Vol. 17, p. 284).  
 ALEXANDER HAMILTON (Vol. 12, p. 880),  
 by Dr. F. S. Philbrick and Hugh Chisholm.  
 JOHN JAY (Vol. 15, pp. 294-296).  
 UNITED STATES, *History*, §106 (Vol. 27, p. 688), by the late Prof. Alexander Johnson, Princeton, and C. C. Whinery, assistant editor, *Encyclopaedia Britannica*.  
 CHARLES BROCKDEN BROWN (Vol. 4, p. 657).  
 WASHINGTON IRVING (Vol. 14, p. 856),  
 by Richard Garnett, late librarian British Museum.  
 JAMES FENIMORE COOPER (Vol. 7, p. 79),  
 by W. E. Henley, poet, critic and essayist.  
 WILLIAM CULLEN BRYANT (Vol. 4, p. 698), by G. W. Cable.  
 NEW YORK CITY, *Literature* (Vol. 19, p. 615).  
 JAMES KIRKE PAULDING (Vol. 20, p. 958).  
 FITZ-GREENE HALLECK (Vol. 12, p. 854).  
 W. G. SIMMS (Vol. 25, p. 123).  
 HERMAN MELVILLE (Vol. 18, p. 102).  
 LYDIA HUNTLEY SIGOURNEY (Vol. 25, p. 82).  
 ALICE AND PHOEBE CARY (Vol. 5, p. 438).  
 N. P. WILLIS (Vol. 28, p. 686).  
 RUFUS WILMOT GRISWOLD (Vol. 12, p. 610).  
 EDGAR ALLAN POE (Vol. 21, p. 875), by David Hannay.  
 BAYARD TAYLOR (Vol. 26, p. 467).  
 BOSTON (Vol. 4, p. 293).  
 HARVARD UNIVERSITY (Vol. 13, p. 38).  
 GEORGE TICKNOR (Vol. 26, p. 936).



- History and Scholarship as affected by European contacts. GEORGE BANCROFT (Vol. 3, p. 307), by Prof. W. M. Sloane, Columbia.  
EDWARD EVERETT (Vol. 10, p. 8), by Edward Everett Hale.  
JARED SPARKS (Vol. 25, p. 608), by Prof. W. L. Corbin, Wells College.  
J. G. PALFREY (Vol. 20, p. 629).  
W. H. PRESCOTT (Vol. 22, p. 294).  
J. L. MOTLEY (Vol. 18, p. 909).
- Unitarianism and its Literary Leaders, Influencing and Influenced by Transcendentalism. HOSEA BALLOU (Vol. 3, p. 282).  
WILLIAM ELLERY CHANNING (Vol. 5, p. 843), by Richard Webster.  
JAMES FREEMAN CLARKE (Vol. 6, p. 444), by E. E. Hale.  
THEODORE PARKER (Vol. 20, p. 829).
- Transcendentalism and the Concord School—its central figures. AMOS BRONSON ALCOTT (Vol. 1, p. 528), by Prof. C. F. Richardson, Dartmouth College.  
RALPH WALDO EMERSON (Vol. 9, p. 382), by Prof. Henry Van Dyke, Princeton.  
HENRY DAVID THOREAU (Vol. 26, p. 877), by William Sharp ("Fiona Macleod").
- The Dial. MARGARET FULLER (Vol. 11, p. 295).  
GEORGE RIPLEY (Vol. 23, p. 363), by Edward Livermore Burlingame, editor of *Scribner's*.
- Brook Farm. BROOK FARM (Vol. 4, p. 645, by E. L. Burlingame).
- The author of "Margaret." SYLVESTER JUDD (Vol. 15, p. 536).
- The great New England Novelist. NATHANIEL HAWTHORNE (Vol. 13, p. 102), by Richard Henry Stoddard, poet and essayist.  
HENRY WADSWORTH LONGFELLOW (Vol. 16, p. 977), by Thomas Davidson, author of *The Philosophical System of Rosmini*.
- The great New England Poet. WASHINGTON ALLSTON (Vol. 1, p. 709).  
RICHARD HENRY DANA (Vol. 7, p. 792).
- Earlier Romanticism. DANIEL WEBSTER (Vol. 28, p. 459), by Everett P. Wheeler, author of *Daniel Webster*, etc.  
RUFUS CHOATE (Vol. 6, p. 258).  
WENDELL PHILLIPS (Vol. 21, p. 407), by Col. T. W. Higginson.  
CHARLES SUMNER (Vol. 26, p. 81).  
ROBERT CHARLES WINTHROP (Vol. 28, p. 736).
- Oratory. In the North. HENRY CLAY (Vol. 6, p. 470), by Carl Schurz, biographer of Clay.
- In the South.

- Other Southern Orators. JOHN C. CALHOUN (Vol. 5, p. 1), by Judge H. A. M. Smith, South Carolina.
- The Pulpit Orator of the North. ROBERT YOUNG HAYNE (Vol. 13, p. 114). HENRY WARD BEECHER (Vol. 3, p. 639), by Dr. Lyman Abbott, editor *The Outlook*.
- The Abolition Novelist, author of *Uncle Tom's Cabin*. HARRIET ELIZABETH BEECHER STOWE (Vol. 25, p. 972), by Horace E. Scudder, late editor of the *Atlantic Monthly*.
- Another anti-slavery authoress. LYDIA MARIA CHILD (Vol. 6, p. 135).
- The New England Poets prominent in the Anti-Slavery Movement. JOHN GREENLEAF WHITTIER (Vol. 28, p. 613), by Edmund Clarence Stedman, poet and critic. JAMES RUSSELL LOWELL (Vol. 17, p. 74), by Horace E. Scudder, biographer of Lowell.
- Their Contemporary, the "Autocrat." OLIVER WENDELL HOLMES (Vol. 13, p. 616), by J. T. Morse, biographer of Holmes.
- The American Poet*—by the criterion of foreign standards. WALT WHITMAN (Vol. 28, p. 610), by John Burroughs, author of *Whitman, A Study*.
- Scholarship and criticism in this Period and the Next: the particularly Important Work done by Americans in Grammar, Language, Text Criticism, etc. FRANCIS JAMES CHILD (Vol. 6, p. 135). CORNELIUS C. FELTON (Vol. 10, p. 246). GEORGE PERKINS MARSH (Vol. 17, p. 768). WILLIAM DWIGHT WHITNEY (Vol. 28, p. 611), by Benjamin E. Smith, editor *Century Dictionary*. RICHARD GRANT WHITE (Vol. 28, p. 601). HORACE HOWARD FURNESS (Vol. 11, p. 362). FRANCIS ANDREW MARCH (Vol. 17, p. 688). BASIL LANNEAU GILDERSLEEVE (Vol. 12, p. 12). CHARLES ELIOT NORTON (Vol. 19, p. 797).
- The later Poets.*  
New England. THOMAS BAILEY ALDRICH (Vol. 1, p. 536). JULIA WARD HOWE (Vol. 13, p. 836). WILLIAM WETMORE STORY (Vol. 25, p. 970).
- New York. EDMUND CLARENCE STEDMAN (Vol. 25, p. 861). RICHARD HENRY STODDARD (Vol. 25, p. 989). RICHARD WATSON GILDER (Vol. 12, p. 12).
- Pennsylvania. CHARLES GODFREY LELAND (Vol. 16, p. 405). SILAS WEIR MITCHELL (Vol. 18, p. 618).

- The South.
- The Middle West (especially humorous, light and character verse).
- The Far West.
- Later Fiction.*
- The American Realist.
- The American Cosmopolite.
- Stories of Italy.
- Historical Romance.
- Humorous Short Story.
- Pietistic Novel.
- The Provincial Types—
- Maine.
- New England.
- West.
- South: Tennessee.
- Kentucky.
- Virginia.
- New Orleans.
- Essayists.*
- Humor.*
- The American "Hood."
- "Bill Nye."
- America's Great Humorist.
- "Uncle Remus."
- Puck.
- "Mr. Dooley."
- SIDNEY LANIER (Vol. 16, p. 181), by Prof. W. P. Trent, Columbia.
- JOHN HAY (Vol. 13, p. 105).
- EUGENE FIELD (Vol. 10, p. 321).
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## CHAPTER XXXVIII

## ENGLISH LITERATURE

ON English literature, with its vastly longer history and greater volume, there is much more matter in the Britannica than on American literature—or of course any other national literature. The key article is ENGLISH LITERATURE (Vol. 9, p. 607; equivalent to 120 pages of this Guide), and an excellent outline for the study of this subject may be based on this article which should be supplemented by the sections on *Literature* in the articles SCOTLAND, CANADA, etc. A

combination of these with special articles may be arranged as follows:

On the period before Chaucer—the first part of the article ENGLISH LITERATURE (Vol. 9, p. 607), by Henry Bradley, joint-editor of *The Anglo-Saxon New English Dictionary*, etc.; the same author's BEOWULF (Vol. 3, p. 758), CÆDMON (Vol. 4, p. 934) and CYNEWULF (Vol. 7, p. 690), ANGLO-SAXON CHRONICLE (Vol. 2, p. 34), and ALFRED THE GREAT (Vol. 1, p. 582),

both by the Rev. Charles Plummer, author of *Life and Times of Alfred the Great*, etc.; DAN MICHEL OF NORTHGATE (Vol. 18, p. 371); ANGLO-NORMAN LITERATURE (Vol. 2, p. 31), by Prof. L. M. Brandin, University of London; ANCREN RIWLE (Vol. 1, p. 952); ORM (Vol. 20, p. 293), by Henry Bradley; LAYAMON (Vol. 16, p. 311), by the late Prof. W. W. Skeat of Cambridge; HAVELOK THE DANE (Vol. 13, p. 80); ROMANCE, ARTHURIAN ROMANCE, etc.

On the period from Chaucer to the Renaissance, see the second part of the article ENGLISH LITERATURE (Vol. 9, p. 611), by Prof. J. M. Manly, University of Chicago, author of *The Language of Chaucer's Legend of Good Women*; THE PEARL (Vol. 21, p. 27), by Prof. Israel Gollancz, King's College, London, editor of the *Temple Shakespeare*, etc.; LANGLAND (Vol. 16, p. 174); JOHN GOWER (Vol. 12, p. 298), by G. C. Macaulay, editor of Gower's works; GEOFFREY CHAUCER (Vol. 6, p. 13), by A. W. Pollard, chief-editor of the "Globe" *Chaucer*; JOHN LYDGATE, (Vol. 17, p. 156), by Frederick J. Snell, author of *The Age of Chaucer*; THOMAS OCCLEVE (Vol. 19, p. 966), by W. S. McCormick, formerly professor of English, University College, Dundee; STEPHEN HAWES (Vol. 13, p. 93); JOHN SKELTON (Vol. 25, p. 184); JULIANA BERNERS (Vol. 3, p. 801); THOMAS OF ERCELDOUNE (Vol. 26, p. 865); JOHN BARBOUR (Vol. 3, p. 389), by Professor George Gregory Smith, Queen's University, Belfast; ANDREW OF WYNTOUN (Vol. 28, p. 873); HARRY THE MINSTREL (Vol. 13, p. 29); JOHN WYCLIFFE (Vol. 28, p. 866), by Reginald Lane Poole, author of *Wycliffe and Movements for Reform*, and W. Alison Phillips; REGINALD PECOCK (Vol. 21, p. 33); SIR JOHN FORTESCUE (Vol. 10, p. 678), by P. C. Yorke; WILLIAM CAXTON (Vol. 5, p. 587).

The English versions of the Bible are dealt with in the chapter of this Guide

on *Bible Study*; but the article BIBLE, ENGLISH (Vol. 3, p. 894), by Canon Henson of Westminster Abbey and Anna C. Paues, lecturer in Germanic philology at Newnham College, should be read in connection with the study of this and earlier periods of English literature.

On English literature in the Elizabethan age read part 3 of the article ENGLISH LITERATURE (Vol. 9, p. 616), by Prof. Oliver Elton, University of Liverpool; also SIR THOMAS MORE (Vol.

18, p. 822), by Mark Pattison, the essayist and student of the Renaissance; WILLIAM TYNDALE (Vol. 27, p. 498); ROGER ASCHAM (Vol. 2, p. 720), by A. F. Leach, author of *English Schools at the Reformation*, etc.; WILLIAM DUNBAR (Vol. 8, p. 668), by Prof. G. Gregory Smith; SIR THOMAS HOBY (Vol. 13, p. 553); RAPHAEL HOLINSHED (Vol. 13, p. 584); JOHN FOXE (Vol. 10, p. 770); SIR THOMAS NORTH (Vol. 19, p. 759); SIR THOMAS WYAT (Vol. 28, p. 861); EARL OF SURREY (Vol. 26, p. 138); GEORGE GASCOIGNE (Vol. 11, p. 493); NICHOLAS UDAL (Vol. 27, p. 554), by A. F. Leach; EDMUND SPENSER (Vol. 25, p. 639.)

by the late Professor William Minto of Aberdeen, and F. J. Snell, author of *The Age of Chaucer*, etc.; SIR PHILIP SIDNEY (Vol. 25, p. 43); JOHN LYLY (Vol. 17, p. 159), by Mrs. Humphry Ward; EUPHUISM (Vol. 9, p. 898); MICHAEL DRAYTON (Vol. 8, p. 557), and SAMUEL DANIEL (Vol. 7, p. 808), all by Edmund Gosse; WILLIAM WARNER (Vol. 28, p. 327); EDWARD FAIRFAX (Vol. 10, p. 130); SIR JOHN HARRINGTON (Vol. 12, p. 952); GILES and PHINEAS FLETCHER (Vol. 10, p. 498); THOMAS WATSON (Vol. 28, p. 413), by E. Gosse; THOMAS LODGE (Vol. 16, p. 860), by Prof. A. W. Ward, Cambridge; THOMAS CAMPION (Vol. 5, p. 137), by P. Vivian, editor of *Campion*; NICHOLAS BRETON (Vol. 4, p. 501); ROB-



ERT SOUTHWELL (Vol. 25, p. 517); the metaphysical poets, JOHN DONNE (Vol. 8, p. 417), GEORGE HERBERT (Vol. 13, p. 339), RICHARD CRASHAW (Vol. 7, p. 379), ABRAHAM COWLEY (Vol. 7, p. 347), THOMAS TRAHERNE (Vol. 27, p. 155), and HENRY VAUGHAN (Vol. 27, p. 955); WILLIAM BROWNE (Vol. 4, p. 667); GEORGE WITHER (Vol. 28, p. 758); WILLIAM DRUMMOND of Hawthornden (Vol. 8, p. 600); ROBERT HERRICK (Vol. 13, p. 389), by E. Gosse; RICHARD LOVE-LACE (Vol. 17, p. 71); SIR JOHN SUCKLING (Vol. 26, p. 7); ANDREW MARVELL (Vol. 17, p. 805); EDMUND WALLER (Vol. 28, p. 282), by E. Gosse; and JOHN MILTON (Vol. 18, p. 480), in great part by David Masson, late professor at Edinburgh University.

Elizabethan drama—particularly Shakespeare—deserves a separate paragraph, especially as its treatment in

### The Drama

the Britannica is so full. Read in the article ENGLISH LITERATURE, pp. 622-626; in the article DRAMA, by Prof. A. W. Ward, Cambridge, pp. 520-524 of Volume 8; and the articles: JOHN LYLY (Vol. 17, p. 159), by Mrs. Humphry Ward; THOMAS KYD (Vol. 15, p. 958), by E. Gosse; GEORGE PEELE (Vol. 21, p. 44); ROBERT GREENE (Vol. 12, p. 539), by A. W. Ward; CHRISTOPHER MARLOWE (Vol. 17, p. 741), by A. C. Swinburne and Thomas Seccombe, author of *The Age of Johnson*, etc.; and above all SHAKESPEARE (Vol. 24,

### Shakespeare

p. 772; equivalent to 80 pages of this Guide), containing a biography and sketches of the different works by E. K. Chambers, editor of the "Red Letter Shakespeare" and author of *The Medieval Stage*, with a discussion of the portraits of Shakespeare (20 of which are reproduced), by M. H. Spielmann, formerly editor of the *Magazine of Art*, and of the Shakespeare-Bacon controversy by Hugh Chisholm, editor-in-chief of the Encyclopaedia Britannica,

and an elaborate, classified bibliography by H. R. Tedder, librarian of the Athenaeum Club, London. In his discussion of the Baconian theory of the authorship of the plays Mr. Chisholm says:

"No such idea seems to have occurred to anybody till the middle of the 19th century. . . The most competent special students of Shakespeare, however they may differ as to details, and also the most authoritative special students of Bacon, are unanimous in upholding the traditional view." And he adds that as regards the effort to account for the positive contemporary evidence in favour of the identification of the man Shakespeare with the author of Shakespeare's works, "it is highly significant that it was not attempted or thought of for centuries." See also: HAMLET (Vol. 12, p. 894) for earlier treatment of the legend, and MACBETH (Vol. 17, p. 197) for the historical basis of the play.

For the other dramatists of the time see the articles BEN JONSON (Vol. 15, p. 502), by A. W. Ward; GEORGE CHAPMAN (Vol. 5, p. 852), JOHN WEBSTER (Vol. 28, p. 462), CYRIL TOURNEUR (Vol. 27, p. 106), and BEAUMONT AND FLETCHER (Vol. 3, p. 592), all by A. C. Swinburne; THOMAS DEKKER (Vol. 7, p. 939), by William Minto and R. B. McKerrow; THOMAS HEYWOOD (Vol. 13, p. 439); THOMAS MIDDLETON (Vol. 18, p. 416); JOHN MARSTON (Vol. 17, p. 776); PHILIP MASSINGER (Vol. 17, p. 868); JOHN FORD (Vol. 10, p. 641), by A. W. Ward; JAMES SHIRLEY (Vol. 24, p. 990).

For Elizabethan prose writers not already mentioned, see: the translators, JOHN BOURCHIER, LORD BARON BERNERS (Vol. 3, p. 800),

### 16th and 17th Century Prose

PHILEMON HOLLAND (Vol. 13, p. 587) and GIOVANNI FLORIO (Vol. 10, p. 546); and the philosophers and essayists, RICHARD HOOKER (Vol. 13, p. 672), by T. F. Henderson, FRANCIS BACON, (Vol. 3, p. 135; equivalent to 55 pages of this Guide), by Robert Adamson

and J. M. Mitchell, THOMAS HOBBS (Vol. 13, p. 545), by G. Croom Robertson, biographer of Hobbes, SIR THOMAS BROWNE (Vol. 4, p. 666), IZAAK WALTON (Vol. 28, p. 300), ROBERT BURTON (Vol. 4, p. 865), JEREMY TAYLOR (Vol. 26, p. 469), THOMAS FULLER (Vol. 11, p. 296), WILLIAM CHILLINGWORTH (Vol. 6, p. 162), JOHN HALES (Vol. 12, p. 834), RALPH CUDWORTH (Vol. 7, p. 612), by Henry Sturt, author of *Personal Idealism*, etc.; the historian CLARENDON (Vol. 6, p. 428), by P. C. Yorke; and the letter-writer JAMES HOWELL (Vol. 13, p. 838).

On the Restoration period—from 1660 to 1700—see Professor Elton's chapter (Vol. 9, pp. 628–631) in the article

ENGLISH LITERATURE; and the

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JOHN LOCKE (Vol.

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For the 19th century see the last section of the article ENGLISH LITERATURE

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18, p. 620), GROTE (Vol. 12, p. 619), by J. M. Mitchell, edition of Grote's *Greece*; JAMES MILL (Vol. 18, p. 453), SIR WILLIAM NAPIER (Vol. 19, p. 175), WILLIAM COBBETT (Vol. 6, p. 606), SIR WALTER SCOTT (Vol. 24, p. 469),

- by William Minto; LEVER (Vol. 16, pp. 508-510), MARRYAT (Vol. 17, p. 759), BULWER LYTTON (Vol. 17, p. 185), by Arthur Waugh; BEACONSFIELD (Vol. 3, p. 563), by Frederick Greenwood; JANE AUSTEN (Vol. 2, p. 936), by E. V. Lucas; MARIA EDGEWORTH (Vol. 8, p. 934), HARRIET MARTINEAU (Vol. 17, p. 796), MARY RUSSELL MITFORD (Vol. 18, p. 619), ELIZABETH CLEGHORN GASKELL (Vol. 11, p. 501) and the BRONTËS (Vol. 4, p. 637), by C. K. Shorter; THOMAS LOVE PEACOCK (Vol. 21, p. 21), by Richard Garnett; GEORGE MEREDITH (Vol. 18, p. 160), by Hugh Chisholm; TENNYSON (Vol. 26, p. 630), by E. Gosse; ELIZABETH BARRETT BROWNING (Vol. 4, p. 668), by Alice Meynell; ROBERT BROWNING (Vol. 4, p. 670) and CARLYLE (Vol. 5, p. 349), both by Sir Leslie Stephen; CHARLES READ (Vol. 22, p. 938), DICKENS (Vol. 8, p. 178), by Thomas Seccombe; THACKERAY (Vol. 26, p. 716), by W. H. Pollock; GEORGE ELIOT (Vol. 9, p. 275), by Mrs. Craigie ("John Oliver Hobbes"); ANTHONY TROLLOPE (Vol. 27, p. 301), WILKIE COLLINS (Vol. 6, p. 693), CHARLES and HENRY KINGSLEY (Vol. 15, p. 817); HERBERT SPENCER (Vol. 25, p. 634), by F. C. S. Schiller, author of *Studies in Humanism*, etc.; JOHN STUART MILL (Vol. 18, p. 454), by William Minto and J. M. Mitchell; CHARLES DARWIN (Vol. 7, p. 840), by Prof. E. B. Poulton, Oxford; HUXLEY (Vol. 14, p. 17), by Sir W. T. Thiselton-Dyer; J. R. GREEN (Vol. 12, p. 534), WILLIAM STUBBS (Vol. 25, p. 1048), E. A. FREEMAN (Vol. 11, p. 79) and J. A. FROUDE (Vol. 11, p. 252), all by William Hunt, formerly president Royal Historical Society; LECKY (Vol. 16, p. 354), BUCKLE (Vol. 4, p. 732), MAINE (Vol. 17, p. 432), by Sir Frederick Pollock; GEORGE BORROW (Vol. 4, p. 275), by Theodore Watts-Dunton; EDWARD FITZGERALD (Vol. 10, p. 443), by E. Gosse; MATTHEW ARNOLD (Vol. 2, p. 635), by Theodore Watts-Dunton and Sir Joshua Girling Fitch; Ruskin JOHN RUSKIN (Vol. 23, p. 858), by Frederic Harrison; DANTE GABRIEL ROSSETTI (Vol. 23, p. 747), by Theodore Watts-Dunton and F. G. Stephens, formerly art-critic of the *Athenaeum*; SWINBURNE (Vol. 26, p. 234), by E. Gosse; WILLIAM MORRIS (Vol. 18, p. 871), JOHN ADDINGTON SYMONDS (Vol. 26, p. 286) and WALTER PATER (Vol. 20, p. 910) all by Arthur Waugh; NEWMAN (Vol. 19, p. 517), by Arthur Wollaston Hutton, biographer of Manning; JOHN KEBLE (Vol. 15, p. 710), EDWARD BOUVERIE PUSEY (Vol. 22, p. 667), RICHARD JEFFERIES (Vol. 15, p. 300), by Sir Walter Besant, biographer of Jeffries; THOMAS HARDY (Vol. 12, p. 946), by Arthur Symons; ROBERT STEVENSON (Vol. 25, p. 907), by E. Gosse; and among later names—the historians LORD ACTON (Vol. 1, p. 159), by Hugh Chisholm, M A N D E L L (Vol. 7, p. 401), MORLEY (Vol. 18, p. 841), BRYCE (Vol. 4, p. 699) and BURY (Vol. 4, p. 867); the novelists WILLIAM BLACK (Vol. 4, p. 19), BLACKMORE (Vol. 4, p. 24), M. E. BRADDON (Vol. 4, p. 369), MRS HUMPHRY WARD (Vol. 28, p. 320), MARIE CORELLI (Vol. 7, p. 143), HALL CAINE (Vol. 4, p. 949), GEORGE GISSING (Vol. 12, p. 52), GEORGE MOORE (Vol. 18, p. 808), H. G. WELLS (Vol. 28, p. 514), WILLIAM DE MORGAN (Vol. 8, p. 10), RUDYARD KIPLING (Vol. 15, p. 825), by W. Price James, author of *Romantic Professions*, etc.; the critics and essayists WALTER BAGEHOT (Vol. 3, p. 198),



by Richard Garnett, STOPFORD A. BROOK (Vol. 4, p. 645), MARK PATTISON (Vol.

**Essays and Criticism**

20, p. 937), LESLIE STEPHEN (Vol. 25, p. 885), by Thomas Seccombe, H. D. TRAILL (Vol. 27, p. 155), GEORGE SAINTSBURY (Vol. 24, p. 45), SIDNEY COLVIN (Vol. 6, p. 748), WATTS-DUNTON (Vol. 28, p. 422), R. C. JEBB (Vol. 15, p. 299), F. W. H. MYERS (Vol. 19, p. 111), EDWARD DOWDEN (Vol. 8, p. 456), WILLIAM ARCHER (Vol. 2, p. 362), RICHARD GARNETT (Vol. 11, p. 471), EDMUND GOSSE (Vol. 12, p. 268), ANDREW LANG (Vol. 16, p. 171), G. K. CHESTERTON (Vol. 6, p. 111), ARTHUR SYMONS (Vol. 26, p. 287),—a list in which it is interesting to note how many are contributors to the Encyclopaedia Britannica; of recent poetry poets, ROBERT BRIDGES (Vol. 4, p. 532), so recently

named poet-laureate, his predecessor ALFRED AUSTIN (Vol. 2, p. 938), WILLIAM WATSON (Vol. 28, p. 414), by W. Price James, W. B. YEATS (Vol. 28, p. 909), WILLIAM SHARP, "Fiona Macleod" (Vol. 24, p. 811), FRANCIS THOMPSON (Vol. 26, p. 869), JOHN DAVIDSON (Vol. 7, p. 863), SIR W. S. GILBERT (Vol. 12, p. 9), by Thomas Seccombe; OWEN SEAMAN (Vol. 24, p. 543), LAURENCE BINYON (Vol. 3, p. 952), H. J. NEWBOLT (Vol. 19, p. 463), STEPHEN PHILLIPS (Vol. 21, p. 407), ALICE MEYNELL (Vol. 18, p. 350); and of the younger

**Modern Drama** dramatists, OSCAR WILDE (Vol. 28, p. 632), by Hugh Chisholm, SIR A. W. PINERO (Vol. 21, p. 625), A. H. JONES (Vol. 15, p. 498), J. M. BARRIE (Vol. 3, p. 435), by W. Price James; G. BERNARD SHAW (Vol. 24, p. 812),—and see also under DRAMA (Vol. 8, especially pp. 534-538).

## CHAPTER XXXIX

### GERMAN LITERATURE

**T**HE article in the Britannica on German Literature (Vol. 11, p. 783; equivalent to 55 pages of this Guide) is by Professor John George Robertson, University of London, author of *History of German Literature*. This article is divided into six sections, and following this scheme the course of reading below is divided into six parts, in connection with each of which the reader should first peruse the correspondingly numbered section in the article GERMAN LITERATURE.

**Old High German**

I. *The Old High German Period, 750-1050*:—the articles ULFILAS (Vol. 27, p. 565), by Charles Anderson Scott, author

of *Ulfilas, Apostle of the Goths*; HELIAND (Vol. 13, p. 221), by Henry Bradley, author of *The Story of the Goths*; EINHARD (Vol. 9, p. 134), by A. W. Holland; NOTKER (Vol. 19, p. 824) and HROSVITHA (Vol. 13, p. 842), by A. W. Ward—and see Prof. Ward on the medieval drama in the article DRAMA (Vol. 8, especially p. 497).

II. *The Middle High German Period, 1050-1350*:—the articles ROMANCE (Vol. 23, p. 500), by George Saintsbury; WALTHARIUS (Vol. 28, p. 298), **Middle** NIBELUNGENLIED (Vol. 19, **Period** pp. 637-640), GUDRUN (Vol. 12, p. 668), DIETRICH OF BERN (Vol. 8, p. 221), ORTNI (Vol. 20, p. 341), WOLFDIETRICH (Vol. 28, p. 772), HEL-



DENBUCH (Vol. 13, p. 218), LAY OF HILDEBRAND (Vol. 13, p. 460), by J. G. Robertson; RUODLIEB (Vol. 23, p. 854), ARTHURIAN LEGEND (Vol. 2, p. 684), PERCEVAL (Vol. 21, p. 132), and TRISTAN (Vol. 27, pp. 292-294), by J. L. Weston, author of *Legends of the Wagner Drama*; HARTMANN VON AUE (Vol. 13, p. 37), GOTTFRIED VON STRASSBURG (Vol. 12, p. 277), WOLFRAM VON ESCHENBACH (Vol. 28, p. 775), by J. L. Weston; WALTHER VON DER VOGELWEIDE (Vol. 28, p. 299), MINNESINGERS (Vol. 18, p. 547), FREIDANK (Vol. 11, p. 94), CONRAD OF WÜRZBURG (Vol. 6, p. 968).

III. *The Transition Period, 1350-1600*:—the articles FRAUENLOB (Vol. 11, p.

42), REYNARD THE

14th and 15th Centuries FOX (Vol. 23, p. 226), SEBASTIAN BRANT

(Vol. 4, p. 431),

MAXIMILIAN I. (Vol. 17, p. 922), by A. W. Holland; MEISTERSINGER (Vol. 18, p. 86) and EULENSPIEGEL (Vol. 9, p. 887), by J. G. Robertson; HANS SACHS (Vol. 23, p. 972), TAULER (Vol. 26, p. 452), GEILER VON KAISERBERG (Vol. 11, p. 553), ERASMUS (Vol. 9, p. 727), by Mark Pattison and P. S. Allen, editor of the Oxford Erasmus; REUCHLIN (Vol. 23, p. 204), by W. Robertson Smith; ULRICH VON HUTTEN (Vol. 14, p. 14), by the Very Rev. G. W. Kitchin, Dean of Durham; MARTIN LUTHER (Vol. 17, p. 133), by Dr. T. M. Lindsay, author of *A History of the Reformation*; ERASMUS ALBERUS (Vol. 1, p. 504), THOMAS MURNER (Vol. 19, p. 37), JOHANN FISCHART (Vol. 10, p. 425), PHILIPP NIKODEMUS FRISCHLIN (Vol. 11, p. 232), JÖRG WICKRAM (Vol. 28, p. 619), AYRER (Vol. 3, p. 74), FAUST (Vol. 10, p. 210).

IV. *The Renaissance, 1600-1740*:—the articles PAUL GERHARDT (Vol. 11, p. 768), JAKOB BOEHME (Vol. 4, p. 113), GEORG

RUDOLF WECKHERLIN

Renaissance (Vol. 28, p. 464), MARTIN OPITZ (Vol. 20, p.

129), GEORG PHILIPP HARSDÖRFFER (Vol. 13, p. 29), SIMON DACH (Vol.

7, p. 726), PAUL FLEMING (Vol. 10, p. 494), VON LOGAU (Vol. 16, p. 877), ABRAHAM A SANCTA CLARA (Vol. 1, p. 72), JOHANN VON RIST (Vol. 23, p. 366), ANDREAS GRYPHIUS (Vol. 12, p. 642), MOSCHEROSCH (Vol. 18, p. 890), GRIMMELSHAUSEN (Vol. 12, p. 603), PUFENDORF (Vol. 22, p. 634), THOMASIVS (Vol. 26, p. 868), CHRISTIAN WOLFF (Vol. 28, p. 774), by Andrew Seth Pringle-Pattison; LEIBNITZ (Vol. 16, p. 385), by Prof. W. R. Sorley, Cambridge; SPENER (Vol. 25, p. 638), VON CANITZ (Vol. 5, p. 183), JOHANN CHRISTIAN GÜNTHER (Vol. 12, p. 730), B. H. BROCKES (Vol. 4, p. 624), and, the dictator of the pseudo-classic age, GOTTSCHED (Vol. 12, p. 279).

V. *The Classical Period of Modern German Literature, 1740-1832*:—the articles

J. J. BODMER (Vol. 4, p.

Classical 111), GELLERT (Vol. 11, Period p. 558), RABENER (Vol.

22, p. 773), J. ELIAS

SCHLEGEL (Vol. 24, p. 329), KLOPSTOCK (Vol. 15, p. 848), LAVATER (Vol. 16, p. 291), GERSTENBERG (Vol. 11, p. 907), GLEIM (Vol. 12, p. 118), GÖTZ (Vol. 12, p. 289), Uz (Vol. 27, p. 828), RAMLER (Vol. 22, p. 876), HAGEDORN (Vol. 12, p. 813), ALBRECHT VON HALLER (Vol. 12, p. 855), E. C. VON KLEIST (Vol. 15, p. 846), LESSING (Vol. 16, pp. 496-499), by James Sime, author of *A History of Germany*, and J. G. Robertson, and Lessing's associates — WINCKELMANN (Vol. 28, p. 707), by James Sime and J. M. Mitchell, MOSES MENDELSSOHN (Vol. 18, p. 120), by Israel Abrahams, author of *A Short History of Jewish Literature*, and C. F. NICOLAI (Vol. 19, p. 662)—; WIELAND (Vol. 28, p. 621), by J. G. Robertson; M. A. VON THÜMMEL (Vol. 26, p. 898), A. VON KNIGGE (Vol. 15, p. 850), MUSÄUS (Vol. 19, p. 43), BASEDOW (Vol. 3, p. 461), PESTALOZZI (Vol. 21, p. 284), HAMANN (Vol. 12, p. 869).

On the *Sturm und Drang period*, the articles HERDER (Vol. 13, p. 347), the STOLBERGS (Vol. 25, p. 953), J. H. VOSS

(Vol. 28, p. 215), HÖLTY (Vol. 13, p. 620), BÜRGER (Vol. 4, p. 812), M. CLAUDIUS (Vol. 6, p. 466),—all of the Göttingen school; GOETHE (Vol. 12, p. 182), by J. G. Robertson; his imitators and followers, J. M. R. LENZ (Vol. 16, p. 431), KLINGER (Vol. 15, p. 846), FRIEDRICH ("Maler") MÜLLER (Vol. 18, p. 961), HEINSE (Vol. 13, p. 216), K. P. MORITZ (Vol. 18, p. 838); the great dramatist of the late *Sturm und Drang*, SCHILLER (Vol. 24, p. 324), by J. G. Robertson; A. W. IFFLAND (Vol. 14, p. 291), F. JACOBI (Vol. 15, p. 115).

On the classical period proper, the latter part of the article on Goethe and Schiller, IMMANUEL KANT (Vol. 15, p. 662), and J. G. FICHTE (Vol. 10, p. 313), both by Robert Adamson; the historians SCHLOSSER (Vol. 24, p. 342), MÖSER (Vol. 18, p. 895), and JOHANNES VON MÜLLER (Vol. 18, p. 962), by W. A. B. Coolidge; the scientists J. G. A. FORSTER (Vol. 10, p. 674), ALEXANDER VON HUMBOLDT (Vol. 13, p. 873), by Agnes Mary Clerke, and KARL WILHELM VON HUMBOLDT (Vol. 13, p. 875), by Archibald Henry Sayce; the dramatist KOTZEBUE (Vol. 15, p. 919); the novelist RICHTER, "Jean Paul" (Vol. 23, p. 313); and the poet MATTHISSON (Vol. 17, p. 901).

On the romantic school: the articles on the founders, AUGUST WILHELM SCHLEGEL and FRIEDRICH SCHLEGEL (Vol. 24, p. 328 and 329), TIECK (Vol. 26, p. 962), HÖLDERLIN (Vol. 13, p. 583), and NOVALIS (Vol. 19, p. 829); in the second Romantic school, the more realistic Heidelbergers KLEMENS BRENTANO (Vol. 4, p. 496), L. A. VON ARNIM (Vol. 2, p. 630), J. J. VON GÖRRES (Vol. 12, p. 260), and, owing much to the interest in folk-literature of the Heidelbergers, the brothers GRIMM (Vol. 12, pp. 600-602), by Dr. Henry Sweet of the University of Oxford, CHAMISSE (Vol. 5, p. 825); the patriot

poets KÖRNER (Vol. 15, p. 913) and ARNDT (Vol. 2, p. 627); the North Germans KLEIST (Vol. 15, p. 846), ZACHARIAS WERNER (Vol. 28, p. 523), FOUQUÉ (Vol. 10, p. 749), E. T. W. HOFFMAN (Vol. 13, p. 561), EICHENDORFF (Vol. 9, p. 131), and RÜCKERT (Vol. 23, p. 813) and WILHELM MÜLLER (Vol. 18, p. 963), who, like Byron, found romance, one in the Orient and the other in Greek struggles for liberty; and, of the Swabian school, UHLAND (Vol. 27, p. 563), KERNER (Vol. 15, p. 757), HAUFF (Vol. 13, p. 65), and MÖRIKE (Vol. 18, p. 837); and the philosopher SCHELLING (Vol. 24, p. 316).

VI. *Literature since Goethe, 1832 onwards*:—Read G. W. F. HEGEL (Vol. 13, p. 200, by the late Prof. William Wallace of Oxford and Prof. J. H. Muirhead, University of Birmingham), Schelling's successor as a philosophic force in Germany; the articles on the "Young Germans" HEINE (Vol. 13, p. 213), by J. Walter Ferrier and J. G. Robertson; BÖRNE (Vol. 4, p. 255), GUTZKOW (Vol. 12, p. 744) and LAUBE (Vol. 16, p. 276); and the historians and philosophers D. F. STRAUSS (Vol. 25, p. 1002), GERVINUS (Vol. 11, p. 908), W. MENZEL (Vol. 18, p. 147) and FEUERBACH (Vol. 10, p. 303); the dramatists—some more closely connected with the preceding period,—GRABBE (Vol. 12, p. 306) and GRILLPARZER (Vol. 12, p. 596), IMMERMANN (Vol. 14, p. 335) and PLATEN-HALLERMUND (Vol. 21, p. 804), HOLTEI (Vol. 13, p. 619), RAUPACH (Vol. 22, p. 921) and MÜLLNER (Vol. 18, p. 965), and, in Austria, besides Grillparzer, COLLIN (Vol. 6, p. 690), MÜNCH-BELLINGHAUSEN, "Friedrich Halm" (Vol. 19, p. 2), BAUERNFELD (Vol. 3, p. 538) and RAIMUND (Vol. 22, p. 861); the novelists WILLIBALD ALEXIS (Vol. 1, p. 576), HAUFF (Vol. 13, p. 65) and ZSCHOKKE (Vol. 28, p. 1046); and such poets of the '30 and the '48 as HERWEGH (Vol. 13, p. 405), FREILIGRATH (Vol. 11, p. 94), DINGELSTEDT (Vol. 8, p. 275), HOFFMANN VON FALLERSLEBEN (Vol.

13, p. 561), and, in Austria, a little earlier, AUERSPERG, "Anastasius Grün" (Vol. 2, p. 900); and the possibly greater poets who were less interested in politics, GEIBEL (Vol. 11, p. 550), LENAU (Vol. 16, p. 417), STRACHWITZ (Vol. 25, p. 976), and DROSTE-HÜLSHOFF (Vol. 8, p. 591).

On the mid-century period:—the articles on SCHOPENHAUER (Vol. 24, p. 372, by Prof. Wallace),—the philosopher of the new age; the natural scientists VOGT (Vol. 28, p. 172), and BÜCHNER (Vol. 4, p. 719); the fiction writers SPIELHAGEN (Vol. 25, p. 667), GUSTAV FREYTAG (Vol. 11, p. 212), EBERS (Vol. 8, p. 841), DAHN (Vol. 7, p. 734), "CHARLES SEALSFIELD" (Vol. 24, p. 543), GERSTÄCKER (Vol. 11, p. 906), STORM (Vol. 25, p. 968), GOTTFRIED KELLER (Vol. 15, p. 718); and, among those who portrayed peasant and provincial life, BITZIUS, "Jeremias Gott-helf" (Vol. 4, p. 15), AUERBACH (Vol. 2, p. 899), STIFTER (Vol. 25, p. 915), FRITZ REUTER (Vol. 23, p. 210); the dramatists HEBBEL (Vol. 13, p. 165) and OTTO LUDWIG (Vol. 17, p. 114); in the Munich School, BODENSTEDT (Vol. 4, p. 109), SCHEFFEL (Vol. 24, p. 315), BAUMBACH (Vol. 3, p. 539), HAMERLING (Vol. 12, p. 876), HEYSE (Vol. 13, p. 438); and the Platt-Deutsch poet KLAUS GROTH (Vol. 12, p. 621).

On the period since 1870, see the articles LASSALLE (Vol. 16, p. 235, by Thomas Kirkup, author of *An Inquiry into Socialism*) and MARX (Vol. 17, p. 807, by Eduard Bernstein, Socialist deputy on the

Reichstag) for new economic views; and LOTZE (Vol. 17, p. 23), by J. T. Merz, author of *European Thought in the XIXth Century*, and Henry Sturt, author of *Personal Idealism*, and EDUARD VON HARTMANN (Vol. 13, p. 36) for philosophical compromises between science and metaphysics and between pessimism and idealism; the dramatists ANZENGRUBER (Vol. 2, p. 158), PAUL LINDAU (Vol. 16, p. 717, and, composer and dramatist, RICHARD WAGNER (Vol. 28, p. 236), by W. S. Rockstro, author of *A Great History of Music*, and D. F. Tovey, author of *Essays in Musical Analysis*; the historians SYBEL (Vol. 26, p. 275), TREITSCHKE (Vol. 27, p. 238), RANKE (Vol. 22, p. 893), MOMMSEN (Vol. 18, p. 683) and BURCKHARDT (Vol. 4, p. 809); and Burckhardt's friend, the early friend of Wagner and the type of a new spirit in German letters, NIETZSCHE (Vol. 19, p. 672), by F. C. S. Schiller, Oxford, author of *Studies in Humanism*.

The most important names of the last few years are SUDERMANN (Vol. 26, p. 20) and HAUPTMANN (Vol. 13, p. 68). See, besides, the articles on WILHELM JENSEN (Vol. 15, p. 321), WILHELM RAABE (Vol. 22, p. 765), W. BUSCH (Vol. 4, p. 869), PETER ROSEGGER (Vol. 23, p. 734), FONTANE (Vol. 10, p. 608), EBNER-ESCHENBACH (Vol. 8, p. 843), FRANZOS (Vol. 11, p. 38), K. F. MEYER (Vol. 18, p. 349), RICHARD VOSS (Vol. 28, p. 215), ERNST VON WILDENBRUCH (Vol. 28, p. 633), and for modern German drama, in the article DRAMA (Vol. 8, especially pp. 535-536).

## CHAPTER XL

### GREEK LITERATURE

**I**N the article LITERATURE in the Britannica, by Professor James Fitzmaurice-Kelly, himself a specialist in Spanish literature, are these sentences:

The evolution of literature is completed in Greece, and there its subdivisions may best be studied. Epic poetry is represented by the Homeric cycle, lyric poetry by Tyrtaeus, dramatic poetry by Aeschylus, history by Herodotus, oratory by Pericles, philosophy by Plato, and criticism by Zoilus, the earliest of slashing reviewers; and in each department there is a long succession of illustrative names. Roughly speaking, all subsequent literature is imitative.

This testimony to the importance of Greek literature is all the more weighty as coming from one whose own field of criticism is in Romantic literature. The authority with which such an important subject as Greek literature is treated in the Britannica will be apparent to any classical student who notes the names of the contributors of the articles mentioned in the following course of reading.

#### The Main Article

The key article GREEK LITERATURE (Vol. 12, p. 507; equivalent to 65 pages of this Guide) is divided into three sections: Ancient (p. 507), Byzantine (p. 516) and Modern (p. 524). The second section, by Prof. Karl Krumbacher of Munich, author of *Geschichte der byzantinischen Literatur*, and the third, by J. D. Bouchier, correspondent of *The Times* (London) in South-Eastern Europe, need not be dwelt upon here. To the ordinary student, in spite of the increasing interest shown in Byzantine and modern Hellenic literature, "Greek literature" must mean the literature of ancient Greece, and for him the first part of the article will be the foundation of his study of the subject. This section of the article is by the late

Sir Richard C. Jebb, professor of Greek at Glasgow and then at Cambridge, known as the biographer of Bentley, as the author of an excellent brief history of Greek literature, and as an authority on subdivisions of that subject so diverse as rhetoric and oratory on the one side and lyric and dramatic poetry on the other.

Jebb's article divides ancient Greek literature into three periods: *Early*, including epic, elegiac, iambic and lyric poetry and coming down to 475 B.C.; *Attic*, 475-300 B.C., including tragic and comic drama and historical, oratorical and philosophical prose; and *Decadence*—Alexandrian, 300-146 B.C., and Greco-Roman, 146 B.C.-529 A.D.

In the first of these periods the student should supplement Professor Jebb's treatment in the article GREEK LITERATURE

by the following articles:  
Epic EPIC POETRY (Vol. 9, p. 681), a general sketch of the form by Edmund Gosse; HOMER (Vol. 13, p. 626; equivalent to 40 pages of this Guide), by the late Prof. David Binning Monro of Oriel College, Oxford, editor of Homer and author of *Grammar of the Homeric Dialect*,—and on the "Homeric question" see also the articles ARISTARCHUS and F. A. WOLF; HESIOD (Vol. 13, p. 407), by James Davies, formerly head master Ludlow Grammar School, and John Henry Freese, formerly fellow St. John's, Cambridge; CYCLE (Vol. 7, p. 682; last part of the article); and the cyclic poets, STASINUS, ARCTINUS, LESCHES, and CREOPHYLUS.

For the elegy see Edmund Gosse's article ELEGY; and on the Greek elegists, the articles CALLINUS and TYRTÆUS for martial poetry, MIMNERMUS for melan-



choly verse, SOLON for political and ethical poetry, THEOGNIS and PHOCLIDES for the gnomic elegy, and XENOPHANES for the use of the measure in didactic philosophical verse. On iambic verse and its Greek writers before the time of the drama see: IAMBIC, ARCHILOCHUS, SIMONIDES OF AMORGOS, and HIPPOXACHUS.

The third poetic form of the period, one which unfortunately has come down to us only in tantalizingly brief fragments

### Lyric Poetry

—comparable to the quotations illustrating word-usage in our dictionaries—is the lyric. On this see the general article LYRICAL POETRY, by Edmund Gosse, on this form in different literatures, and the sketches of the Greek lyricists the Aeolians ALCAEUS (see also the article ALCAICS) and SAPPHO, by Prof. John Arthur Platt, University College, London; PRAXILLA and ERINNA, Sappho's rivals as lyric poetesses; (the Ionian ANACREON (see also the article ANACREONTICS, by Edmund Gosse); the Dorian ALCMAN; STESICHORUS, ARION and IBYCUS; SIMONIDES, who may be called Panhellenic; PINDAR (Vol. 21, p. 617; equivalent to 10 pages of this Guide, by Sir R. C. Jebb), the only Greek lyricist whose work has come down to us in any considerable quantity, and whose poems are such remarkable examples of metrical structure; BACCHYLIDES (Vol. 3, p. 121; equivalent to 9 pages of this Guide; also by Sir R. C. Jebb, who was one of the first editors), Pindar's rival, whose poems until a few years ago were known to us only by brief quotations by grammarians, but who had the good luck to survive in papyrus lately found in Egypt; and TIMOTHEUS of Miletus, of whose "Persians" a valuable fragment was found in 1903 in what seems to be the oldest papyrus in existence.

The Attic period has two important developments—the drama, tragic and comic, and the beginnings of a Greek prose.

For the drama read the part of Prof.

A. W. Ward's article DRAMA dealing with the Greek period (Vol. 8, pp. 488-493),

and the article COMEDY; and the articles on the great dramatists:—the tragedians THESPIAS, CHOERILUS, PHRYNICHUS and PRATINAS in the earlier period; AESCHYLUS (Vol. 1, p. 272; equivalent to 12 pages of this Guide), by Arthur Sidgwick, fellow of Corpus Christi, Oxford, and editor of the Oxford text of Aeschylus; SOPHOCLES (Vol. 25, p. 424; equivalent to 12 pages of this Guide), by Lewis Campbell, editor and translator of this poet; and EURIPIDES (Vol. 9, p. 901; equivalent to 15 pages of this Guide), in the main by Sir R. C. Jebb; and the comic poets,—the

Sicilian EPICHRMUS; the Comedy representatives of the Attic Old Comedy, CRATINUS,

CRATES, PHERECRATES, EUPOLIS, PHRYNICHUS (not to be confused with the tragic poet of that name), MAGNES, PLATO (to be distinguished from the philosopher),—all these known to us only by allusions and chance quotations—and ARISTOPHANES (Vol. 2, p. 499; equivalent to 7 pages of this Guide, by Sir R. C. Jebb), the only Greek poet of whom we have complete plays and probably the greatest of the writers of Greek comedy; the names—they are little more—of EUBULUS, ANTIPHANES, ALEXIS in the Middle Comedy; and in the New Comedy or third period, PHILEMON, MENANDER (by J. H. Freese), who was so highly esteemed and so constantly pilfered from by the Roman comic writers, and of whose plays large fragments have been found in the last few years; DIPHILUS, APOLLODORUS of Carystus, POSIDIPPUS, RHINTHON and SOTADES.

The prose of the Attic period we may divide roughly into history, oratory and philosophy. On the his-

torians read LOGOGRAPHI, GREECE, *Ancient History*, "Authorities" (Vol. 12, p. 454), with



criticism of the historical accuracy of Herodotus, Thucydides, Diodorus, Plutarch, Xenophon, etc., **HECATAEUS** of Miletus, **HERODOTUS** (Vol. 13, p. 381; equivalent to 10 pages of this Guide), by the historian George Rawlinson and E. M. Walker, librarian of Queen's College, Oxford; **THUCYDIDES** (Vol. 26, p. 893; equivalent to 10 pages of the Guide), by Sir R. C. Jebb, and Malcolm Mitchell, editor of Grote's *Greece*; **XENOPHON** (Vol. 28, p. 885; equivalent to 7 pages in this Guide), by E. M. Walker and J. H. Freese; **CTESIAS**, **PHILISTUS**, **THEOPOMPUS**, and **TIMAEUS**.

On Attic orators read **ANDOCIDES**, **LYSIAS**, **ISOCRATES**, **ISAEUS**, **ANTIPHON**, **DEMOSTHENES**, **AESCHINES**, **HYPEREIDES**,

—most of these articles  
**Oratory** being by Sir R. C. Jebb,  
who was particularly versed

in this branch of Greek literature. The special student of the orators should read also the articles **GREEK LAW** (Vol. 12, p. 501; equivalent to 15 pages in this Guide), by Prof. J. E. Sandys of Cambridge, author of *A History of Classical Scholarship*, etc.; **SOPHISTS** (Vol. 25, p. 418, equivalent to 20 pages of this Guide), by Prof. Henry Jackson of Cambridge, a well-known writer on Greek philosophy, and **RHETORIC** (Vol. 23, p. 233), by Sir R. C. Jebb.

On Greek philosophical writing see the articles **PHERECYDES** of Syros, **ANAXIMENES** of Miletus, **ANAXIMANDER**, and the names great not only in Greek thought and literature but in the world's—**PLATO** (Vol. 21, p. 808; equivalent to about 50 pages of this Guide), by Lewis Campbell, editor and critic of many of the Platonic dialogues, and **ARISTOTLE** (Vol. 2, p. 501; equivalent to 70 pages of this Guide), by Prof. Thomas Case, Oxford, author of *Physical Realism*, etc. For a fuller guide to Greek philosophy see the chapter in this Guide on *Philosophy*.

The third period of classical Greek literature was one of Greek thought in un-Greek surroundings—see the article **HELLENISM**, by E. R. Bevan, author of *The House of Seleucus*, etc.,—and this

came to its first and  
**Decadence** finest flower in Al-  
exandria, in Egypt,

under the Ptolemies—see the article **ALEXANDRIAN SCHOOL**, especially that part of it dealing with *Literature* (Vol. 1, p. 573). On the writers of the Alexandrian period see: for poetry, **PHILETAS**, **HERMESIANAX**, **ASCLEPIADES** of Samos, and the comic poets **SOTADES** and **RHINTHON**, already mentioned; **HERODAS**, by W. G. Headlam, editor of Herodas; the idyllist **THEOCRITUS** (Vol. 26, p. 760), by A. C. Clark, fellow of Queen's, Oxford; Theocritus's followers **BION** and **MOSCHUS**; the mythologist **CALLIMACHUS**, who influenced Catullus as much as Theocritus did the young Virgil; the didactic poet **ARATUS**, whom Cicero translated into Latin and whom Virgil imitated in his *Georgics*; the epic **APOLLONIUS** of Rhodes, and the late tragedian **LYCOPHRON**; and for prose the critic **ARISTARCHUS**.

In the Greco-Roman period, following the Alexandrian the principal articles for the student are: the historians **POLYBIUS** and **DIODORUS SICULUS**, the satirist **LUCIAN**, the later historians **DIONYSIUS HALICARNASSENSIS**, **DIO CASSIUS**, **ARRIAN**, **APPIAN**, **HERODIAN**, **EUSEBIUS**, **ZOSIMUS**, the biographers **PLUTARCH**, **DIOGENES LAERTIUS**, **PHILOSTRATUS**, the rhetoricians **LONGINUS** and **DIO CHRYSOSTOM**, and the emperor philosopher **MARCUS AURELIUS** and his forerunner the "slave philosopher" **EPICETUS**.

Possibly the most typical output of the later Greek age is the matchless collection of short poems known to us as "the Greek Anthology"; on this see the articles **EPIGRAM** and **ANTHOLOGY**.

## CHAPTER XLI

### BIBLE STUDY

**I**T is impossible for the student to consider the subject of Bible Study without being impressed by the immense labour and the profound scholarship which have been devoted to the interpretation and discussion of Scripture. Continued investigation has solved many difficulties, but has also vastly increased the mass of evidences and conjectures which must be weighed in connection with any doubtful passages. The *Britannica* tells us, for example, (Vol. 3, pp. 903, 904) that the translators of the King James's version spent only two years and nine months over their task, while the work on the Revised Version took eleven years for the New Testament and fourteen for the Old Testament.

It is equally true that all the time which learned men have given to translating and elucidating the text seems nothing when it is compared with the time that mankind at large have spent in reading it. But

**The Bible as a Focus of Thought**  
the *Britannica* mentions a report of the great English Bible Society, the "British and Foreign," in which the copies circulated by it are totalled at more than 198 million, and, for the American Bible Society and its federated associations, it gives a total of more than 84 million copies (Vol. 3, p. 907). It has often been said that the English Bible is the only example of a translation that became more famous than the original, and it is as true that no other translation has been the source of so many secondary translations, for versions in

no less than 530 distinct languages and dialects have been derived from the English text. It is interesting to note, although in this case the English version has certainly nothing to do with the matter, that "in Italy, by a departure from the traditional policy of the Roman Church, the newly formed, 'Pious Society of St. Jerome for the Dissemination of the Holy Gospels' issued in 1901, from the Vatican press, a new Italian version of the Four Gospels and *Acts*," and sold 400,000 copies at 4 cents each.

As a sort of threshold-study, it will be well to consider three topics: Hebrew Literature, Hebrew Religion and Biblical History.

HEBREW LITERATURE (Vol. 13, p. 169), by Dr. Arthur Cowley, of the Bodleian Library, Oxford, points out

that the term "Hebrew Literature" is loosely used of "all works written in Hebrew characters, whether the language be Aramaic, Arabic, or even some vernacular not related to Hebrew;" and that "this literature begins with, as it is almost entirely based upon, the Old Testament." This article on Hebrew Literature may be supplemented by the following articles:

TARGUM, by John Frederick Stenning, lecturer in Aramaic at Oxford.

HALAKHA }  
QARAITES } by Israel Abrahams, reader in Talmudic and Rabbinic Literature, Cambridge.

TALMUD }  
MIDRASH } by Stanley Arthur Cook, lecturer in Hebrew and Syriac, Cambridge.

SEADIAH, by Dr. Arthur Cowley.

MAIMONIDES, by Herbert Loewe, curator of Oriental Literature, Cambridge.

Quite as important is the article HEBREW RELIGION (Vol. 13, p. 176), by the Rev. Dr. Owen Charles Whitehouse

### Hebrew Religion

of Christ's and Cheshunt Colleges, Cambridge. His treatment of the subject is comparative and historical. There is an interesting summary of what is known and may be inferred about pre-Mosaic religion; and it is important to notice that the author does not consider that the plural Elohim used in certain Old Testament passages to mean "God" is to be understood as "a comprehensive expression for the multitude of gods embraced in the One God of Old Testament religion," but explains the plural as one "of majesty" like the "we" of royalty. Blood-offerings and magic charms against demons and jinns may be assumed as belonging to the early Hebrew religion as to the later Arabian period before Mahomet. Dr. Whitehouse thinks that there is little or no trace of totemism but possibly some of ancestor-worship in the Jews' religion.

Among the many articles supplementing this general treatment of Hebrew religion the following are possibly the most important:

CIRCUMCISION, by Israel Abrahams.

TERAPHIM, by W. Robertson Smith and G. H. Box, formerly lecturer in theology, Oxford.

BAAL, by W. Robertson Smith and Stanley Arthur Cook, editor for Palestine Exploration Fund.

CALF, THE GOLDEN, by S. A. Cook.

HIGH PLACES.

FEASTS AND FESTIVALS.

PASSOVER, by Dr. Joseph Jacobs of the Jewish Theological Seminary of New York City.

PENTECOST, by Dr. O. C. Whitehouse.

ARK, by Stanley Arthur Cook.

TABERNACLE and TEMPLE, by Dr. Archibald R. S. Kennedy, professor of Hebrew and Semitic languages, Edinburgh.

EPHOD, by S. A. Cook.

URIM AND THUMMIM, by G. H. Box.

PROPHET, by W. Robertson Smith, Owen Charles Whitehouse, Adolf Harnack of Berlin, and Professor A. C. McGiffert of Union Theological Seminary, New York.

JEHOVAH, by George Foot Moore, professor of history of religion, Harvard.

MESSIAH, by W. Robertson Smith and O. C. Whitehouse.

ESCHATOLOGY, by Dr. A. E. Garvie, principal of New College, Hampstead.

ANGEL, by William Henry Bennett, professor of Old Testament Exegesis in New and Hackney Colleges, London.

The third topic is history and for this the student should read the article JEWS (Vol. 15, p. 371), especially the

### Biblical History

part on *Old Testament History*, by S. A. Cook; the article PALESTINE, *Physical Features*, by R. A. S. Macalister, director of excavations for the Palestine Exploration Fund, *Old Testament History*, by S. A. Cook, especially the treatment of Biblical Religion (pp. 610-611 of Vol. 20); CANAAN, by Dr. Thomas Kelly Cheyne, formerly Oriel professor of interpretation of Scripture, Oxford; HITTITES, by D. G. Hogarth, keeper of the Ashmolean Museum, Oxford.

But of course the central article for the Bible student is the article BIBLE (Vol. 3, p. 849), which is divided into two

main parts—*Old Testament* and *New Testament*, each of these being divided

in turn into five parts: Canon, Texts and Versions, Textual Criticism, Higher Criticism, and Chronology. This logical arrangement greatly enhances the value of the article, which is in itself an ex-

cellent summary of the subject written by the following authorities: Dr. Samuel Rolles Driver, professor of Hebrew, Oxford, on Old Testament canon and chronology; John Frederick Stenning, dean of Wadham College, Oxford, and lecturer in Aramaic, on Old Testament texts and versions; Dr. George Buchanan Gray, professor of Hebrew and Old Testament exegesis, Mansfield College, Oxford, on Old Testament textual and higher criticism; Dr. William Sanday, professor of Divinity and canon of Christ Church, Oxford, on New Testament canon; the Rev. Kirsopp Lake, author of *The Text of the New Testament*, etc., and professor of New Testament exegesis at Leiden, on New Testament texts and versions and textual criticism; Dr. Francis Crawford Burkitt, professor of divinity, Cambridge, and author of *The Gospel History and its Transmission*, etc., on New Testament higher criticism; and Cuthbert Hamilton Turner, of Magdalen College, Oxford, on New Testament chronology.

The article BIBLE, ENGLISH (Vol. 3, p. 894), by Anna C. Paues, author of *A Fourteenth Century Biblical Version*, and Canon Henson of Westminster Abbey (on the Revised Version) is accompanied by a plate with fac-similes of several early English Bibles and is besides of special value as giving quotations from different versions in Anglo-Saxon and later English. The article BIBLE SOCIETIES (Vol. 3, p. 905), by the Rev. Thomas Herbert Darlow, literary superintendent of the British and Foreign Bible Society, will also be of value to the student.

One other general article should be studied before the articles on different books of the Bible are taken up. This is—

INSPIRATION (Vol. 14, p. 645), by Dr.

**Inspiration** Alfred Ernest Garvie, author of *Studies in the Inner Life of Jesus*; it outlines the principal theories of inspiration—

(1) Mechanical dictation or verbal inspiration;

(2) Dynamic influence or degrees of inspiration;

(3) Essential inspiration, distinguishing matters of doctrine and conduct from the remaining contents of Scripture;

(4) Vital inspiration, emphasizing religious and moral life.

A course of study in the books of the Bible may well start with the outline in the article BIBLE, especially pages 851–854 for the Old Testament. For the

**The Hexateuch** Hexateuch the student should read first the brief article HEXATEUCH; then what there is under BIBLE on pp. 851–852 of Vol. 3; then under JEWS for the early period; and then the articles:

GENESIS, by S. A. Cook; and the subsidiary articles: COSMOGONY, EDEN, PARADISE, ADAM, EVE, ABEL, CAIN, ENOCH, LAMECH, NOAH, DELUGE, ARARAT, ARK, BABEL, CANAAN, GENEALOGY, NIMROD, HAM, SHEM, JAPHETH, ABRAHAM, BEERSHEBA, MELCHIZEDEK, ISAAC, MIDIAN, ABIMELECH, ISHMAEL, ESAU, JACOB, JACOB'S WELL, BETHEL, ISRAEL, SIMEON, SHECHEM, REUBEN, ISSACHAR, ZEBULUN, DAN, NAPHTALI, ASHER, GAD, MANASSEH, JOSEPH, BENJAMIN, LOT, MOAB, AMMONITES, GOSHEN, etc.

EXODUS, BOOK OF, by John Frederick Stenning, and EXODUS by S. A. Cook; and the articles MOSES, AARON, RAMESSES, PITHOM, AMALEKITES, JETHRO, PASSOVER, SINAI, HOREB, DECALOGUE, SABBATH, CALF (GOLDEN), TABERNACLE, ARK, URIM AND THUMMIM.

LEVITICUS, by J. F. Stenning and LEVITES, by S. A. Cook; and SACRIFICE, ATONEMENT AND DAY OF ATONEMENT, MOLOCH, PENTECOST.

NUMBERS, by Dr. James Alexander Paterson, professor of Hebrew, New College, Edinburgh; and the articles BALAAM, HEBRON.

DEUTERONOMY, by Dr. Paterson, and

the articles EZRA, NEHEMIAH, and JOSIAH.

JOSHUA, by S. A. Cook, and the articles AMALEKITES, GIBEONITES, HIVITES, PHILISTINES, GEZER, JUDAH, CALEB, SHECHEM.

JUDGES, BOOK OF, by S. A. Cook, and the articles, OTHNIEL, EHUD, DEBORAH, GIBEON, ABIMELECH, JEPHTHAH, SHIBBOLETH, SAMSON, EPHOD, TERAPHIM, MICAH (of Ephraim).

SAMUEL, BOOKS OF, and SAMUEL, by S. A. Cook; and the articles ELI, SHILOH, ARK, SAUL, JONATHAN, DAVID, GOLIATH, AHITHOPHEL, JASHAR, ABSALOM, JERAHMEEL, KENITES.

KINGS, BOOKS OF, by S. A. Cook; and the articles DAVID, ADONIJAH, SOLOMON, TEMPLE, JERUSALEM, ABIATHAR, JOAB, EPHRAIM, JEROBOAM, REHOBOAM, ASA, OMRI, AHAB, JEHOASHAPHAT, JEHORAM, ATHALIAH, AHAZIAH, ELIJAH, CARMEL, JORDAN, ELISHA, JEHU, RECHABITES, JOASH, AZARIAH, HOSEA, UZZIAH, AHAZ, ISALAH, HEZEKIAH, MANASSEH, JOSIAH, JEHOIACHIN, SAMARIA.

CHRONICLES, by W. Robertson Smith and S. A. Cook; and the articles ABSALOM, DAVID, UZZIAH, JUBILEES, MIDRASH, LEVITES and many mentioned above under SAMUEL and KINGS.

EZRA AND NEHEMIAH, BOOKS OF, by S. A. Cook; the article EZRA; and, as the books are to be grouped with CHRONICLES, that article and DEUTERONOMY, and the article SAMARITANS and those on the two "apocryphal" books, EZRA, THIRD BOOK OF, and EZRA, FOURTH BOOK OF, by Dr. Robert Henry Charles, lecturer in Biblical studies, Oxford. See also SYNAGOGUE.

For the prophetic books the article **The Prophets** PROPHEET as an introduction, and then:

ISALAH, by T. K. Cheyne; and, for outline, under BIBLE, Vol. 3, p. 853; and EMMANUEL (on chap. 7) and MESSIAH and ATONEMENT (on chap. 53).

JEREMIAH, by T. K. Cheyne; and the

articles BARUCH, ZEDEKIAH, NEBUCHADREZZAR, EDOM, AMMONITES, MOAB.

LAMENTATIONS, by the Rev. Charles James Ball, lecturer in ASSYRIOLOGY, Oxford, with peculiarly valuable information about poetical structure and acrostic verse, some suggested emendations of the text, and a summary of the arguments in regard to the authorship.

EZEKIEL, by Professor C. H. Toy of Harvard University; and the articles ZEDEKIAH, and, for certain literary forms, ALLEGORY and PARABLE.

The Minor Prophets: see Vol. 3, p. 853; Vol. 22, p. 443; Vol. 13, p. 183.

HOSEA, by W. Robertson Smith and the Rev. Henry Wheeler Robinson, professor of church history, Rawdon College, Leeds; articles BAAL, CALF (GOLDEN), etc.

JOEL, by W. Robertson Smith and T. K. Cheyne; and ESCHATOLOGY, etc. AMOS, by T. K. Cheyne; JEROBOAM, etc.

OBADIAH, by W. Robertson Smith and H. W. Robinson; and EDOM, ESCHATOLOGY, etc.

JONAH, by T. K. Cheyne; and the article NINEVEH, and, for an explanation of the "great fish," COSMOGONY.

MICAH, by W. Robertson Smith and H. W. Robinson; and SAMARIA, HIGH PLACE, MESSIAH, ESCHATOLOGY.

NAHUM, by G. H. Box; NINEVEH, etc. HABAKKUK, by H. W. Robinson; CHALDAEAN, etc.

ZEPHANIAH, by S. A. Cook; and BAAL, MOLOCH, COSTUME, *Oriental* (Vol. 7, p. 226 sq., for chap. 1, v. 8), etc.

HAGGAI, by W. Robertson Smith and Dr. A. J. Grieve, professor at the United Independent College, Bradford; and the article TEMPLE.

ZECHARIAH, by Julius Wellhausen, professor at Göttingen, and H. W. Robinson; and the articles ANGEL, TEMPLE, MESSIAH, ZION, JAPHETH and IONIANS (for "Javan" of chap. 9, v. 13).



**MALACHI**, by W. Robertson Smith and H. W. Robinson.

**PSALMS** is by W. Robertson Smith and Dr. Robert Hatch Kennett, Canon of Ely and professor of Hebrew, Cambridge; read the articles **HALLEL**, **DAVID**, **SOLOMON**, **TEMPLE**, **LEVITES** (for Levitical Psalms), **ASAPH**, **CHRONICLES**, **EZRA**, **PSALTERY**, **LITURGY**, the section of Hebrew Hymnody in, and the whole article **HYMNS**; **BIBLE**, **ENGLISH**, for the version of the Psalms in the English Prayer Book from the Great Bible; and, for Psalms 9, 10, 25, 34, 37, 111, 112, 119 and 145, and the article **ACROSTIC**. See also R. H. Charles's article on the apocryphal book, **SOLOMON**, **PSALMS OF**.

The student should read the article **WISDOM LITERATURE**, by Prof. C. H. Toy of Harvard as an introduction to **PROVERBS**, **JOB** and **ECCLESIASTES** (and to the apocryphal **WISDOM**, **BOOK OF**—see article by Professor Toy; **ECCLESIASTICUS**,—see article by William Emery Barnes, Hulsean professor of Divinity, Cambridge; **TOBIT**,—see article by St. George Stock, lecturer University of Birmingham; and 4th **MACCABEES**—see the article **MACCABEES**, by Dr. William Fairweather, editor of *Maccabees* in the "Cambridge Bible for Schools.")

**PROVERBS**, **BOOK OF**, by C. H. Toy; and the articles **SOLOMON**, **PROVERB** and, for other famous collections, **PUBLILIUS**, **ERASMUS**, etc.

**JOB**, by Dr. Andrew B. Davidson, late professor of Oriental languages, New College, Edinburgh, and author of a Commentary on Job, and Prof. C. H. Toy; and the articles **DEVIL** (for the meaning of "Satan" in chap. 1, v. 6); **SABAEANS**, **UZ**, **BEHEMOTH**, etc.

**ECCLESIASTES**, by Professor Toy; the articles **PESSIMISM**, **ESCHATOLOGY**, **SADUCEES**.

**CANTICLES**, by W. Robertson Smith and H. W. Robinson.

**ESTHER**, by T. K. Cheyne and, on the "additions," Dr.

**Other Old Testament Books** Robert Henry Charles, Grinfield lecturer, Oxford; and the articles **AHASUERUS**, **SUSA**, **COSMOGONY**, **PURIM**.

**RUTH**, by W. Robertson Smith and S. A. Cook; and the articles **BETHLEHEM**, **CALEB**, and, for the marriage custom underlying the story, the article on **LEVIRATE**.

**DANIEL**, by John Dyneley Prince, professor of Semitic languages, Columbia University, and, for the "additions," **Susannah**, **Bel** and the **Dragon**, and **The Song of the Three Children**, the Rev. Dr. Robert Henry Charles; the article **SEMITIC LANGUAGES** for the Aramaic of chapters 2 (from verse 4) to 7; **ANGELS**, **GABRIEL**, **MICHAEL**; **CHALDAEAN** and **CHALDEE**; **BELSHAZZAR**; **APOCALYPTIC LITERATURE** (for chapters 7-12).

Before passing to the New Testament the student should read the article **APOCRYPHAL LITERATURE**, by Robert Henry

**Apocrypha** Charles; and the articles on the separate books: **EZRA**, **THIRD BOOK OF** (1 Esdras) and **EZRA**, **FOURTH BOOK** (or **APOCALYPSE**), both by Robert Henry Charles; **JUDITH**, by the same scholar; **ECCLESIASTICUS**, by Dr. W. E. Barnes; **BARUCH**, by R. H. Charles; **TOBIT**, by St. George Stock; **JEREMY**, **EPISTLE OF**, by R. H. Charles; **MACCABEES**, **BOOKS OF**, and **MACCABEES**, by the Rev. Dr. William Fairweather; **MANASSES**, **PRAYER OF**, by R. H. Charles, and **MANASSEH**; and **WISDOM**, **BOOK OF**, by C. H. Toy.

The general articles preliminary to a study of the New Testament are:—besides the part of the article **BIBLE** dealing with New Testament, Canon, Criticism, Text, Chronology, etc.—the following:

**MESSIAH**, by W. Robertson Smith and Dr. Owen Charles Whitehouse, lecturer

in Hebrew, Cheshunt College, Cambridge.

**JESUS CHRIST**, by the Very Rev. Dr. Joseph Armitage Robinson, dean of Westminster, constituting a critical outline of the gospel story.

**CHRISTIANITY**, by Dr. George William Knox, late professor of philosophy and history of religion, Union Theological Seminary, New York City.

In outlining a course of study on the New Testament, the order of the books as printed in English Bibles will not be followed absolutely. Here, as in studying the Old Testament, a rearrangement may be worth while for topical study.

But first the student should read the article **GOSPEL**, by the Rev. Dr. Vincent Henry Stanton, professor of divinity,

**The Gospels** Cambridge, and author of *The Gospels as Historical Documents*, etc.; and the article by Dr. Kirsopp Lake on **TATIAN** the compiler of the Diatessaron or "Gospel of the Four Gospels."

For the gospel story the student should read the following separate articles:

**JOHN THE BAPTIST**, **HEROD ANTIPAS**, **SALOME**, **JOSEPH** (Vol. 15, p. 513, col. 2), **MARY**, **IMMACULATE CONCEPTION**, **BETHLEHEM**, **NAZARETH**, **NAZARENES**, **EBIONITES**, **GALILEE**, **CAPERNAUM**, **CANA**, **JORDAN**, **PETER**, **ANDREW**, **JAMES**, **JOHN**, **PHILIP**, **BARTHOLOMEW**, **THOMAS**, **MATTHEW**, **JUDAS**, **DEMONOLOGY**, **POSSESSION**, **EXORCISM**, **MIRACLE**, **MARY MAGDALENE**, **NATHANAEL**, **PHARISEES**, **SADDUCEES**, **SABBATH**, **PASSOVER**, **EUCHARIST**, **PARABLE**, **CAESAREA PHILIPPI**, **JUDAEA**, **JERUSALEM**, **BETHANY**, **OLIVES**, **MOUNT OF GETHSEMANE**, **PILATE**, **CALVARY**, **JOSEPH OF ARIMATHAEA**.

In studying the separate Gospels, let the reader follow the order suggested in the articles **GOSPEL** and **JESUS CHRIST**.

First he should study the article **MARK**, **GOSPEL OF**, by Dr. Stanton; the article on **ST. MARK**, by Dr. James Vernon Bartlett, professor of Church History,

Mansfield College, Oxford, and, for a summary of the points in the Marcan or Galilean narrative as contrasted with the Jerusalem narrative in regard to the betrayal of Jesus and the period immediately following, the article on **ST. PETER** by Dr. Kirsopp Lake.

**MATTHEW**, **GOSPEL OF ST.**, by Dr. Vincent H. Stanton, and **MATTHEW**, by Dr. J. V. Bartlett; with particular attention to the paragraph on additions to Mark's narrative in Vol. 15, p. 355; and to the stress on the Messianic character, the mention of the church and of St. Peter as the Rock in chapter 16.

**LUKE**, **GOSPEL OF ST.**, by Dr. Stanton, and the biographical sketch of **LUKE**, by Dr. Bartlett; and the paragraph on Luke's additions to Mark's narrative in Vol. 15, p. 356. This is the universal gospel, just as Mark's was for extra-Palestinian use and Matthew's particularly for the Jew, as is shown by the incidents of Zaccheus and of the Samaritan leper; and Renan's characterization of the gospel of the one evangelist who was not a Jew, "the most beautiful book in the world," is quoted twice in the Britannica.

**JOHN**, **GOSPEL OF ST.**, and **JOHN** (the Apostle), both by Baron Friedrich von Hügel, author of *The Mystical Element of Religion*: the paragraph on the distinctive elements of John's gospel (in Vol. 15, p. 357), such as the story of John the Baptist (see the article on this "forerunner," by G. H. Box, late lecturer in theology, Oxford); the philosophical prologue (see the article **LOGOS**, by the late Rev. Dr. Stewart Dingwall Fordyce Salmon, professor of systematic theology, United Free Church College, Aberdeen, and the Rev. A. J. Grieve, professor of New Testament and church history, Yorkshire United Independent College, Bradford); the Judean scene as contrasted with the predominance of Galilee and Samaria in the other three (synoptic) gospels, and the prominence given to great abstract ideas and symbols—the Light of the

World, the Living Bread, the Only-Begotten, the Re-Birth, Eternal Life, the Way, the Truth, and the Life, Water and Wine, the Paraclete, and the refrain and variations on the theme of Love.

Before studying the articles dealing with the book of ACTS, let the reader consult Dr. Garvie's article MIRACLE, for a study of the supernatural and particularly for a development of the argument for miracles from "the congruity of the miracle with divine truth and grace"; the miracles of Jesus, and of the apostles, consist in "the relief of need, the removal of suffering, the recovery of health and strength."

The article ACTS OF THE APOSTLES, by Dr. J. Vernon Bartlett, should be supplemented by referring again to the article LUKE, and the student

**Acts** should call to mind that the probable author was not a Jew, was a personal friend and traveling companion of both Paul and Peter, and was a physician, a trained scientific observer, as can be seen not only from his descriptions of disease, but from his accuracy in geographical, meteorological and other matters. The importance of the testimony of the physician to the miracles of the apostles is brought out (p. 164, top of column 2) in the article on the book. For the study of ACTS, besides the article on the book, read the following separate articles:

LUKE, PETER, JOHN, JUDAS, ACELDAMA, MATTHIAS, PENTECOST, TONGUES, GIFT OF; ANANIAS, GAMALIEL, STEPHEN, SIMON MAGUS, PHILIP, PAUL, JOPPA, ANTIOCH, HEROD, BARNABAS, ICONIUM, LYCAONIA, MARK, TIMOTHY, SILAS, PHILIPPI, THESSALONICA, ATHENS, AREOPAGUS, CORINTH, AQUILA, APOLLOS, EPHESUS, FELIX, ANANIAS, AGRIPPA.

For a study of the book of Acts, which was probably written before any one of the Gospels, one will need constantly to refer in the *Britannica* to the article on PAUL, THE APOSTLE

(Vol. 20, p. 938), by Dr. J. Vernon Bartlett. This article, equivalent to 55 pages in this Guide, is so important that it will be well to outline it here. After an introduction, in which Paul's attitude toward Jewish legalism is made an explanation of the superficially obvious contrast between Jesus and Paul, there is a biographical sketch: Paul of Tarsus, a Roman citizen with Roman name, talking Latin and not a narrow, one-sided Jew; his Jewish training; in Jerusalem, under Gamaliel (see the article GAMALIEL); first impressions as to Jesus, and Saul as persecutor; the vision at Damascus and its spiritual content; his new theory of the law and its universal value; Christology of Paul,—his deep insight into Jesus's character; Paul's theology rooted in experience; his early apostolate; his first missionary journey; the issue of Gentile Christianity raised; Paul's conciliatory spirit; Peter's visit to Antioch; Paul's protest; the second mission tour; Paul in Europe—Athens, Corinth, etc.; first missionary letters; as an ethical teacher; Paul, the Law, the Spirit; later travels; later letters; Paulinism—its Christocentric character; apparent contrasts and contradictions between Paul's gospel and Jesus's gospel—one seen through the eyes of a conscious sinner, the other the sinless consciousness of the Saviour; Paul's position between Judaeo-Christianity and Gnosticism—see also the article GNOSTICISM, by Wilhelm Bousset, professor of New Testament exegesis, Göttingen.

In general on the Pauline epistles the student should not only read this article PAUL, but should turn again to the treatment of New Testament canon in the article BIBLE (Vol. 3, pp. 872-873), and

### The Pauline Epistles

should look over the first part of the article JESUS CHRIST which finds in 1st Thessalonians the earliest extant document of Christianity. Then let him read the articles:

**THESSALONIANS, EPISTLES TO THE**, by the Rev. James Everett Frame, professor of Biblical theology, Union Theological Seminary, New York City. See also in the article **PAUL** (Vol. 20, pp. 945-946) for Paul at Thessalonica, and the articles **ESCHATOLOGY** and **APOCALYPTIC LITERATURE** for the doctrine of the "second coming" or "Parousia," especially in 2 Thess., chap. 2.

**CORINTHIANS, EPISTLES TO THE**, by the Rev. Dr. James Hardy Ropes, professor of New Testament criticism and interpretation, Harvard; and the articles **CORINTH**, **APOLLOS**, **PETER**, **ASCETICISM**, **FASTING**, **EUCHARIST** (1 Cor., chap. 11, vs. 23 sqq. is the oldest extant account of the Lord's Supper), **TITUS**.

**GALATIANS, EPISTLE TO THE**, by the Rev. Dr. James Moffatt, author of *The Historical New Testament*; and the articles **GALATIA** (for the "South Galatian" theory), **ANTINOMIANISM** (for Christianity vs. legalism).

**ROMANS, EPISTLE TO THE**, by Dr. Moffatt; and the article **HEBREW RELIGION** for the covenant which Paul here presents as one of faith and not of the law.

**EPHESIANS, EPISTLE TO THE**, by Prof. J. H. Ropes, pointing out that the theme is "the unity of mankind in Christ and hence the unity and divinity of the Church of Christ"; the article **EPHESUS**; the articles on **COLOSSIANS** and on 1st **PETER** for textual criticism; the article **MARRIAGE** for Paul's influence (Eph. ch. 5, v. 23-32) on the Church's attitude toward marriage; and the article **GNOSTICISM** for the tendency in the church which Paul attacked in this epistle and in **Colossians**.

**COLOSSIANS**, by Prof. J. E. Frame; the article **COLOSSAE**; **ANGEL** (on chap. 2, v. 18); **ASCETICISM** (on chap. 2, v. 16).

**PHILEMON, EPISTLE TO**, by Dr. Moffatt; the article **SLAVERY**, *Rome* (Vol. 25, p. 218) for the status of a runaway like Onesimus.

**PHILIPPIANS, EPISTLE TO THE**, by Dr.

Moffatt; the article **PHILIPPI**; **ANTINOMIANISM** (on the beginning of chap. 3); and on the **Kenosis** or emptying of self of Christ in Phil. 2, 7, see the article on **CHARLES GORE** (Vol. 2, p. 255), and in the article **THEOLOGY** the discussion in column 1 of p. 781 (Vol. 26).

**TIMOTHY, FIRST EPISTLE TO**; and **TIMOTHY, SECOND EPISTLE TO**, by Dr. Moffatt; the article **TIMOTHY**; the articles **MARRIAGE** and **CELIBACY** (on 1 Tim. 4, 3); **FASTING**, the article **GNOSTICISM** (for the "knowledge falsely so-called" of 1 Tim. 6, 20), and the article **PASTORAL EPISTLES** on these letters and on that to **Titus**. The article **TITUS** has much important criticism on Timothy.

**TITUS, THE EPISTLE TO**, by Dr. Moffatt; the articles **BISHOP** and **PRESBYTER**, etc.

**HEBREWS, EPISTLE TO THE**, by Dr. J. Vernon Bartlett; and, on authorship, the articles **PAUL**, **BARNABAS**, **APOLLOS**, **LUKE**, **CLEMENT**, **STEPHEN**; and the articles **CLEMENTINE LITERATURE**, **HEBREW RELIGION**, **TEMPLE**, **ATONEMENT** and **DAY OF ATONEMENT**, **ANGEL**, **MOSES**, **PRIEST**, **AARON**, **MELCHIZEDEK**, **SACRIFICE**, **MESSIAH**.

Before turning to the articles on the other books of the New Testament, let the student read a part of the article

**The Other Epistles** **THEOLOGY**, by the Rev. Dr. Robert Mackintosh of the

Lancashire Independent College, Manchester, with special attention to the paragraphs (end of p. 773 and p. 774, Vol. 26) on Jewish theology, St. Paul and contents of the New Testament. Here "Paulinism" is shown not merely in the Pauline writings but in the Acts, in 1st Peter ("good independent Paulinism"), and even in the Apocalypse, at least as regards the atonement and Christology. "The Johannine Gospel and Epistles are later than Paulinism, and presuppose its leading or less startling positions." And the same article (p. 783) after pointing out that Luther



and the evangelical revival "went back to St. Paul" asks "can Christianity not dig deeper by going back to Jesus?" The writer also suggests that the German school of Ritschl in "not idolizing Paulinism" have "idolized Luther."

The other principal topics to be studied are:

**JAMES, EPISTLE OF**, by the Rev. Dr. Benjamin Wisner Bacon, professor of New Testament criticism and exegesis, Yale; the article on **JAMES** by the Rev. Dr. George Milligan, Professor of divinity and Biblical criticism, Glasgow; and the articles **REVELATION**, **CLEMENT**, **HERMAS**, etc., for the question of date and relation with other writings; **WISDOM LITERATURE**, for earlier writings on the "Wisdom" and proverbial expressions of chapter 3; **MATTHEW**, for a similar view of the gospel and the Church; and on "Justification," vol. 20, p. 954, in article **PAUL**.

**PETER, EPISTLES OF**, by Dr. Kirsopp Lake; the article on **ST. PETER**, by the same scholar. For a date earlier than that of the Epistle of James, see the article on that book. See also **ROMANS** and **POLYCARP** to supplement what is here said of the relations of 1st Peter to these writings; and **ESCHATOLOGY** on the expected "second coming" of 2nd Peter, chapter 3, vs. 1-13, and **JUDE, EPISTLE OF**, on its relation to this book.

**JUDE, EPISTLE OF**, by Prof. B. W. Bacon of Yale; the article on **HEGESIPUS**, the authority for the little we know of Jude; the articles **ESCHATOLOGY** (for "the last time" of verse 18), **ANGEL** (for vs. 6, 9), **MICHAEL**, and especially the articles **APOCRYPHAL LITERATURE**; **MOSES, ASSUMPTION OF**; and **ENOCH, BOOK OF**, for the allusions in verses 9 and 14.

Under the head of **Johannine** are grouped, besides the fourth gospel, the three epistles of John and the Revelation. On these see:

**JOHN, THE EPISTLES OF**, by Dr.

Moffatt, and the article on **St. John** in regard to authorship, which may more probably be assigned to John the presbyter; and the articles **ANTICHRIST** (on 1 John, 2, 22), **GNOSTICISM** (for chap. 3, vs. 4-7), etc.

**REVELATION, BOOK OF**, by the Rev. Dr. Robert Henry Charles, lecturer in Biblical studies, Oxford. This book, and this article, should be studied in connection with the article, also by Dr. Charles, on **APOCALYPTIC LITERATURE**, and the canonical apocalyptic passages in Mark 13, Mathew 24, Luke 21 and 2nd Thessalonians 2, as well as the extra-canonical apocalypses described in **APOCALYPTIC LITERATURE** and in the separate articles **ISALAH, ASCENSION OF**, and **HERMAS, SHEPHERD OF**. Besides see the articles **ESCHATOLOGY, MILLENIUM**. The student should read the article **NERO**, even if "666" does not certainly refer to him, and the articles **DOMITIAN** and **VESPASIAN** on the possibility that one of them may have been "the beast that was and is not, . . . himself also an eighth" (see footnote on p. 220, Vol. 23).

As an epilogue the student should read the articles **APOCRYPHAL LITERATURE**, both of the Old and New Testament periods, by Dr. Charles and at least the first part, by Dr. A. C. McGiffert of Union Theological Seminary, New York City, of the article **CHURCH HISTORY**.

The study outline sketched in this chapter will give the student some idea of the possibilities of the Britannica in helping him. The list of articles dealing with the Bible on pp. 944-945 of the Index (Vol. 29) will show that in the Britannica there is an adequate and excellent encyclopaedia of the Bible or text-book of Bible Study.

### Johannine Writings

### Apochryphal Literature

### A Biblical Encyclopaedia



## CHAPTER XLII

### HISTORY, INTRODUCTORY AND GENERAL

**W**HEN you turn to the new Britannica to study history, you naturally expect to learn a great deal that will be new to you. But you can anticipate something more and better than that. You will find a great deal that is new to *everyone*, even to those who have been reading history for years. For the contributors to the work, in making a completely fresh survey of the whole field of human knowledge, were helping one another to obtain new light upon the history of even the earliest periods. As all the articles were completed before a single volume was printed, there was such an opportunity for comparison and revision as has never before existed. When research upon one subject had disclosed new evidence that was of value in relation to another subject, the contributors and editors could co-operate as fully as if they had all been assembled in a great international congress. And the result of this collaboration is that the publication of the new Britannica does more, at one stroke, to advance historical knowledge, to solve historical doubts, and to correct historical mistakes than is done by isolated historians in the course of a generation.

With this idea of *combined* effort clearly before you, consider for a moment the accumulated *individual* authority of such individual

**Authority** specialists as those who deal with history in the Britannica. There are, to name only a few, the Germans Eduard Meyer and Schieman of Berlin, Hashagen of Bonn, von

Pastor of Innsbruck, Pauli of Göttingen, Keutgen of Hamburg, and Count Lüt-zow; Frenchmen like Mgr. Duchesne, Luchaire, Valois, Anchel, Halphen, Babelon and Bémont; the Italians Villari, Barnabei and Balzani; the Canadians Doughty, Grant, Dionne and Wrong; among Americans, J. H. Robinson, W. A. Dunning, H. L. Osgood, C. H. Hayes, G. W. Botsford, and J. T. Shotwell of Columbia; President Emeritus Charles W. Eliot, and Drs. Edward Channing, F. J. Turner and Charles Gross of Harvard; Drs. A. D. Morse, R. B. Richardson and Preserved Smith of Amherst; Dr. T. F. Collier of Williams; Professors William Graham Sumner, G. Burton Adams and J. C. Schwab of Yale; Prof. Grant Showerman of Wisconsin; Prof. William MacDonald of Brown; Profs. Fleming and Scroggs of Louisiana; Dr. McMaster of Pennsylvania; Prof. I. J. Cox of Cincinnati; the late Alexander Johnston of Princeton; Prof. W. Roy Smith of Bryn Mawr; Henry Cabot Lodge, Carl Schurz and James Ford Rhodes; and—to mention only a few English names—S. R. Gardiner, Edward Freeman, Thomas Hodgkin, James Bryce, James Gairdner, J. D. Bury, C. W. C. Oman, A. F. Pollard, J. H. Round, H. W. C. Davis, Osmond Airy, G. W. Prothero, John Morley, Reginald Lane Poole, J. Holland Rose, F. J. Haverfield, W. Alison Phillips, Sir Donald Mackenzie Wallace, R. Nisbet Bain, W. Warde Fowler, J. L. Myres, J. S. Reid, W. J. Brodrigg and H. F. Pelham.

So much for the quality of the his-

torical matter in the Britannica. The quantity is equally remarkable.

*If the history in the Britannica was printed in the usual volumes on heavy paper, containing 100,000 words to a volume, it would fill about 70 such volumes, or, say, four good-sized shelves in an ordinary "unit" book-case.*

Every country and every event from the earliest syllable of recorded time receives its proper treatment. Under such

#### Method of Treatment

circumstances it is obvious that in the limits of this Guide it would not be possible to give outlines of courses of historical readings for all nations and periods. Such readings in history alone would more than fill this whole Guide. But the information is all in the Britannica, and what has been said above will give the reader some notion of the authority of the articles written by natives of nearly every civilized country in the world, and some idea of the scope of treatment. The character of the subject matter of history and the method of treatment in the Britannica combine to make minute outlines less necessary for historical study than for the pursuit of a course in almost any other subject. The Britannica, the student will quickly see, contains in each instance a "key" article on the history of each nation—either as a separate article, like ENGLISH HISTORY or ROMAN HISTORY or as a historical section of the article on the country—for instance, in the article GREECE there is a "sub-article," so to say, on history (Vol. 12, pp. 440-470), and in the article UNITED STATES a sub-article on American history (Vol. 27, pp. 663-735). The student of any country's history should read *first* such an article or sub-article, so that he will

get a big outline view of the subject, and then use it as a basis or starting point for further reading, looking up in the Index volume the important topics mentioned in the main article. These will be:

(1) Articles on the history of parts of the country he is studying—states, provinces, counties, kingdoms, duchies, cities and towns.

(2) Biographies of rulers, statesmen, soldiers, reformers, etc.

(3) Articles on wars and battles, each under its proper heading.

(4) Articles on movements and changes, sometimes of national, sometimes of international importance, the Renaissance, political parties, economic, political and religious revolutions, the Crusades, etc.

(5) Articles on churches, sects and denominations of historical importance in the country under consideration.

But although it is impossible to give in this Guide complete courses of reading for the history of all countries, it is possible and desirable to give it in cases where it would be most useful to the greatest number of readers.

The following chapter is an outline course of study in the *History of the United States*, which is given in some detail, because it has a peculiar interest to Americans.

Next is given an outline of a course of reading in Canadian and then in English History, then in French History, and then in the History of the countries of the Far East, India, China and Japan. These will show the reader how fully and authoritatively the history of countries, whether near or distant, is given in the Britannica; and if he wishes to pursue his studies into the record of other countries, it is certain that with these for an example, and with the aid of the Index, he will have no trouble in so doing.

## CHAPTER XLIII

### AMERICAN HISTORY

**T**HE plan adopted in most of the chapters of this Guide is to give a separate account of each of the more important articles on the subject to which the chapter is devoted. But in the case of American history, the articles are so numerous, and are so accurately dovetailed to make a continuous story, that the reader's convenience has been better served by reversing this process, and grouping the articles under the periods with which they deal. The reader is thus enabled to turn at once to any one of the outstanding episodes of the story, and to find explicit references to those parts of the Britannica in which the narrative is continued from one article to another. The summary has been put in the form of a table, in order that its contents may more easily be surveyed. There is a much fuller summary, in narrative form, in the Britannica itself in the historical portion of the article UNITED STATES (Vol. 27, pp. 663-735). This is the most complete condensed history of the country that has ever been written. It is not quite so long as this entire Guide; but from each of its 412 sections the reader can turn to articles describing in detail the events consecutively outlined.

It has been taken for granted that the reader will recognize the natural connection between this and other chapters of the Guide. For example, no attempt has been made in this chapter to indicate the articles, elsewhere described, which discuss the history of American industries

and commerce, railroads and shipping, finance and economics, art and literature. Again, the particular history of a city, town, or river may be of the greatest interest in itself, although the events with which its name is associated were not so typical of any period as to give the article a place in the present chapter. Similarly, the numerous and elaborate American biographies are represented, in this chapter, only by the names of the foremost statesmen and soldiers of the periods included in the table. In short, the articles named are so few, in proportion to all those which directly relate to American history, that the general effect is to make the space which the Britannica devotes to the subject seem less than it really is. But it is not the purpose of this Guide to impress upon the reader the magnitude of the volumes he is using. In that respect the Britannica speaks for itself. The table instances a few of the main topics of American history, in order to show the reader how he may plan fuller courses of reading by combining other articles on the principle indicated by these illustrations.

The left hand columns present a brief outline of the main periods and aspects of American history. The right hand columns give the titles of the articles to be read, the page numbers as well as the volume numbers (so that when the reference is to only one section of a long article the reader can find it at once) and the names of the contributors.

*Topics for Reading**The Aborigines.*

Where did they come from, and when? Their food, tools, clothing and customs. How they carried on their wars. Their practical knowledge and religion. What the white man has learned from the Indians. Over 1000 languages and dialects in America.

Evidence of Asiatic origin. A state of culture in Mexico and Peru, "which in some respects must have put the Spaniards to shame."

The fascinating story of the Aztecs. Did the Asiatic peoples make voyages to America long before Columbus?

The splendid past of Central America. What was accomplished during the 500 years of Mayan culture. An interesting calendar.

*First Voyages of Discovery.*

The Northmen first Europeans to reach American continent, about 1000 A.D. The story of the Icelandic sagas. Was Vinland Nova Scotia?

The accident of Leif's discovery of the American continent.

The first colonizer (A.D. 1002). Fate of the colony. The hostile Skraelings.

*Columbus and His Successors.*

Treaty of Tordesillas (1494).

Columbus thinks he discovers Asia. His voyages and colonies (1492-1504).

Discovery of the Mainland (1497).

How the New World received its name. The beginning of free-lance expeditions. The mystery of the voyage of 1497.

*Articles*

AMERICA, *Ethnology and Archaeology* (Vol. 1, p. 810, fully illustrated), by Otis Tufton Mason, late curator, Department of Anthropology, National Museum, Washington; author of *Primitive Travel and Transportation*, etc.

INDIANS, NORTH AMERICAN (Vol. 14, p. 452), by Dr. A. F. Chamberlain, professor of anthropology, Clark University.

ARCHAEOLOGY (Vol. 2, p. 849), by Dr. Charles H. Read, keeper of British and Medieval Antiquities and Ethnography, British Museum.

MEXICO, *Ancient History and Civilization* (Vol. 18, p. 829), by Dr. E. B. Tylor, professor of anthropology at Oxford; author of *Methods and Results in Mexican Research*.

CENTRAL AMERICA, *Archaeology of* (Vol. 5, p. 677), by Dr. Walter Lehmann, Royal Ethnographical Museum, Munich.

VINLAND (Vol. 28, p. 98), by Julius E. Olson, professor of Scandinavian languages, University of Wisconsin, editor of *Voyages of the Northmen*, etc.

LEIF ERICSSON (Vol. 16, p. 896), by Dr. C. R. Beazley, professor of modern history in the University of Birmingham, author of *The Dawn of Modern Geography*.

THORFINN KARLSEFNI (Vol. 26, p. 878), by Dr. C. R. Beazley, author of *The Dawn of Modern Geography*, etc.

AMERICA, *General Historical Sketch* (Vol. 1, p. 806), by David Hannay, author of *A Short History of the Royal Navy*.

COLUMBUS, CHRISTOPHER (Vol. 6, p. 741), by Dr. C. R. Beazley, author of *The Dawn of Modern Geography*, etc.

CABOT, JOHN (Vol. 4, p. 921), by Henry P. Biggar, author of *The Voyage of the Cabots to Greenland*.

VESPUCCI, AMERIGO (Vol. 27, p. 1058), by Dr. C. R. Beazley, author of *The Dawn of Modern Geography*, etc.

- The Discovery of the Pacific (1513).
- The existence of a new continent distinct from Asia revealed to the world. First circumnavigation of the globe. The Pacific Ocean named (1520).
- The Conquest of Mexico (1519-1521). "The Descendant of the Sun." Discovery of Lower California. Ingratitude of Charles V.
- Exploration of Guatemala and Yucatan (1528), and the Mississippi (1541).
- France attacks Spain in the New World.
- Discovery of the St. Lawrence (1534). How Canada got its name. Early Canadian History.
- Foundation of Quebec (1608). Discovery of Lake Champlain (1609). Champlain assists Algonquins and Hurons against the Iroquois. The beginning of the murderous conflicts between the French and the Iroquois.
- The Fortunes of New France. Colonial Expansion. Horrors of Indian Warfare.
- Louisiana in possession of France (1682). Discovery of the Ohio River.
- The first English colony (1588) unsuccessful.
- The persistent efforts of Raleigh (1584-1587). First English child born in America (Aug. 15, 1587).
- The first permanent English settlement (1607).
- Colonial Expansion and Development of Imperial Control.*
- The Thirteen Original Colonies, their Founders and Leaders, and their early Struggles.
- BALBOA, VASCO NUÑEZ DE (Vol. 3, p. 241).
- MAGELLAN, FERDINAND (Vol. 17, p. 802), by Dr. C. R. Beazley, author of *The Dawn of Modern Geography*, etc.
- PACIFIC OCEAN, *History* (Vol. 20, p. 488).
- CORTES, HERNAN (Vol. 7, p. 205).
- CALIFORNIA, LOWER (Vol. 5, p. 21).
- SOTO, FERDINANDO DE (Vol. 25, p. 485).
- LAS CASAS, BARTOLOMÉ DE (Vol. 16, p. 282).
- CARTIER, JACQUES (Vol. 5, p. 488), by H. P. Biggar, author of *The Voyage of the Cabots to Greenland*.
- CANADA, *History* (Vol. 5, p. 156), by Dr. George McKinnon Wrong, University of Toronto.
- CHAMPLAIN, SAMUEL DE (Vol. 5, p. 880), by Prof. Narcisse E. Dionne, Librarian of the Legislature of the Province of Quebec, author of *Life of Samuel de Champlain, Founder of Quebec*, etc.
- FRONTENAC (Vol. 11, p. 249), by Dr. Arthur G. Doughty, Dominion archivist of Canada, author of *The Cradle of New France*, etc.
- LA SALLE, RENÉ ROBERT, SIEUR DE (Vol. 16, p. 280), by Charles C. Whinery, assistant editor, *Encyclopaedia Britannica*.
- NEWFOUNDLAND, *History* (Vol. 19, p. 482), by Beckles Willson, author of *The Romance of Canada*, etc.
- NORTH CAROLINA, *History* (Vol. 19, p. 775).
- RALEIGH, SIR WALTER (Vol. 22, p. 869), by David Hannay, author of *Short History of the Royal Navy*.
- VIRGINIA, *History* (Vol. 28, p. 122).
- JAMESTOWN (Vol. 15, p. 148).
- UNITED STATES, *History* (Vol. 27, p. 668), by Dr. Herbert L. Osgood, professor of history, Columbia University, author of *The American Colonies in the 17th Century*, etc.



- Virginia. VIRGINIA (Vol. 28, p. 122).  
 JAMESTOWN (Vol. 15, p. 148).  
 SMITH, JOHN (Vol. 25, p. 264).  
 GOSNOLD, BARTHOLOMEW (Vol. 12, p. 265).  
 BERKELEY, SIR WILLIAM (Vol. 3, p. 781).  
 BLAIR, JAMES (Vol. 4, p. 84).  
 SPOTSWOOD, ALEXANDER (Vol. 25, p. 785).
- North Carolina. NORTH CAROLINA (Vol. 19, p. 775).
- South Carolina. SOUTH CAROLINA (Vol. 25, p. 508).
- New England. NEW ENGLAND (Vol. 19, p. 476).
- Massachusetts. MASSACHUSETTS (Vol. 17, p. 858).  
 PLYMOUTH, MASS. (Vol. 21, p. 863).  
 BRADFORD, WILLIAM (Vol. 4, p. 370).  
 STANDISH, MILES (Vol. 25, p. 772).  
 ALDEN, JOHN (Vol. 1, p. 533).  
 WINSLOW, EDWARD (Vol. 28, p. 733).  
 ENDECOTT, JOHN (Vol. 9, p. 382).  
 SALEM (Vol. 24, p. 62).  
 WINTHROP, JOHN (Vol. 28, p. 736).  
 BOSTON, MASS. (Vol. 4, p. 290).  
 IPSWICH, MASS. (Vol. 14, p. 739).  
 VANE, SIR HENRY (Vol. 27, p. 892).  
 HUTCHINSON, ANNE (Vol. 14, p. 12).
- Maine (a part of Massachusetts). MAINE (Vol. 17, p. 489).  
 POPHAM, SIR JOHN (Vol. 22, p. 88).  
 GORGES, SIR FERDINANDO (Vol. 12, p. 256).  
 PORTLAND, ME. (Vol. 22, p. 120).
- Rhode Island. RHODE ISLAND (Vol. 23, p. 251).  
 WILLIAMS, ROGER (Vol. 28, p. 682).  
 PROVIDENCE (Vol. 22, p. 512).
- New Hampshire. NEW HAMPSHIRE (Vol. 19, p. 496).  
 PORTSMOUTH, N. H. (Vol. 22, p. 132).
- Connecticut. CONNECTICUT (Vol. 6, p. 954).  
 HOOKER, THOMAS (Vol. 13, p. 674).  
 NEW HAVEN (Vol. 19, p. 499).  
 EATON, THEOPHILUS (Vol. 8, p. 838).  
 HARTFORD (Vol. 13, p. 33).
- Vermont. VERMONT (Vol. 27, p. 1028).
- Indian Wars in New England. PEQUOT (Vol. 21, p. 132).  
 PHILIP, KING (Vol. 21, p. 389).
- New York. NEW YORK (Vol. 19, p. 603).  
 HUDSON, HENRY (Vol. 13, p. 849).  
 IROQUOIS (Vol. 14, p. 839).  
 NEW YORK (CITY) (Vol. 19, p. 620).  
 ALBANY (Vol. 1, p. 490).  
 STATEN ISLAND (Vol. 25, p. 802).  
 LONG ISLAND (Vol. 16, p. 982).  
 STUYVESANT, PETER (Vol. 25, p. 1055).

- New Jersey. NEW JERSEY (Vol. 19, p. 508).  
CARTERET, SIR GEORGE (Vol. 5, p. 418).  
ANDROS, SIR EDMUND (Vol. 2, p. 1).  
ELIZABETH, N. J. (Vol. 9, p. 287).
- Delaware. DELAWARE (Vol. 7, p. 949).  
LEWES (Vol. 16, p. 522).  
NEW CASTLE (Vol. 19, p. 472).  
WILMINGTON (Vol. 28, p. 690).
- Pennsylvania. PENNSYLVANIA (Vol. 21, p. 111).  
PENN, WILLIAM (Vol. 21, p. 99), by Os-  
mund Airy, author of *Charles II*, editor  
of the *Lauderdale Papers*, etc.  
FRIENDS, SOCIETY OF (Vol. 11, p. 227).  
PHILADELPHIA (Vol. 21, p. 872).
- Maryland. MARYLAND (Vol. 17, p. 831), by N. D.  
Mereness, Ph.D., author of *Maryland  
as a Proprietary Province*.  
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- Assassination of McKinley. The Roosevelt Administration (1901-1909).
- Isthmian Canal.
- Panic of 1907.
- Elkins Law.
- Eastern Policy.
- WEAVER, JAMES B. (Vol. 28, p. 439).
- CLEVELAND, GROVER (Vol. 6, p. 502), by Horace White, late editor of *The New York Evening Post*.
- TARIFF, *United States* (Vol. 26, p. 426), by Prof. F. W. Taussig.
- CLEVELAND, GROVER (Vol. 6, p. 503), by Horace White.
- OLNEY, RICHARD (Vol. 20, p. 91).
- MCKINLEY, WILLIAM (Vol. 17, p. 257).
- HANNA, M. A. (Vol. 12, p. 919).
- BRYAN, WILLIAM J. (Vol. 9, p. 697).
- PALMER, J. M. (Vol. 20, p. 645).
- BUCKNER, S. B. (Vol. 4, p. 732).
- TARIFF, *United States* (Vol. 26, p. 427), by Prof. F. W. Taussig.
- HAWAII, *History* (Vol. 18, p. 91).
- SPANISH-AMERICAN WAR OF 1898 (Vol. 25, p. 594).
- PHILIPPINE ISLANDS, *History* (Vol. 21, p. 399), by Prof. Hiram Bingham, Yale University.
- PORTO RICO, *History* (Vol. 22, p. 126).
- CUBA, *History* (Vol. 7, p. 604), by F. S. Philbrick.
- SOUTH DAKOTA, *History* (Vol. 25, p. 508).
- UNITED STATES, *Constitution and Government* (Vol. 27, p. 651), by Hon. James Bryce, author of *The American Commonwealth*.
- ALASKA (Vol. 1, p. 475).
- FOREST AND FORESTRY, *United States* (Vol. 10, p. 651), by Gifford Pinchot, formerly chief of the Forestry Service, U. S. Department of Agriculture.
- ROOSEVELT, THEODORE (Vol. 23, p. 707), by Lawrence F. Abbott, president of "The Outlook Company."
- PANAMA (Vol. 20, p. 666).
- PANAMA CANAL (Vol. 20, p. 666).
- BANKS AND BANKING (Vol. 3, p. 348), by Charles A. Conant, author of *A History of Modern Banks of Issue*.
- RAILWAYS, *American Legislation* (Vol. 22, p. 829).
- HAY, JOHN (Vol. 13, p. 105).
- ROOT, ELIHU (Vol. 23, p. 711).

This sketch of American History closes with the inauguration of President Roosevelt, for the questions that have arisen since that date are questions into which current politics enter, and these are treated in the chapter of this Guide on *Questions of the Day*. Here we need only say that throughout his study of American history the reader will constantly—and easily—find many more articles bearing on the subject than are mentioned in the outline given above. In particular let him note:

—that there are many biographies of figures prominent in nation and state not mentioned above;

—that in each article devoted to a state there is a section on history, which has a double value, as giving the outline of the state's history and as showing its part in the history of the nation;

—and that there is in articles on cities and towns a great deal of important information of historical value, sometimes merely local, but oftener bearing on the history of state or nation, or both.

## CHAPTER XLIV

### CANADIAN HISTORY

**A**LL the world thinks of Canada as the youngest of countries, for the extraordinary rapidity with which her western territory has been developed within recent years surpasses every other record of agricultural expansion. But in order to realize how young Canada is, in another sense, one must examine the less familiar facts of her geological history. "The innumerable lakes and waterfalls," says the *Britannica* (Vol. 5, p. 148), prove "that the rivers have not been long at work," and that the country owes its contours to comparatively recent geological action. "In many cases the lakes of Canada simply spill over, at the lowest point, from one basin into the next below, since in so young a country there has not yet been time for the rivers to have carved wide valleys . . . Thousands of these lakes have been mapped; and every new survey brings to light small lakes hitherto unknown to the white man . . . For the great extent of lake-filled country there is no comparison"

in any part of the world. And because the rivers have not yet worn their beds to an even slope, there are waterfalls enough to provide unlimited horse power; so that the natural advantages of Canada invite manufacturing just as the fertility of her soil invites agriculture.

The geographical and geological portions of the article CANADA (Vol. 5, p. 142) must be carefully read in order that the significance of the historical account of the country may be fully grasped; and the same is true of those parts of the article which deal with agriculture and with the commerce of which the first developments were associated with early exploration. There is ample and authoritative information on all these subjects in the article, which is equivalent in length to 85 pages of this Guide. The sections and their contributors are: *Geography*, by Prof. A. P. Coleman, Toronto University; *Population, Commerce, etc.*, by Prof. W. L. Grant, Queens University, Kingston; *Agriculture*, by E. H. Godfrey, editor of Census and Statistics Office, Department of Agriculture, Ottawa; *History*—to the



Federation by G. M. Wrong, University of Toronto, and after the Federation by G. R. Parkin, author of *Imperial Federation and Life of Sir John Macdonald*, etc., and *Literature—English—Canadian*, by L. J. Burpee, author of *The Search for the Western Sea*, and French-Canadian by William Wood, author of *The Fight for Canada*.

On the early history of Canada the student should compare what is given in this Guide on the early history of America

### Exploration and Settlement

in general and especially the following articles: LEIF ERICSSON (Vol. 16, p. 396); VINLAND (Vol. 28, p. 98), by Prof. Julius Emil Olson, University of Wisconsin; JOHN CABOT (Vol. 4, p. 921); and JACQUES CARTIER (Vol. 5, p. 433), both by H. P. Biggar, author of *The Voyages of the Cabots to Greenland*; SAMUEL DE CHAMPLAIN (Vol. 5, p. 830), by N. E. Dionne, librarian of the Legislature of the Province of Quebec and biographer of Champlain; JACQUES MARQUETTE (Vol. 17, p. 752); SIEUR DE LA SALLE (Vol. 16, p. 230), by Charles C. Whinery, assistant-editor *Encyclopaedia Britannica*; FRONTENAC (Vol. 11, p. 249), by A. G. Doughty, Dominion archivist of Canada; LOUISBURG; DETROIT; SAULT STE. MARIE; MACKINAC ISLAND; PITTSBURG; NOVA SCOTIA, *History*; SEVEN YEARS' WAR (Vol. 24, especially page 722); QUEBEC; MONTCALM and WOLFE.

The close of the Seven Years' War saw New France ceded to Great Britain. On English rule down to Canadian Federation, the student should consult the following articles: QUEBEC ACT; JAMES MURRAY; AMERICAN WAR OF INDEPENDENCE—and particularly the articles on MONTGOMERY and ARNOLD, leaders in the nearly successful attempt of the Americans to capture Canada, and that on the 1st Baron DORCHESTER, the British defender of Quebec; JOHN GRAVES SIMCOE; LOYALISTS—and the articles NEW BRUNSWICK and ONTARIO, both

regions largely influenced by the settlement there of these Loyal-

### The War Periods

ists; AMERICAN WAR OF 1812—and especially the articles ISAAC BROCK, by Prof. W. L. Grant, Queens University, Kingston; ERIE, OLIVER H. PERRY, SACKETT'S HARBOR, TECUMSEH, LAKE CHAMPLAIN (Vol. 5, p. 830); FORT NIAGARA (Vol. 19, p. 634); JOHN STRACHAN; PAPINEAU and W. L. MACKENZIE for the two revolts of 1837; LORD DURHAM; LORD SYDENHAM; ROBERT BALDWIN and SIR LOUIS LAFONTAINE, heads of the first Liberal administrations; EARL ELGIN (Vol. 9, p. 268); SIR A. A. DORION; JOHN SANDFIELD MACDONALD, "the Ishmael of Parliament"; SIR JOHN BEVERLEY ROBINSON, head of the Tory "Family Compact"; and, for Irish-American outrages on the Canadian border, the article FENIANS.

On the period since federation (1867), see the article FEDERAL GOVERNMENT (Vol. 10, p. 233) for a general description

### Federation and Since

of this form of administration; the articles NOVA SCOTIA, ALFRED GILPIN JONES and JOSEPH HOWE, for local opposition to federation; SIR CHARLES TUPPER, who alone in the delegation from Nova Scotia favoured federation; THOMAS D'ARCY MCGEE (by A. G. Doughty), a prominent opponent of Fenianism who was assassinated by a Fenian; the articles HUDSON'S BAY COMPANY and SIR G. E. CARTIER, by Prof. W. L. Grant, Queens University, Kingston, for the extinction of the Hudson's Bay Company claims and the transfer of its territories to the government; LOUIS RIEL for the Red River Rebellion; PRINCE EDWARD ISLAND for its entrance into the Dominion; GEORGE BROWN, a prominent advocate of federation, by Prof. Grant; GEORGE MONRO GRANT, author of *Ocean to Ocean*; SIR JOHN MACDONALD, by G. R. Parkin, author of *Imperial Federation*, and biographer of Macdonald; SIR FRAN-

CIS HINCKS and SIR ALEXANDER GALT, financiers; SIR HUGH ALLAN and SIR DAVID MACPHERSON, for the Canadian Pacific Railway question; LORD DUFFERIN; ALEXANDER MACKENZIE, head of a Liberal government from 1873 to 1878 when SIR JOHN MACDONALD returned to power on a platform calling for protection of Canadian industries; GEORGE TAYLOR DENISON, founder of the "Canada First" party; SIR SAMUEL LEONARD TILLEY, Macdonald's minister of finance, who was principally responsible for the tariff of 1879; SIR LOUIS HENRY DAVIES, Liberal politician and jurist; LORD STRATHCONA, by Prof. W. L. Grant, BARON MOUNTSTEPHEN, SIR WILLIAM C. VAN HORNE and SIR SANDFORD FLEMING for the completion of the Canadian Pacific Railway; LOUIS RIEL for the Second Riel Rebellion; SIR JOHN THOMPSON; GEORGE EULAS FOSTER; SIR H. G.

JOLY DE LOTBINIÈRE; HONORÉ MERCIER, the French leader of Quebec; S. N. PARMENT; SIR MACKENZIE BOWELL, premier in 1894-1896; his successor, SIR CHARLES TUPPER; EDWARD BLAKE, a Liberal leader who in 1892 left Canadian politics to take a seat in the British House of Commons; SIR OLIVER MOWAT, Blake's successor as premier of Ontario; GEORGE WILLIAM ROSS; SIR DANIEL WILSON, educational reformer, by Professor Grant; SIR WILFRID LAURIER (by J. S. Willison, author of *Sir W. Laurier and the Liberal Party: A Political History*), the great Liberal leader of the last decade, and Laurier's ministers of finance, SIR RICHARD JOHN CARTWRIGHT and W. S. FIELDING, and his minister of militia SIR FREDERICK WILLIAM BORDEN; SIR WILLIAM MULOCK; and ROBERT L. BORDEN, long leader of the Conservative opposition and premier in 1911.

## CHAPTER XLV

### ENGLISH, SCOTCH AND IRISH HISTORY

THE student of English history in the Britannica may well begin with the summary view in the article BRITISH EMPIRE (Vol. 4, p. 606), equivalent to 30 pages of this Guide, by Lady Lugard, wife of the British explorer and colonial administrator, Sir Frederick Lugard, herself an authority on colonial subjects and well-known as colonial editor of the *Times* of London. On pp. 608-610 there is a chronological list of the acquisitions of the Empire, and nothing will surprise the reader more than the comparative recentness of the movement by which two

The British Empire  
small islands have expanded into an empire covering nearly one-fourth of the earth's land surface.

Except for the Channel Islands, the Isle of Man, and "the nominal possession of Newfoundland by Sir Humphrey Gilbert in 1583, all the territorial acquisitions of the Empire have been made in the 17th and subsequent centuries." On each of the localities mentioned in this imposing list the reader will find a separate article in its proper alphabetical place in the Encyclopaedia Britannica dealing with geography, government and history. Here it will be possible only to call attention to articles on the more important branches of the subject.

On the early inhabitants of the islands and on British archaeology, read the elaborate article CELT (Vol. 5, p. 611; equivalent to 135 pages of this Guide),

by Prof. William Ridgeway, Cambridge, author of *The Oldest Irish Epic*, and E. C. Quiggin, lecturer in Celtic, Cambridge,—with particularly full treatment of Celtic languages and literatures,—Gaulish, Irish, Scottish, Gaelic, Manx, Welsh, Breton and Cornish; and the article **BRITAIN** (Vol. 4, p. 583; equivalent to 40 pages of this Guide), which is illustrated by a map of Roman Britain and plans of Roman remains. The treatment of pre-Roman and Roman Britain is by Professor F. J. Haverfield of Oxford; and later Britain is described by Hector Munro Chadwick, librarian of Clare College, Cambridge, and author of *Studies on Anglo-Saxon Institutions*. Then read:

**WALES**, *History* (Vol. 28, pp. 261–268), by Herbert Murray Vaughan, Keble College, Oxford.

**SCOTLAND**, *Political History* (Vol. 24, pp. 429–457), by Andrew Lang, author of *History of Scotland from the Roman Occupation*; and, among

**Scottish History** many other articles, **SCOTLAND**, **CHURCH OF**, (Vol. 24, 460), by the Rev. Dr. Allan Menzies, St. Mary's College, St. Andrews, and such biographies as: **MALCOLM III.** (Canmore); **ALEXANDER I, II AND III** (Vol. 1, p. 563); **WILLIAM THE LION** (Vol. 28, p. 665); **WALLACE, SIR WILLIAM** (Vol. 28, p. 277), by A. F. Hutchinson, late rector of the High School, Stirling; **ROBERT I, THE BRUCE** (Vol. 23, p. 395); **DAVID I AND II** (Vol. 8, p. 859); **JAMES I, II, III, IV AND V** (Vol. 15, p. 139); **MARY, QUEEN OF SCOTS** (Vol. 17, p. 817), a striking biography by the poet and essayist Algernon Charles Swinburne, author of the tragedies *Chastelard*, *Bothwell* and *Mary Stuart*; **BOTHWELL** (Vol. 4, p. 303), by P. C. Yorke; **RIZZIO** (Vol. 23, p. 388); **DARNLEY** (Vol. 7, p. 836), and see also the article **CASKET LETTERS** (Vol. 5, p. 449), an examination of the evidence in this mystery by Andrew Lang; **MAR**

(Vol. 17, p. 666); **KNOX, JOHN** (Vol. 15, p. 878), by Dr. Alexander Taylor Innes, author of **JOHN KNOX** and *Studies in Scottish History*; **GOWRIE** (Vol. 12, p. 301), by R. J. McNeill, late editor *St. James's Gazette*; and **JAMES I** of England—**VI** of Scotland (Vol. 15, p. 136); and for the later period see **ENGLISH HISTORY** to supplement Andrew Lang's account of the period since the Union under **SCOTLAND, History**.

**IRELAND, History** (Vol. 14, p. 756), by Prof. E. C. Quiggin, of Cambridge, on the early period, and Richard Bagwell, commissioner of national education for Ireland and **Irish History** author of *Ireland under the Tudors, Ireland under the*

*Stuarts*, etc.; and to supplement this general treatment such separate articles as **ST. PATRICK** (Vol. 20, p. 933) and **ST. COLUMBA** (Vol. 6, p. 737), both by Dr. E. C. Quiggin; **ST. BRENDAN** (Vol. 4, p. 495); **BRIAN** (Vol. 4, p. 515); **BREHON LAWS** (Vol. 4, p. 488), by Laurence Ginnell, M.P. for North Westmeath and author of *Land and Liberty*, etc.; **O'NEILL family** (Vol. 20, p. 107) and **O'DONNELL family** (Vol. 20, p. 6), by R. J. McNeill; **FITZGERALD family** (Vol. 10, p. 441), by J. H. Round, author of *Feudal England*, etc.; **TYRONE**, earls of (Vol. 27, p. 549); **TYRCONNELL** (Vol. 27, p. 548); **ST. LEGER, SIR ANTHONY** (Vol. 24, p. 23), by R. J. McNeill; **DESMOND** (Vol. 8, p. 98); **BUTLER family** (Vol. 4, p. 879), by Oswald Barron, editor of *The Ancestor*: **DROGHEDA** (Vol. 8, p. 587); **PEEP-OF-DAY BOYS** (Vol. 21, p. 45); **ORANGEMEN** (Vol. 20, p. 160); **FLOOD, HENRY** (Vol. 10, p. 525); **GRATTAN, HENRY** (Vol. 12, p. 379); **TONE, T. WOLFE** (Vol. 27, p. 2) and **EMMET, ROBERT** and **THOMAS A.** (Vol. 9, pp. 342–343), all by R. J. McNeill; **O'CONNELL, DANIEL** (Vol. 19, p. 990), by the late William O'Connor Morris, author of *Irish History*, etc.; **FENIANS** (Vol. 10, p. 254), by R. J. McNeill; **BUTT, ISAAC** (Vol. 4, p. 889); **PARNELL, C. S.** (Vol. 20, p. 854), by

James R. Thursfield, author of *Peel*, etc.; DAVITT, MICHAEL (Vol. 7, p. 870); BOYCOTT (Vol. 4, p. 353); DILLON, JOHN (Vol. 8, p. 273); PLUNKETT, SIR HORACE CURZON (Vol. 21, p. 857); REDMOND, JOHN E. (Vol. 22, p. 968); and many articles on Irish towns and counties, and, on Home Rule and recent political questions, the biographies of English viceroys, premiers and chief secretaries, and the latter part of the article ENGLISH HISTORY.

### ENGLISH HISTORY

On English history the student will find the Britannica particularly valuable. The article ENGLISH HISTORY (Vol. 9, pp. 466-587), is itself equivalent to about 380 pages of this Guide, and carries the story through 13 centuries. This great article—a text-book of the subject in scope and power—is written by: Prof. C. W. C. Oman, Oxford, author of *England before the Norman Conquest*, etc., dealing with the period down to the time of Elizabeth; Prof. A. F. Pollard, University of London, assistant editor *Dictionary of National Biography*, for the Reformation and the reign of Elizabeth, 1528-1603; Samuel Rawson Gardiner, best known as the historian of the Puritan Revolution, who deals with the period from 1603 to 1793; W. Alison Phillips, author of *Modern Europe*, on the years 1793 to 1837; and Hugh Chisholm, editor-in-chief of the Encyclopaedia Britannica, for the period since the accession of Queen Victoria. And the article closes with a critical estimate of *Sources and Writers of English History*, by Prof. Albert Frederick Pollard, University of London.

For the period from 600 to 1066 read: Part 1 of ENGLISH HISTORY (Vol. 8, pp. 466-474); and the separate articles:

For the introduction of Christianity and the "Kingdoms"—AUGUSTINE (Vol. 2, p. 910); ÆTHELBERHT (Vol. 1, p. 289); EDWIN (Vol. 9, p. 7), by F. G. M. Beck, of Clare College, Cambridge; ANGLI-

SAXONS (Vol. 2, p. 38), by H. M. Chadwick; BRITAIN, *Anglo-Saxon* (Vol. 4, pp. 589-595) and ANGLI (Vol. 2, p. 18) and JUTES (Vol. 15, p. 609), by the same author; SAXONS (Vol. 24, p. 264); NORTH-UMBRIA (Vol. 19, p. 793); BERNICIA (Vol. 3, p. 802); DEIRA (Vol. 7, p. 933); EAST ANGLIA (Vol. 8, p. 827); WESSEX (Vol. 28, p. 534); MERCIA (Vol. 18, p. 151); SUSSEX, KINGDOM of (Vol. 26, p. 168), and KENT (Vol. 15, p. 735), ECGBERT (Vol. 8, p. 869); ÆTHELWULF (Vol. 1, p. 292).

On the Danish invasions and the Anglo-Saxon period, VIKING (Vol. 28, pp. 62-66), by C. F. Keary, author of *The Vikings in Western Europe*; ÆTHELBALD (Vol. 1, p. 289), ÆTHELBERHT (Vol. 1, p. 289) and ÆTHELRED I (Vol. 1, p. 290); ALFRED THE GREAT (Vol. 1, p. 582), by Charles Plummer, biographer of Alfred; DANELAGH (Vol. 7, p. 803), by Prof. Allen Mawer of Armstrong College, Newcastle-on-Tyne; EDWARD "THE ELDER" (Vol. 8, p. 989), ÆTHELSTAN (Vol. 1, p. 291), EDMUND I (Vol. 8, p. 948), EDGAR (Vol. 8, p. 933), all by Prof. Mawer; ST. DUNSTAN (Vol. 8, p. 684), ÆTHELRED II "the Unready" (Vol. 1, p. 290), by Rev. C. Stanley Phillips, King's College, Cambridge; SWEYN I (Vol. 26, p. 224), by R. Nisbet Bain of the British Museum; DANEGELD (Vol. 7, p. 803); CANUTE (Vol. 5, p. 221), by R. Nisbet Bain; EDMUND "Ironside" (Vol. 8, p. 948), by Rev. C. Stanley Phillips; HAROLD I (Vol. 13, p. 11); HARDICANUTE (Vol. 12, p. 942); EDWARD "the Confessor" (Vol. 8, p. 990), by Rev. C. Stanley Phillips; HAROLD II (Vol. 13, p. 11).

For the Norman Conquest and the Norman and Angevin kings the student should read the second section of the article ENGLISH HISTORY (Vol. 9, pp. 474-486) and, at least, the following important articles:

WILLIAM I, "The Conqueror" (Vol.



28, p. 659), by H. W. Carless Davis of Oxford, author of *England under the Normans and Ange-*

**William the Conqueror**  
**William Rufus**  
**Henry I**  
**Stephen and Matilda**  
**Henry II**

*vins*; HERWARD (Vol. 13, p. 363), by J. H. Round, author of *Feudal England, etc.*; FEUDALISM (Vol. 10, p. 297), by Prof. George Burton

Adams, Yale University, author of *Political History of England, 1066-1216, etc.*; DOMESDAY BOOK (Vol. 8, p. 398), by J. H. Round; WILLIAM II, "Rufus" (Vol. 28, p. 661) and LANFRANC (Vol. 16, p. 169), both by H. W. Carless Davis; ANSELM (Vol. 2, p. 81); HENRY I (Vol. 13, p. 279), STEPHEN (Vol. 25, p. 881), MATILDA (Vol. 17, p. 888), HENRY II (Vol. 13, p. 281), BECKET, THOMAS (Vol. 3, p. 608), RICHARD I, "Coeur de Lion" (Vol. 23, p. 294), all by H. W. Carless Davis.

In connection with the third section of the article ENGLISH HISTORY dealing with the struggle for constitutional liberty from 1199 to

**John** 1337 (Vol. 9, pp.  
**Henry III** 486-501) the follow-  
**Edward I to III** ing supplementary  
articles are among

the many to which the student should turn: JOHN (Vol. 15, p. 439), and LANGTON, STEPHEN (Vol. 16, p. 178), both by H. W. Carless Davis; MAGNA CARTA (Vol. 16, p. 314), by A. W. Holland, late scholar of St. John's, Oxford; HENRY III (Vol. 13, p. 282), PEMBROKE (Vol. 21, p. 78), MONTFORT, SIMON DE (Vol. 18, p. 781), EVESHAM (Vol. 10, p. 10); EDWARD I (Vol. 8, p. 991-993), by Prof. T. F. Tout, University of Manchester, author of *Edward I*; MORTMAIN (Vol. 18, p. 880); WESTMINSTER, STATUTES OF (Vol. 28, p. 551); EDWARD II (Vol. 8, p. 993); LANCASTER, HENRY and THOMAS, EARLS OF (Vol. 16, pp. 144 and 148); DESPENSER, HUGH LE (Vol. 8, p. 101); MORTIMER family (Vol. 18,

p. 879); and EDWARD III (Vol. 8, p. 994).

On the Hundred Years' War (1337-1453) and contemporary history, see the section in ENGLISH HISTORY (Vol. 8, pp. 501-516); the article HUNDRED YEARS' WAR (Vol. 13, p. 893), by Jules

Viard, archivist of the National Archives, Paris; SLUYS, BATTLE OF (Vol. 25, p. 246), by D. Hannay, author of *Short History of the Royal Navy*; CRÉCY (Vol. 7, p. 389); POITIERS, BATTLE OF (Vol. 21, p. 898); EDWARD, THE BLACK PRINCE (Vol. 8, p. 999), by Prof. Tout; WYCLIFFE (Vol. 28, p. 866), by R. Lane Poole, author of *Wycliffe and Movements for Reform*, and W. Alison Phillips, author of *Modern Europe, etc.*; LANCASTER, JOHN OF GAUNT, DUKE OF (Vol. 16, p. 146), by C. Lethbridge Kingsford, biographer of Henry V; RICHARD II (Vol. 23, p. 295), also by C. L. Kingsford; TYLER, WAT (Vol. 27, p. 495); BALL, JOHN (Vol. 3, p. 263); LOLLARDS (Vol. 16, p. 929), by Dr. T. M. Lindsay, author of *History of the Reformation*; GLOUCESTER, THOMAS, DUKE OF (Vol. 12, p. 130); NORFOLK, THOMAS MOWBRAY, DUKE OF (Vol. 19, p. 742); HENRY IV (Vol. 13, p. 283), by C. L. Kingsford; GLENDOWER, OWEN (Vol. 12, p. 120); NORTHUMBERLAND (Vol. 19, p. 787); HENRY V (Vol. 13, p. 284) and OLDCASTLE, SIR JOHN (Vol. 20, p. 66), by C. L. Kingsford; AGINCOURT (Vol. 1, p. 375); HENRY VI (Vol. 13, p. 285) and GLOUCESTER, HUMPHREY, DUKE OF (Vol. 12, p. 129), both by C. L. Kingsford; BEDFORD JOHN, DUKE OF (Vol. 3, p. 616); JOAN OF ARC (Vol. 15, p. 520), by Prof. J. T. Shotwell of Columbia University and Hugh Chisholm, editor-in-chief of the *Encyclopaedia Britannica*; BEAUFORT family (Vol. 3, p. 585); CADE, JOHN (Vol. 4, p. 927).

On the fifth period of English history, read section 5, *The Wars of the Roses (1453-1497)* in the article ENGLISH



**HISTORY** (Vol. 9, pp. 516-525); the separate article, **ROSES, Edward IV and V** (Vol. 23, p. 735); and the articles: **YORK, HOUSE OF** (Vol. 28, p. 924), and **LANCASTER, HOUSE OF** (Vol. 16, p. 143), both by James Gairdner, author of *The Houses of Lancaster and York*, etc.; **YORK, RICHARD, DUKE OF** (Vol. 28, p. 926), **WARWICK, RICHARD NEVILLE, EARL OF** (Vol. 28, p. 339), **EDWARD IV** (Vol. 8, p. 996), **MARGARET OF ANJOU** (Vol. 17, p. 702), **CLARENCE, GEORGE, DUKE OF** (Vol. 6, p. 428), **EDWARD V** (Vol. 8, p. 996), **RICHARD III** (Vol. 23, p. 296), and **BUCKINGHAM, HENRY STAFFORD, 2ND DUKE OF** (Vol. 4, p. 726), all by C. L. Kingsford; **HENRY VII** (Vol. 13, p. 286), by James Gairdner, author of *The Houses of Lancaster and York*, and biographer of Henry VII; **WARBECK, PERKIN** (Vol. 28, p. 316).

The sixth section of the article **ENGLISH HISTORY**, dealing with the years 1497-1528 (Vol. 9, pp. 525-530), should

be supplemented by the latter part of James Gairdner's article on **HENRY VII** and by the articles: **REFORMATION** (Vol. 23, p. 4), by Prof. James Harvey Robinson, Columbia University, author of *History of Western Europe*, etc; **HENRY VIII** (Vol. 13, p. 287) and **FOX, RICHARD** (Vol. 10, p. 766), both by Prof. A. F. Pollard; **WOLSEY, THOMAS** (Vol. 28, p. 779); **CATHERINE OF ARAGON** (Vol. 5, p. 529) and **BOLEYN, ANNE** (Vol. 4, p. 159), by P. C. Yorke, Oxford; **CROMWELL, THOMAS** (Vol. 7, p. 499); **CRANMER, THOMAS** (Vol. 7, p. 375); **FISHER, JOHN** (Vol. 10, p. 427), by Rev. E. L. Taunton, author of *The English Black Monks of St. Benedict*, etc.; **MORE, SIR THOMAS** (Vol. 18, p. 822), by Mark Pattison, late rector of Lincoln College, Oxford; **HOWARD, CATHERINE** (Vol. 13, p. 832); **PARR, CATHERINE** (Vol. 20, p. 861);

**NORFOLK, THOMAS HOWARD, 3RD DUKE OF** (Vol. 19, p. 743); **ASKEW, ANNE** (Vol. 2, p. 762), by A. F. Pollard; **EDWARD VI** (Vol. 8, p. 996); **SOMERSET, EDWARD SEYMOUR, DUKE OF** (Vol. 25, p. 386); **NORTHUMBERLAND, JOHN DUDLEY, EARL OF WARWICK, AND DUKE OF** (Vol. 19, p. 788); **GREY, LADY JANE** (Vol. 12, p. 590); **MARY I** (Vol. 17, p. 814) and **GARDINER, STEPHEN** (Vol. 11, p. 460), both by James Gairdner; **WYAT, SIR THOMAS** (Vol. 28, p. 862); **POLE, CARDINAL** (Vol. 21, p. 974), by E. L. Taunton; **RIDLEY, NICHOLAS** (Vol. 23, p. 320); **LATIMER, HUGH** (Vol. 16, p. 242), by T. F. Henderson, author of *Mary Queen of Scots and the Casket Letters*; **ELIZABETH** (Vol. 9, p. 282); **MARY QUEEN OF SCOTS** (Vol. 17, p. 817), by A. C. Swinburne; **NORFOLK, THOMAS HOWARD, 4TH DUKE OF** (Vol. 19, p. 744); **ARMADA** (Vol. 2, p. 560); **HAWKINS, SIR RICHARD** (Vol. 13, p. 99); **DRAKE, SIR FRANCIS** (Vol. 8, p. 473); **RALEIGH, SIR WALTER** (Vol. 22, p. 869); **LEICESTER, ROBERT DUDLEY, EARL OF** (Vol. 16, p. 390); **ESSEX, ROBERT DEVEREUX, EARL OF** (Vol. 9, p. 782); **BACON, FRANCIS** (Vol. 3, p. 135), by Prof. Robert Adamson of Glasgow, and J. Malcolm Mitchell, University of London; **BURGHLEY, WILLIAM CECIL, BARON** (Vol. 4, p. 816); and—for this whole period the article **ENGLAND, CHURCH OF** (Vol. 9, especially pp. 447-448), by William Hunt, author of *History of the English Church*.

The seventh part of the article **ENGLISH HISTORY** (Vol. 9, pp. 535-542) deals with the *Stuart Monarchy, the*

*Great Rebellion and the Restoration* (1603-1689). From the great wealth of supplementary material in the Britannica on this interesting period, at least the following articles should be selected: **STEWART OF STUART family** (Vol. 12, p. 911); **JAMES I** (Vol. 15, p. 136); **GUN-**

POWDER PLOT (Vol. 12, p. 727); BIBLE, ENGLISH (Vol. 3, p. 894); SALISBURY, ROBERT CECIL, 1ST EARL OF (Vol. 24, p. 76); BUCKINGHAM, GEORGE VILLIERS, 1ST DUKE OF (Vol. 4, p. 722); THIRTY YEARS' WAR (Vol. 26, p. 852); CHARLES I (Vol. 5, p. 906) and LAUD, WILLIAM (Vol. 16, p. 276), both by P. Chesney York; SHIP-MONEY (Vol. 24, p. 982); HAMPDEN, JOHN (Vol. 12, p. 900); PYM, JOHN (Vol. 22, p. 680) and STRAFFORD, THOMAS WENTWORTH, EARL OF (Vol. 25, p. 978), both by P. C. Yorke; GREAT REBELLION (Vol. 12, p. 403); CROMWELL, OLIVER (Vol. 7, p. 487), by P. C. Yorke, C. F. Atkinson and R. J. McNeill; CROMWELL, RICHARD (Vol. 7, p. 498); for the military operations of the Great Rebellion, the articles listed under that heading in the chapter of this Guide entitled *For Army Officers*; MONK, GEORGE (Vol. 18, p. 723); CHARLES II, (Vol. 5, p. 912); CLARENDON, EDWARD HYDE, 1ST EARL OF (Vol. 6, p. 428); BUCKINGHAM, GEORGE VILLIERS, 2ND DUKE OF (Vol. 4, p. 724); CLEVELAND, DUCHESS OF (Vol. 6, p. 500); PORTSMOUTH, DUCHESS OF (Vol. 22, p. 131); GWYN, NELL (Vol. 12, p. 750); LAUDERDALE, DUKE OF (Vol. 16, p. 279); SHAFTESBURY, 1ST EARL (Vol. 24, p. 760) by Osmund Airy, biographer of Charles II; DUTCH WARS (Vol. 9, p. 729); TEST ACTS (Vol. 26, p. 665); JAMES II (Vol. 15, p. 138); ARGYLL, 9TH EARL OF (Vol. 2, p. 484); MONMOUTH, DUKE OF (Vol. 18, p. 725); TYRCONNELL (Vol. 27, p. 548).

On the Revolution and the age of Anne (1689-1714) see the article ENGLISH HISTORY (Vol. 9, pp. 542-544),

and WILLIAM III, William and Mary; Anne (Vol. 28, p. 662); MARY II. (Vol. 17, p. 816); BURNET, GILBERT (Vol. 4, p. 851); GRAND ALLIANCE (Vol. 12, p. 342), and for additional military articles the chapter *For Army Officers* in this Guide; ANNE (Vol. 2, p. 65); MARLBOROUGH, 1ST DUKE OF (Vol. 17, p. 737), by

W. Prideaux Courtney; MASHAM, LADY (Vol. 17, p. 836); GODOLPHIN (Vol. 12, p. 174); SOMERS (Vol. 25, p. 384); HALIFAX, 1ST MARQUESS OF (Vol. 12, p. 839); OXFORD, 1ST EARL (Vol. 20, p. 403); BOLINGBROKE, VISCOUNT (Vol. 4, p. 161); SHREWSBURY, DUKE OF (Vol. 24, p. 1016).

The part of the article ENGLISH HISTORY dealing with the Hanoverian Kings, 1714-1793 (Vol. 9, pp. 544-551) and that on the Revolutionary epoch, George I to IV William IV the reaction and the triumph of re-

form, 1793-1837 (pp. 551-558) are respectively by S. R. Gardiner and W. Alison Phillips. They should be supplemented by S. R. Gardiner's articles on the four Georges (Vol. 11, pp. 737-745); SOUTH SEA BUBBLE (Vol. 25, p. 515); STANHOPE, 1ST EARL (Vol. 25, p. 773); WALPOLE, HORATIO (Vol. 28, p. 288); WHIG AND TORY (Vol. 28, p. 588); TOWNSHEND, CHARLES (Vol. 27, p. 111); CAROLINE (Vol. 5, p. 380); PELHAM, HENRY (Vol. 21, p. 67); CHARLES EDWARD, "the Young Pretender" (Vol. 5, p. 940), by H. M. Vaughan, author of *The Last of the Royal Stuarts*; METHODISM (Vol. 18, p. 293); WESLEY, JOHN (Vol. 28, p. 527); NEWCASTLE, THOMAS PELHAM HOLLES, DUKE OF (Vol. 19, p. 471); CHATHAM, WILLIAM PITT, 1ST EARL OF (Vol. 6, p. 1); SEVEN YEARS' WAR (Vol. 24, p. 715) and, for engagements and commanders in the war, see the chapter in this Guide *For Army Officers*; INDIA, *History* (Vol. 14, especially pp. 407-409); CANADA, *History* (Vol. 5, especially p. 158); BUTE, 3RD EARL OF (Vol. 4, p. 877); GRENVILLE, GEORGE (Vol. 12, p. 580); ROCKINGHAM, MARQUESS OF (Vol. 23, p. 434); GUILFORD, 2ND EARL, Lord North (Vol. 12, p. 691); WILKES, JOHN (Vol. 28, p. 642); BURKE, EDMUND (Vol. 4, p. 824), by John Morley; FOX, CHARLES JAMES (Vol. 10, p. 761); GORDON, LORD GEORGE (Vol. 12, p. 253); LANSDOWNE, MARQUESS OF, Lord Shelburne (Vol. 16, p.

184); PORTLAND, 3RD DUKE (Vol. 22, p. 119); PITT, WILLIAM (Vol. 21, p. 667); FRENCH REVOLUTIONARY WARS (Vol. 11, p. 171), NAPOLEONIC CAMPAIGNS (Vol. 19, p. 216) and, for leaders and engagements in these wars, in the Peninsular War, and in the American War for Independence, see the chapter in this Guide *For Army Officers*; CAROLINE AMELIA AUGUSTA (Vol. 5, p. 380); WELLESLEY, MARQUESS (Vol. 28, p. 506); LONDONDERRY, MARQUESS OF, Castlereagh (Vol. 16, p. 969); CANNING, GEORGE (Vol. 5, p. 186); CORN LAWS (Vol. 7, p. 174); COBBETT, WILLIAM (Vol. 6, p. 606); WELLINGTON, DUKE OF (Vol. 28, p. 507); WILLIAM IV. (Vol. 28, p. 664); GREY, 2ND EARL (Vol. 12, p. 586); BROUGHAM, LORD (Vol. 4, p. 652); PARLIAMENT (Vol. 20, especially p. 843); MELBOURNE, 2ND VISCOUNT (Vol. 18, p. 90); PEEL, SIR ROBERT (Vol. 21, p. 40).

On the reign of Victoria the section of the article ENGLISH HISTORY (Vol. 9, pp. 558-582) gives a very full treatment,

### Victoria

which should be supplemented by the study of such articles as: VICTORIA (Vol. 28, p. 28), by Hugh Chisholm, editor-in-chief of the Encyclopaedia Britannica; ALBERT (Vol.

1, p. 495), by the same author; PALMERSTON (Vol. 20, p. 645); RUSSELL, 1ST EARL (Vol. 23, p. 863); O'BRIEN, WILLIAM SMITH (Vol. 19, p. 953); CHARTISM (Vol. 5, p. 953); DERBY, 14TH EARL (Vol. 8, p. 66); CRIMEAN WAR (Vol. 7, p. 450); "ALABAMA" ARBITRATION (Vol. 1, p. 464); BRIGHT, JOHN (Vol. 4, p. 567); COBDEN, RICHARD (Vol. 6, p. 607); BEACONSFIELD (Vol. 3, p. 563); GLADSTONE, W. E. (Vol. 12, p. 66), by G. W. E. Russell, biographer of Gladstone; SALISBURY (Vol. 24, p. 72); TRANSVAAL, *History* (Vol. 27, p. 193); PARNELL, C. S. (Vol. 20, p. 854); GORDON, C. G. (Vol. 11, p. 249); ROSEBERY (Vol. 23, p. 731); RHODES, C. J. (Vol. 23, p. 254).

For the years since Victoria's death see the articles: EDWARD VII. (Vol. 8, p. 997) and GEORGE V. (Vol. 11, p. 745),

### Edward VII George V

and the articles on recent political leaders: BALFOUR (Vol. 3, p. 250); CHAMBERLAIN (Vol. 5, p. 813); CAMPBELL-BANNERMAN (Vol. 5, p. 131); ASQUITH (Vol. 2, p. 769); and LLOYD GEORGE (Vol. 16, p. 832); and on the reform of the House of Lords PARLIAMENT (Vol. 20, especially pp. 845-847) and REPRESENTATION (Vol. 23, especially pp. 111-113).

## CHAPTER XLVI

### FRENCH HISTORY

THE article FRANCE in the Encyclopaedia Britannica includes a section on *History* (Vol. 10, pp. 801-906) equivalent to 320 pages of this Guide, of which the first part, down to 1870, is by Paul Wiriath, director of the École Supérieure Pratique de Commerce et d'Industrie, Paris, and the part since 1870 is by J. E. C. Bodley, author of *France*, etc. Opposite page 802 are four

coloured historical maps showing France at the end of the 10th, 13th and 14th centuries, and the changes in the eastern frontier from 1598 to 1789. The historical part of the article closes with a historiographic section, or critical summary of French historical writing, by Charles Bémont of the University of Paris.

Supplementing this main treatment, see:

On prehistoric and Roman France, GAUL (Vol. 11, p. 533), by Prof. F. J. Haverfield, Oxford, the well-known authority on Roman

### Early History of France

occupation of Britain and Gaul; BRACTE, ALESIA, ITRIVS PORTUS, DRUIDISM, and, on Caesar's campaigns, CAESAR, JULIUS; and, on Roman remains, ARLES, NÎMES, ORANGE, ARCHITECTURE, AQUEDUCT, and AMPHITHEATRE.

On the Franks, the articles FRANKS (Vol. 11, p. 35) and SALIC LAW (Vol. 24, p. 68), by Prof. Christian Pfister of the Sorbonne; and the articles, AUSTRASIA, MEROVINGIANS, CHILDERIC, CLOVIS, CHILDEBERT, CLOTAIRE, SIGEBERT, CHARIBERT, GUNTRAM, FREDEGOND, BRUNHILDA, CLOTAIRE II, DAGOBERT, PIPPIN I, II and III, EBROIN, CAROLINGIANS, CHARLES MARTEL (Vol. 5, p. 942), CARLOMAN, CHILDERIC; CHARLEMAGNE, ROLAND, EINHARD, ALCUIN; LOUIS I "the Pious," LOTHAIR (Vol. 17, p. 17); CHARLES II "the Bald" (Vol. 5, p. 897); FEUDALISM; LOUIS II and III; CHARLES III "the Fat" (Vol. 5, p. 898); ODO; LOUIS IV (Vol. 17, p. 35), by Dr. René Poupardin, secretary of the École des Chartes; LOTHAIR (Vol. 17, p. 18); BRUNO; LOUIS V.

For the Capetian period, the articles CAPET (Vol. 5, p. 251); ROBERT "the Strong" (Vol. 23, p. 402); HUGH "the Great"

### Medieval France

(Vol. 13, p. 857); HUGH CAPET (Vol. 13, p. 858); ROBERT "the Pious" (Vol. 23, p. 399); HENRY I (Vol. 13, p. 290); PHILIP I (Vol. 21, p. 378); LOUIS VI (Vol. 17, p. 35), by Prof. J. T. Shotwell, Columbia University; Prof. Shotwell's article on LOUIS VII; SUGER; ELEANOR OF AQUITAINE (Vol. 9, p. 168); PHILIP AUGUSTUS (Vol. 21, p. 378); INGEBORG; ALBIGENSES; and for French and English relations, RICHARD I and JOHN of England; LOUIS VIII; BLANCHE OF CASTILE (Vol. 4, p. 40); Prof. Shotwell's article on

LOUIS IX "St. Louis"; and the article CRUSADES; PHILIP III "the Bold" (Vol. 21, p. 381); PHILIP IV; BONIFACE VIII; SAISSET; NOGARET; TEMPLARS; LOUIS X; PHILIP V and CHARLES IV.

For the Valois line and the history of the period (1328-1498), the article HUNDRED YEARS' WAR; SLUYS; CRÉCY; and for detail of the war the articles under that head in the chapter *For the Army Officer* in this Guide; and PHILIP VI (Vol. 21, p. 383); FLANDERS; ARTEVELDE (Jacob and Philip van); DAUPHINÉ; DAUPHIN; GABELLE; JOHN II (Vol. 15, p. 441); POITIERS; MARCEL; LE COQ; STATES GENERAL; CHARLES II of Navarre (Vol. 5, p. 924); CHARLES V (Vol. 5, p. 917); JACQUERIE; DU GUESCLIN; CHARLES VI; ARMAGNAC; ISABELLA of Bavaria (Vol. 14, p. 860); BENEDICT XIII (Vol. 3, p. 718); JOHN "the Fearless" (Vol. 15, p. 445); AGINCOURT; CHARLES VII; ARTHUR III of Brittany (Vol. 2, p. 682); JOAN OF ARC; COEUR; AGNES SOREL (Vol. 25, p. 432); BRÉZÉ; PRAGUERIE; LOUIS XI; BALUE; LE DAIM; LIÉGE, *History*; CHARLES "the Bold" of Burgundy (Vol. 5, p. 932); CHARLES VIII; ANNE of France (Vol. 2, p. 70); ANNE of Brittany (Vol. 2, p. 69).

For the years, 1498-1589, and the Orleans dynasty, LOUIS XII and AMBOISE, by Prof. Jules Isaac of the Lyons Lycée;

### 16th Century

MARY (Vol. 17, p. 824); FRANCIS I (Vol. 10, p. 934), by Prof. Isaac; LOUISE OF SAVOY; MARIIGNANO; PAVIA; MARGUERITE D'ANGOULÊME (Vol. 17, p. 706); ÉTAMPES (Vol. 9, p. 803); DU PRAT, ANNE DE MONTMORENCY (Vol. 18, p. 787); HENRY II (Vol. 13, p. 291); DIANE DE POITIERS; CATHERINE DE' MEDICI; FRANCIS II; GUISE (Vol. 12, p. 699); L'HÔPITAL; CONDÉ; AMBOISE; ROMORANTIN; HUGENOTS; CHARLES IX; COLIGNY; SAINT ANDRÉ; ST. BARTHOLOMEW; HENRY III.

For the Bourbon kings, beginning 1589—BOURBON (with genealogical chart);



HENRY IV; Duke of MAYENNE; EDICT OF NANTES (Vol. 19, p. 165); SULLY; • LOUIS XIII; MARIE DE' MEDICI; RICHELIEU, by Prof. J. T. Shotwell, Columbia University; CONCINI; LUYNES; CINQUE-MARS; ROHAN; SOUBISE; JANSENISM; THIRTY YEARS' WAR; and for leaders and engagements in that conflict the titles listed in the chapter in this Guide entitled *For Army Officers*; LOUIS XIV, by Prof. A. J. Grant of Leeds University; MAZARIN, by Prof. H. Morse Stephens, University of California; MARIE THERÈSE; LA VALLIÈRE; MONTESPAN; MAINTENON; Duc de BEAUFORT; FRONDE; TURENNE; RETZ and LA ROCHEFOUCAULD, by Prof. George Saintsbury of Edinburgh University; FOUQUET; COLBERT, by Prof. J. T. Shotwell, Columbia; CHAMPLAIN; LA SALLE; LOUVOIS; CAMISARDS, by M. Frank Puaux, president of the Société de l' Histoire du Protestantisme Français; JANSENISM, by Viscount St. Cyres; PORT ROYAL; BOSSUET; FENELON; LE TELLIER; GRAND ALLIANCE; and for details of military operations and sketches of commanders the articles enumerated in the chapter in this Guide *For Army Officers*; LOUIS XV; Philip II, Duke of ORLEANS (Vol. 20, p. 286); FLEURY; AUSTRIAN SUCCESSION and SEVEN YEARS' WAR and articles under these heads in the chapter in this Guide *For Army Officers*; CHATEAUX; POMPADOUR; DU BARRY; COMTE D' ARGENSON (Vol. 2, p. 459), CHOISEUL; MAUPEOU; AIGUILLON.

On the Revolution and the period immediately before it, the articles LOUIS XVI, by Robert Anchel, archivist to the Department de l' Eure; MARIE ANTOINETTE; BEAUMARCHAIS; MAUREPAS; TURGOT; NECKER; VERGENNES; CALONNE; DIAMOND NECKLACE; LOMÉNIE DE BRIENNE; FRENCH REVOLUTION (Vol. 10, p. 154, equivalent to 58 pages of this Guide), by Prof. F. C. Montague, University Col-

lege, London; DES MOULINS; MIRABEAU; SIEYÈS; DANTON; ROBESPIERRE; MOUNNIER; LA FAYETTE; MONTMORIN DE SAINT-HÉREM; MARAT; CORDAY; TALLEYRAND; ASSIGNATS; NARBONNE-LARA; JACOBINS; GIRONDISTS; ROLAND; BRISSOT; MOUNTAIN; DIRECTORY; BABEUF; FRENCH REVOLUTIONARY WARS; and for battles and leaders in these wars the articles mentioned under this head in the chapter in this Guide *For Army Officers*.

On the Napoleonic period, the articles by J. Holland Rose, author of *Napoleonic Studies*, etc., on NAPOLEON (Vol. 19, p. 190)—equivalent to 65 pages of this Guide, and on the principal figures of the Napoleonic period,—for example, BONAPARTE family, FOUCHÉ, GARDANE, JUNOT; the articles NAPOLEONIC CAMPAIGNS, PENINSULAR WAR and WATERLOO and the articles listed under these two heads in the chapter in this Guide *For Army Officers*.

On the Bourbon restoration, LOUIS XVIII; DECAZES; Duc de RICHELIEU (Vol. 23, p. 302); **The Kingdom Again** Duc de BERRY; VIL- LÈLE; CHARLES X (Vol. 5, p. 921); MARTIGNAC; POLIGNAC; MARMONT.

On the revolution of 1830 and the rule of Louis Philippe, the articles LOUIS PHILIPPE (Vol. 17, p. 51); CAVAINAC; THIERS; GUIZOT; CONSTANT; CASIMIR PÉRIER; LAFITTE; BARROT; DUPONT DE L'EURE; BERRYER; SAINT-SIMON; FOURIER; LAMENNAIS; Louis BLANC; MOLÉ.

On the revolution of 1848 and the second Empire, besides most of the articles in the preceding paragraph, NAPOLEON III, by Albert Thomas, author of *The Second Empire*; CRÉMIEUX; LEDRU-ROLLIN; CARNOT; GARNIER-PAGÈS; MONTALEMBERT; OLLIVIER; ROUHER; FAVRE; PICARD; CRIMEAN WAR; ITALIAN WARS; FRANCO-PRUSSIAN WAR;



and articles listed under those heads in the chapter in this Guide *For Army Officers*; EUGÈNE; MAXIMILIAN of Mexico (Vol. 17, p. 924).

On the Third Republic, 1870 and the following years, the story in Vol. 10, pp. 873-904 (equivalent to 100 pages of this Guide) is to be supplemented by the articles THIERS; RÉ-

MUSAT; SIMON; BARTHÉLEMY; BROGLIE; MACMAHON; DUFAURE; GRÈVY; FERRY; GAMBETTA; FREYCINET; CHAMBORD; CLÉMENTEAU; BRISSON; BOULANGER; CARNOT; LOUBET; LESSEPS; CASIMIR-PÉRIER; FAURE; RIBOT; MÉLINE; WALDECK-ROUSSEAU; DREYFUS; DUPUY; RIBOT; GALLIFFET; JAURÈS; MILLERAND; COMBES; DELCASSÉ; ROUVIER; PELLETAN; BRIAND; LEMIRE; FALLIÈRES; POINCARÉ.

## CHAPTER XLVII

### THE FAR EAST

**A**N account, in this chapter, of the principal articles dealing with the history of India, China and Japan, will sufficiently indicate to the student the plan adopted in the Britannica's treatment of all the countries in the far East. But before turning to these three groups of articles, he should read ASIA (Vol. 2, p. 734), which defines the social and economic position of the Orient in general, and gives a survey of the field covered by articles on Eastern countries other than the three dealt with in this chapter. This article, equivalent in length to 65 pages of this Guide, is by Sir Richard Strachey, the famous Indian administrator; Sir Charles Eliot, of the British diplomatic service; Sir T. H. Holdich, of the Indian Frontier Survey; and Philip Lake, the Oriental geologist.

**Asiatic Characteristics** of Asiatic characteristics, as revealed by history, with which the historical section (p. 749) of the article begins, is noteworthy in connection with current political questions:

The words "Asiatic" and "oriental" are often used as if they denoted a definite and homogeneous type, but Russians resemble Asiatics in many ways, and Turks, Hindus,

Chinese, etc., differ in so many important points that the common substratum is small. It amounts to this, that Asiatics have not the same sentiment of independence and freedom as Europeans. Individuals are thought of as members of a family, state or religion, rather than as entities with a destiny and rights of their own. This leads to autocracy in politics, fatalism in religion, and conservatism in both.

All three of these are certainly conspicuous in the history of the first Eastern country dealt with in this chapter.

#### INDIA

In the article INDIA (Vol. 14, p. 375), equivalent to 140 pages of this Guide) there is much of value to the historical student besides the chapter on *History* (p. 395), which is written by Sir William Wilson Hunter, administrative head of the statistical survey of India and one of the editors of *The Imperial Gazetteer of India*, and by James Sutherland Cotton, editor of this same Gazetteer. Particularly important are the sections, *The People* (p. 382), *Administration* (p. 385), and *Indian Costume* (p. 417), illustrated from pen-and-ink drawings by J. Lockwood Kipling, known to many as the illustrator of his son's book *Kim*. And the student of Oriental history will find it possible to gain a little comprehension

—at least—of Oriental ways of thought, Eastern setting and colour, by reading in the Britannica such articles as CASTE (Vol. 5, p. 464), HINDUISM (Vol. 13, p. 501), BRAHMANISM, BRAHMAN and BRAHMANA (Vol. 4, p. 378), all by Prof. Julius Eggeling, Edinburgh; BUDDHA and BUDDHISM (Vol. 4, p. 737), both by Prof. T. W. Rhys Davids of Manchester, author of *Sacred Books of the Buddhas*, etc.; MAHOMET (Vol. 17, p. 399), by Prof. D. G. Margoliouth, Oxford; MAHOMMEDAN INSTITUTIONS and MAHOMMEDAN LAW (Vol. 17, p. 411), by Prof. D. S. Macdonald, Hartford Theological Seminary, and MAHOMMEDAN RELIGION (Vol. 17, p. 417), by Rev. G. W. Thatcher, Camden College, Sydney, N. S. W.; INDIAN LAW (Vol. 14, p. 434), by Sir William Markby, author of *Lectures on English Law*, etc.; and ZOROASTER (Vol. 28, p. 1039), by Prof. Karl Geldner, Marburg, and PARSEES (Vol. 20, p. 866). This list of articles subsidiary to the history of India could be prolonged almost indefinitely, but enough has been given to put the student on the track of valuable articles which might otherwise escape his notice.

Before we come to the authentic history of India there is a legendary period, the only historic test for which is the rock inscriptions,—see the article INSCRIPTIONS, *Indian* (Vol. 14, p. 621), by J. F. Fleet, author of *Inscriptions of the Early Gupta Kings*. On the earliest literary description of the Aryans in India and their contests with the Dravidians see the article SANSKRIT, *Vedic Period* (especially p. 161 of Vol. 24, on the *Rig Veda*)—and in general the articles ARYAN and DRAVIDIAN. An interesting reconstruction of the civilization of the primitive Aryans on the basis of languages will be found in the article INDO-EUROPEAN LANGUAGES (Vol. 14, especially pp. 498–500), by Dr. Peter Giles, Cambridge, author of *Manual of Comparative Philology*; and this picture of Aryan life before the conquest of India will hold in the main for the earlier period of the Aryans in India.

With the 6th century we come to the beginning of the Buddhist period. See the article JAINS, the articles on Bud-

### Early Buddhism

dhism already mentioned, and the articles: ASOKA, the great Buddhist emperor and organizer of the faith, whose rock inscriptions throughout India are so valuable as historical records; KANISHKA, the Buddhist king of Kabul and Kashmir; FA-HIEN and HSÜAN TSANG, the Chinese pilgrims of India, who left important records of early Buddhism and of Brahmanism, which was steadily growing in power and strength.

The Hindu period, overlapping the Buddhist, is marked by the beginning of Western influences on India. For the Persians in India see the articles PERSIA (Vol. 21, especially pp. 209–210), DARIUS (Vol. 7, p. 832), and SCYLAX, the Greek who under Darius's orders explored the course of the Indus. Far more important was the conquest by Alexander the Great and the establishment of the Hellenistic empire of the Seleucids in Syria, Bactria and India: see ALEXANDER THE GREAT (Vol. 1, especially p. 548), NEARCHUS, Alexander's admiral and navigator, and SELEUCID DYNASTY. The first paramount ruler of India was CHANDRAGUPTA (Vol. 5, p. 839), whom the Greeks called Sandracottus and who crushed the Seleucid power and founded the Maurya dynasty. Of his grandson Asoka we have already spoken in outlining the growth and decline of Buddhism. In this period Greek thought and art influenced India greatly, and in the period immediately following—the 2nd century B.C.—north-western India was invaded again by western troops: see DEMETRIUS, EUCRATIDES, MENANDER. The records of the next four centuries are confused and vague; on the invasions from the North, see SAKA and YUE-CHI, by Sir Charles Norton Edgumbe Eliot.

The Yue-Chi founded the Kushan dynasty, in which the greatest king was

KANISHKA (Vol. 15, p. 653), already mentioned as a Buddhist ruler whose policy marked the beginning of the end of Buddhism in India. On the succeeding dynasty see the article GUPTA; and refer again to the article FA-HIEN for the Chinese account of the rule of the second Gupta king, Chandragupta,—on whom in legend see VIKRAMADITYA. On the White Huns and their invasion consult the articles EPHthalites and HUNS. On the only other great king of this period, who was paramount monarch of northern India in the first half of the 7th century and whose administration was described by Hsüan-Tsang, see HARSHA. On the principal Deccan dynasties of the Hindu period, see CHALUKYA and RASHTRAKUTA, and the article DECCAN.

For a general notion of the Mahomedan period in India the student should read the articles on Mahomedanism already mentioned,

**Mahomedans and Moslems** and for more definite information about India, the articles

on the 11th century invader MAHMUD OF GHAZNI (Vol. 17, p. 397), and on SOMNATH, the temple city which he captured and sacked in 1025. See DECCAN and GUJARAT for the Moslem conquest of these states by Ala-ud-din. For the destruction of the Tughlak dynasty, which followed Ala-ud-din's successors, see AFGHANISTAN (Vol. 1, especially p. 315) and TIMUR (Vol. 26, p. 994), by Major-General Sir Frederick John Goldsmid. The "last stand made by the national faith in India against conquering Islam" was in VIJAYANAGAR (Vol. 28, p. 62). With the 16th century and the Mogul dynasty, India is quite definitely Moslem: see BABER, HUMAYUN, AKBAR, ABUL FAZL the historian of Akbar's reign, JAHANGIR, SHAH JAHAN, and AGRA and INDIAN ARCHITECTURE (especially Fig. 17, opposite p. 433, Vol. 14) for the Taj Mahal, the Mausoleum built by Shah Jahan for his wife Mumtāz Mal, and—for the culmination of the Mogul power, the beginning of its

decay, and the first sign of Moslem bigotry and intolerance on the part of the Mogul emperors,—AURANGZEB. His attempt to conquer the Mahomedan kings of the Deccan gave the natives an opportunity to regain power: see the article MAHRATTAS, and for the earlier risings of the Mahrattas, SIVAJI. And for the rise of Afghan power under the Durani dynasty and the battle of Panipat in 1761, a crushing defeat for the Mahrattas, see AFGHANISTAN, *History* (Vol. 1, especially p. 316), and AHMAD SHAH.

On earlier European settlements in India see the article INDIA, *History* (Vol. 14, p. 404), and more particularly for Portuguese explorations and settlements the articles VASCO DA GAMA (Vol. 11, p. 433), ALBUQUERQUE (Vol. 1, p. 516), and GOA the capitol of Portuguese India, the last article being by K. G. Jayne, author of *Vasco da Gama and His Successors*: for Dutch rule the article DUTCH EAST INDIA COMPANY (Vol. 8, p. 716); and for the beginning of British influence in India the articles EAST INDIA COMPANY; SURAT; MADRAS, where the first English fort was built in 1640 and the first grant, except for factory use, was made by the English; BOMBAY, acquired from Portugal in 1661-65; SIR JOHN and SIR JOSIAH CHILD; JOB CHARNOCK, founder of Calcutta, and the article on CALCUTTA.

On British political history in India in the 18th century, see the articles on PONDICHERRY, DUPLEIX, French Governor-General in Pon-

### The British Conquest

dicherry, his rival CLIVE the founder of the British Empire and of the power of the East India Company in India, EYRE COOTE who took Pondicherry from the French in 1761, SURAJ-UD-DOWLAH and CALCUTTA for the siege of the city and story of the Black Hole, PLASSEY, SHAH ALAM for the massacre of PATNA; and for the period after CLIVE the articles WARREN HASTINGS, MAHRATTAS for the first Mahratta war, HYDER ALI and MYSORE for the

first Mysore war; TIPPOO SAHIB and CORNWALLIS for the second Mysore war; TEIGNMOUTH and BENGAL, for the permanent settlement of Bengal under Cornwallis; WELLESLEY and TIPPOO SAHIB and SERINGAPATAM, WELLINGTON and LAKE (Vol. 16, p. 85) for the campaigns against the French and natives during Wellesley's governor-generalship; LORD MINTO for the years from 1807 to 1813; MARQUESS OF HASTINGS, OCHTERLONY and NEPAL for the war in Nepal; for the wars of 1817 the articles PINDARIS, MAHARATTAS, ELPHINSTONE, SIR JOHN MALCOLM; for the administration (1823-28) of Lord Amherst, the articles AMHERST, BURMESE WARS, BHARATPUR and COMBERMERE; for Bentinck's rule, the articles BENTINCK, SUTTEE, THUGS by Reinhold Rost, late secretary of the Royal Asiatic Society, and MYSORE; METCALFE, for a view of his short tenure of office; for the stormy period of the '40's, AUCKLAND, ELLENBOROUGH, AFGHANISTAN, SIR W. H. MACNAGHTEN, SIR R. H. SALE and SIND; and for the Sikh wars, HARDINGE, PUNJAB, SIKH WARS, RANJIT SINGH, SIR HUGH GOUGH, DALHOUSIE, SIR HENRY LAWRENCE, EDWARDES, BURMESE WARS for the second war of 1852, and OUDH for its annexation; and for the close of the Company's rule, the articles LORD CANNING, INDIAN MUTINY, DELHI, LORD LAWRENCE, RICHARD BAIRD SMITH, JOHN NICHOLSON, SIR NEVILLE CHAMBERLAIN, CAWNPORE, NANA SAHIB, LUCKNOW, SIR HENRY LAWRENCE, SIR J. E. W. INGLIS, HAVELOCK, J. G. S. NEILL, OUTRAM, SIR COLIN CAMPBELL.

On India under the Crown, since 1858, see particularly the articles on the viceroys, CANNING, ELGIN, LAWRENCE, MAYO, NORTHBROOK, LYTTON (see also SHERE ALI and YAKUB KHAN),—RIPON (see also AYUB KHAN, EARL ROBERTS, and ABDUR RAHMAN KHAN), DUFFERIN (see also PANJDEH for the Russian scare of 1885 and BURMA and BURMESE WARS for the dispute with Thebaw), CURZON and KITCHENER, and MINTO.

## CHINA

As with India, so with China, the whole of the article in the Britannica is of value to the historical student. The article CHINA (Vol. 6, pp. 166-231) is equivalent to 200 pages of this Guide. The most important part for the student of history is section V. (pp. 188-212) on *History*: but such parts of the article as *Geography*, with a coloured map, the *People* (pp. 171-174), *Religion* (174-177), *Economics* (177-181), *Government and Administration* (181-188), *Art* (213-216) with illustrations, and *Language and Literature* (216-231) are all of importance to help get the background that is so baffling to an accidental studying the Far East. As was the case with India, the study of religions is particularly important and besides the section *Religion* in the article CHINA, the student should turn to the articles LAO-TSZE, the founder of a philosophy debased into Taoism, MENCIOUS, and CONFUCIUS, all by the Rev. James Legge, author of *The Religions of China*, and the editor of *The Chinese Classics*, and BUDDHISM and LAMAISM, the latter the form of Buddhism in vogue in China,—and he should remember that there are some Mahomedans in China. In connection with the latest developments in Chinese history he should read with great care in the article CHINA, Section IV, *Government and Administration*, especially p. 184 on the Civil Service, an elaborate merit system.

Section V. of the article CHINA opens with a treatment by Sir Henry Yule, the famous Orientalist, of the European knowledge of China before 1615, particularly "Cathay" and the early explorers of Mongolia, CARPINI (see Vol. 5, p. 397) and RUBRUQUIS (see Vol. 23, pp. 810-812), and of Cathay itself MARCO POLO (see Vol. 22, pp. 7-10). The internal history of China begins (Vol. 6, p. 191) with a discussion of Chinese origins: "anthropological arguments seem to contradict the idea of any connection with Babylonians, Egyptians, Assyrians, or



Indians. The earliest hieroglyphics of the Chinese, ascribed by them to the Shang dynasty (second millennium B.C.) betray the Mongol character of the nation that invented them by the decided obliquity of the human eye whenever it appears in an ideograph. . . . Our standpoint as regards the origin of the Chinese race is, therefore, that of the agnostic. . . . Their civilization was already old at a time when Britain and Germany were peopled by half-naked barbarians, and the philosophical and ethical principles on which it is based remain, to all appearances, as firmly rooted as ever." Chinese legendary history goes back to Fu-hi as the "first historical emperor; and they place his life-time in the years 2852-2738 B.C." There is much that is purely legendary and mythical in these early records, but with the

#### The First Definite Date

year 776 B.C. we find a veritable record: in an ode referring to a wicked emperor there is mention of "certain signs showing that Heaven itself is indignant at Yu-wang's crimes. One of these signs was an eclipse of the sun . . . the date and month being clearly stated. This date corresponds exactly with August 29, 776 B.C.; and astronomers have calculated that on that precise date an eclipse of the sun was visible in North China." It is an interesting coincidence that this earliest sure date in Chinese history is the date of the first Greek Olympiad, from which time was reckoned in the Greek calendar—though there are no certain dates in Greek history until much later. The first outstanding event in the history of China was nearly 20 centuries later—the Mongol invasion; see the articles MONGOLS (Vol. 18, pp. 712-719) and JENGHIZ KHAN (Vol. 15, p. 316), both by Sir Robert K. Douglas, author of *The Life of Jenghiz Khan*. On the period immediately following see KUBLAI KHAN, for the foundation of the Mongol dynasty, and the section *Medieval Cathay* (Vol. 6, p. 189) of

the article CHINA for early exploration and missionary effort. Mongol rule was broken in the 14th century by the founder of the Ming dynasty. The Portuguese arrival at Canton in 1517 marked the beginning of modern intercourse with Europe; and see the article MATTEO RICCI by Sir Henry Yule, for the first important

#### Foreign Relations

work of a Christian missionary in China early in the 17th century. Immediately thereafter came the Manchu invasion, on which see the article MANCHURIA, by Sir R. K. Douglas. Trade with Europe on a large scale began in the second half of the 18th century; see the article CANTON. British diplomatic missions for the improvement of the condition of traders in Canton were unsuccessful, but in 1840 the opium war made China feel the weight of Great Britain's power when Hong Kong was ceded to the English and other ports were opened to trade: see LORD NAPIER, SIR HUGH GOUGH, and HONG-KONG. On the T'ai-p'ing rebellion, the "Arrow" affair, and the second interference of Great Britain with China, see SIR H. S. PARKES, CHARLES GEORGE GORDON ("Chinese Gordon"), EARL OF ELGIN (Vol. 9, p. 268), TSENG KUO-FAN, LI HUNG CHANG. On the Russian boundary disputes of 1858 and 1860 see AMUR and VLADIVOSTOK.

The history of China since 1875 is told pretty completely in the article CHINA, in two sections, the first on 1875-1901 being by Sir Valentine Chirol, author of *The Far Eastern Question*. But in connection with the general treatment the student should read the articles on KOREA, ANNAM and TONGKING for the earlier efforts to detach from the Chinese empire these quasi-vassals; CHINO-JAPANESE WAR for the military details of the struggle by which Japan got command of the Korean coast-line; MEKONG for the dispute of 1895 with Great Britain; KIAOCHOW BAY, PORT ARTHUR and WEI-HAI-WEI for the seizures of 1897 and



1898 by Germany, Russia and Great Britain respectively; JOHN HAY for America's part in the Open Door policy; PEKING and TIENSIN for details added to the general account in the article CHINA, of the "Boxer" rising; MANCHURIA for Russian encroachments before, and JAPAN for Manchuria after the Russo-Japanese War.

### JAPAN

The article JAPAN (Vol. 15, p. 156) is equivalent to 370 pages of this Guide,—and is almost entirely the work of Captain Frank Brinkley, editor of the *Japan Mail*, author of *Japan, A History of Japan, An Unabridged Japanese-English Dictionary*, etc. The article is divided into 10 parts—*Geography, People, Language and Literature, Art, Economic Conditions, Government and Administration, Religion, Foreign Intercourse, Domestic History, and The Claim of Japan; A Japanese View*, by Baron Dairoku Kikuchi, in which the president of the Imperial University of Kyoto and of the Imperial Academy of Japan discusses "the ambition of the Japanese people . . . to be recognized as an equal by the Great Powers," their resenting "any discrimination against them as an Asiatic people," the "misrepresentation, arising from want of proper knowledge of Japanese character and feelings,"

**Japanese in America** that the Japanese immediately after the war with Russia were "ready and eager to fight with the United States"—whereas the Japanese have always regarded the Americans with a special good will, due no doubt to the steady liberal attitude of the American government and people towards Japan and Japanese, and they look upon the idea of war between Japan and the United States as ridiculous."

Any justifiable discrimination against the Japanese as Asiatics must of course be based upon such characteristics of custom and thought as render Japanese im-

migration undesirable, and not upon the colour of the Japanese skin or any other peculiarity of appearance. But it is none the less interesting to turn from Baron Dairoku Kikuchi's argument to Capt. Brinkley's careful study (p. 164) of the physical characteristics of the Japanese. "The best authorities are agreed that the Japanese do not differ, physically, from their Korean and Chinese neighbors as much as the inhabitants of Northern Europe differ from those of Southern Europe." Some of the bodily traits which distinguish the Japanese from races of European origin are to be observed "in the eyes, the eyelashes, the cheekbones and the beard."

**Marks of the Race** The eyeball does not differ from that of an occidental, but the eye is less deeply set. The conspicuous peculiarity is that the upper eyelids are much heavier at the inner corners than at the outer, making the eyes apparently oblique; and a fold of the upper lids hangs over the roots of the upper lashes. The lashes, too, are short and scanty, and converge, instead of diverging as they do in occidentals, so that the tips are nearer together than the roots. There is but little hair on the face (except among the Ainus), and it is nearly always straight. The cheekbones are prominent among the lower, rather than the upper classes. The article proceeds to discuss the moral characteristics of the Japanese; attributing to them a degree of frugality and endurance such as to make it virtually impossible for any occidental race, living in reasonable comfort, to compete with Japanese labour.

As in the study of India and China, it will be well for the student of Japanese history to make himself familiar with the Britannica's full material on native religion: see Vol. 15, p. 222, noting especially that in the section on Shinto it is said: "The grandson of the sun goddess was the first sovereign of Japan, and his descendants have ruled the land in unbroken succession ever since."

In Japanese history two main topics of study present themselves—foreign intercourse and domestic or internal history—the former naturally the more attractive

**Foreign Intercourse**

to the foreign student, and of additional interest both because of its picturesque and romantic early detail and by reason of its explaining the sudden emergence of Japan as a power in world politics. Portuguese shipwrecked in Japan in 1542 or 1543 opened the country to Portuguese trade and in 1549 landed the great Jesuit missionary, FRANCISCO DE XAVIER: see the article by K. G. Jayne, author of *Vasco da Gama and his Successors*. The contest between Spain and Portugal for Eastern trade and between Jesuits and Franciscans for Japanese converts to Christianity and the other factors that resulted in the suppression of Christianity in 1614 and the consequent persecutions of converts and missionaries are told in the article JAPAN—and so also is the story of the foothold that Dutch and English traders got before the Japanese practically excluded them also, as Christians rather than as foreigners or traders. From the middle of the 17th to the beginning of the 19th century Japan was practically untouched by Western civilization. The part of the United States navy in opening the country to trade in 1853 is described in the article JAPAN (pp. 237-238) and in the article MATTHEW CALBRAITH PERRY. The article JAPAN also devotes much space (p. 238) to the work done by another American, Townsend Harris, who was less known than Perry, but who carried through the immensely important first commercial treaty.

The remainder of the story of Japan's foreign relations is given in the main article JAPAN, but the

**Recent Wars**

student should read besides the articles CHINO - JAPANESE WAR, MANCHURIA,

and RUSSO-JAPANESE WAR. The last of these would be equivalent to 40 pages of this Guide; it is accompanied by the following plans: *General Dispositions after Nanshan, Liao-Yang, Port Arthur, and Mukden*: and it is a remarkable critical summary of the military operations of the war. Read also the biographies of KATSURA, KODAMA, KUROKI, NOGI, NOZU, OKUMA, OYAMA, TOGO, YAMAGATA.

As for domestic history, it is important to note that early Japanese history is more purely mythical and legendary, and

**Domestic History**

is chronologically untrustworthy for a longer period than is Chinese history. The conventionally accepted date of the establishment of the Empire is 660 B. C.; and from this year all dates are reckoned; but Japanese annals are self-contradictory and are proved faulty by Chinese and Korean records. Even the famed Japanese invasion of Korea in 200 is possibly apocryphal, and there are few trustworthy recorded facts before 400 A.D. or dates before 500 A.D. In the middle of the 6th century Chinese influence, through Korea, became strong, and in 552 Buddhism was introduced from Korea. A century later legislative government and administrative reform began.

On the Japanese feudal system beginning in the 12th century see: the article BUSHIDO; in the article JAPAN the account of the earlier army; and the articles SHOGUN and MIKADO. The more important separate articles for the later period are: TOKUGAWA and ARISUGAWA for the rival families of the 17th-19th centuries; MUTSU HITO; SANJO; OKUBO TOSHIMITSU; SAIGO; MUTSU; IWAKURA MATSUKATA, the financier; KATO; KOMURA; ITO; ENOMOTO; ITAGAKI, "the first to organize and lead a political party in Japan"; INOUE; OKUMA; YAMAGATA; HAYASHI.

## CHAPTER XLVIII

### ECONOMICS AND SOCIAL SCIENCE

**M**ANY topics in the field of economics and social science are treated with some detail in other parts of this Guide. For public finance, for instance, see the chapter *For Bankers and Financiers*. Tariffs, trusts, labour questions and the problems of population (such as immigration, eugenics, aliens and race-conflict, the liquor traffic, penal and charitable institutions) are among the topics presented in the course on *Questions of the Day*. In this chapter is a brief outline of the entire subject, including these special topics.

The key article, equivalent to 35 pages in this Guide, is *ECONOMICS*, (Vol. 8, p. 899), by W. A. S. Hewins, formerly director of the London School of Economics, secretary of the tariff commission.

For the history of economic theory in biographies of great economists, see JEAN BODIN; THOMAS MUN; HOBBS;

#### Great Economists

SIR WILLIAM PETTY; SIR WILLIAM TEMPLE; SIR JOSIAH CHILD; VAUBAN; SIR DUDLEY NORTH; FÉNELON; CHARLES DAVENANT; PIERRE BOISGUILBERT; MONTESQUIEU; FRANÇOIS QUESNAY; BENJAMIN FRANKLIN; ANTONIO GENOVESI; SIR JAMES STEUART; JOSIAH TUCKER; VICTOR MIRABEAU; COUNT OF CARLI-RUBBI; JUSTUS MÖSER; PEDRO RODRIGUEZ; ADAM SMITH; ANNE ROBERT JACQUES TURGOT; FERDINANDO GALIANI; BECCARIA-BONESANA; DU PONT DE NEMOURS; GASPAR MELCHOR DE JOVELLANOS; GAETANO FILANGIERI; ALEXANDER HAMILTON; HENRY THORN-

TON; THOMAS ROBERT MALTHUS; MELCHIORRE GIOJA; JEAN BAPTISTE SAY; DAVID RICARDO; JEAN C. L. DE SISMONDI; JAMES MILL; THOMAS TOOKE; RICHARD JONES; ROBERT TORRENS; FRIEDRICH LIST; J. R. M'CULLOCH; NASSAU W. SENIOR; KARL HEINRICH RAU; HENRY CHARLES CAREY; AUGUSTE COMTE; FREDERIC BASTIAT; HARRIET MARTINEAU; JOHN STUART MILL; BONAMY PRICE; W. T. THORNTON; EMILE DE LAVELEYE; J. E. CAIRNES; J. E. THOROLD ROGERS; J. K. INGRAM; WALTER BAGEHOT; T. E. CLIFFE LESLIE; DAVID AMES WELLS; W. STANLEY JEVONS; HENRY GEORGE; FRANCIS AMASA WALKER; W. G. SUMNER; L. J. BRENTANO; WILLIAM CUNNINGHAM; EUGEN BOEHM VON BAWERK; ARNOLD TOYNBEE; R. T. ELY; A. T. HADLEY; D. R. DEWEY; F. W. TAUSSIG; W. J. ASHLEY; E. W. BEMIS; and E. R. A. SELIGMAN.

For the chief branches of economic theory read:

VALUE (Vol. 27, p. 867) by Dr. J. S. Nicholson, professor of political economy, Edinburgh University, author of *Principles of Political*

*Economy*, etc. This article, equivalent to 25 pages of this

Guide, distinguishes between utility and value—to be valuable a “thing must have some utility; and there must be some difficulty in its attainment.” There are three laws of value—supply and demand, in the discussion of which monopoly-values and competition-values are considered; that of cost of production, in which

cost of raw material and wages are obvious factors; and that of increasing cost with increased quantity of production,—upon which depends the theory of rent.

**WEALTH** (Vol. 28, p. 437) is by the same author, who adopts the definition of wealth connected with the name of Adolf von Held, based on a study of *consumption, production and distribution* of wealth,—“consumable utilities which require labour for their production and can be appropriated and exchanged.”

**CONSUMPTION** (Vol. 7, p. 23) is the “destruction of utilities.”

**PRODUCTION** (Vol. 22, p. 423) is the creation of utilities.

**CAPITAL** (Vol. 5, p. 278) is accumulated wealth available for earning interest and producing fresh wealth. It is not antithetical to labour, but . . . the accumulated savings of labour and of the profits accruing from the savings of labour.” The “importance of ability or brain-work, as against much of modern theorizing against capitalism,” must not be overlooked.

**WAGES** (Vol. 28, p. 229), also by Dr. Nicholson, is equivalent to 17 pages in this Guide. It distinguishes between nominal and real wages, describes the economic wages fund theory, and deals with such topics as state regulation of wages, factory legislation, trades unions and wages, effects of machinery on wages.

Further information, more particularly in the field of finance, will be found in:

**BANKS AND BANKING** (Vol. 3, p. 334), with a special treatment of American banking by Charles A. Conant, formerly treasurer of the Morton Trust Co., New York City, and author of *History of Modern Banks of Issue*, and with the general description by Sir Robert Palgrave, director of Barclay & Co., Ltd., and editor of the *Dictionary of Political Economy*.

**TRUST COMPANY** (Vol. 27, p. 329) is

by C. A. Conant, late treasurer of the Morton Trust Co., New York.

**MONEY** (Vol. 18, p. 694) and **FINANCE** (Vol. 10, p. 347) are by Prof. Charles Francis Bastable, University of Dublin, author of *Public Finance*, etc.

See also the articles on **GOLD**, **SILVER**, **BIMETALLISM**, and **MONETARY CONFERENCES**.

On “Ideal” social systems, see these four groups of articles:

**ANARCHISM** (Vol. 1, p. 914), by Prince Kropotkin, author of *Modern Science and Anarchism*, and a contributor to the

Britannica on **Russian geography**; and **Anarchism, Socialism, etc.**

**NIHILISM** (Vol. 19, p. 686), by Sir Donald

Mackenzie Wallace, author of *Russia*, and *The Web of Empire*; and biographies of **WILLIAM GODWIN**, **PROUDHON**, **BAKUNIN**, **CLÉMENCE MICHEL**, **KROPOTKIN**, **MOST**, **RECLUS** (like Kropotkin, well known as a geographer), **TOLSTOY**, and on “anarchist” outrages see **CHICAGO** (Vol. 6, p. 125), **MCKINLEY**, **ALEXANDER II of Russia**, **M. F. S. CARNOT**, **ELIZABETH of Austria** (Vol. 9, p. 285), and **HUMBERT**.

**COMMUNISM** (Vol. 6, p. 791), and see also **ROBERT OWEN**, **NEW HARMONY**, **AMANA**, **SHAKERS**, **FOURIER**, **BROOK FARM**, **CONSIDERANT**, **CABET**, **SAINT-SIMON** and **ONEIDA COMMUNITY**; and on Plato’s “Republic,” **PLATO** (especially pp. 818–819, Vol. 21); on More’s “Utopia,” the article **SIR THOMAS MORE** (especially p. 825, Vol. 18); on Bacon’s “New Atlantis,” the article **FRANCIS BACON** (especially p. 144, Vol. 3); on Hobbe’s “Leviathan,” the article **HOBBS** (especially p. 547, Vol. 13); on Campanella’s “Civitas Solis” or “City of the Sun,” the article **CAMPANELLA** (Vol. 5, p. 121); **SAMUEL BUTLER** (Vol. 4, p. 887) for “Erewhon” and “Erewhon Revisited”; and **EDWARD BELLAMY** (Vol. 3, p. 694) for “Looking Backward,” the latest of the well-known literary pictures of an ideal commonwealth.

**CO-OPERATION** (Vol. 7, p. 82), by



Aneurin Williams, chairman of executive, International Co-Operative Alliance, and author of *Twenty-eight Years of Co-operation at Guise*; and BUILDING SOCIETIES (Vol. 4, p. 766) and FRIENDLY SOCIETIES (Vol. 11, p. 217), both collaborative articles by Sir Edward William Brabrook, late chief registrar of friendly societies, and Dr. Carroll D. Wright, late United States Commissioner of Labor; and for the different co-operative experiments, see, in addition to the articles mentioned under Communism above: ROCHDALE, GUISE, JEAN BAPTISTE, ANDRÉ GODIN, E. V. NEALE, RAIFFEISEN and SCHULZE-DELITZSCH for German co-operative banks and rural credit, IRELAND (especially p. 749, Vol. 14), FRANCE (especially p. 782, Vol. 10), ITALY (especially p. 14, Vol. 15), RUSSIA (especially p. 887, Vol. 23, on the *Artel*); and for American approaches to co-operation the articles HOPEDALE, PULLMAN and MORMONS (especially p. 846, Vol. 18).

SOCIALISM (Vol. 25, p. 301), by James Bonar, author of *Philosophy and Political Economy*; and supplement this by the articles ROBERT OWEN; KARL MARX, by Edward Bernstein, author of *Theorie und Geschichte des Socialismus* and formerly a Socialist member of the Reichstag and a leader of the German Socialist movement away from MARX; ROBERTUS; LASSALLE; KETTLER; BEBEL; LIEBKNECHT; SCHMOLLER; JAURES; MILLERAND; HENRY GEORGE; WILLIAM MORRIS; H. G. WELLS; BERNARD SHAW; JOHN BURNS; and local articles, especially NEW ZEALAND and FINLAND.

Among the more interesting general economic topics are tariffs and trusts, matters of constant and great importance

Tariffs, both in politics and business. See the articles: TARIFF (Vol. 26, p. 422), by

Dr. F. W. Taussig, professor at Harvard, and author of *The Tariff History of the United States*; FREE TRADE (Vol. 11, p. 88), by Dr. William Cunningham, arch-

deacon of Ely, author of *Growth of English Industry and Commerce*.

PROTECTION (Vol. 22, p. 464), by E. J. James, president of the University of Illinois, author of *History of American Tariff Legislation*, etc.

For the history of tariff legislation in the United States, the articles ALEXANDER HAMILTON, HENRY CLAY, FEDERALIST PARTY, ANTI-FEDERALIST PARTY, DEMOCRATIC PARTY, WHIG PARTY, REPUBLICAN PARTY, J. S. MORRILL, MCKINLEY, etc., and UNITED STATES HISTORY (Vol. 27) especially § 113 (p. 689), § 151 (p. 694), § 195 (p. 701), § 241 (p. 708), § 297 (p. 716), § 314 (p. 718), § 354 (p. 728), § 370 (p. 728), § 373 (p. 729), etc.

And for the English tariff legislation in the last hundred years, the articles CORN LAWS, JOHN BRIGHT, COBDEN, JOSEPH CHAMBERLAIN, etc.

The article TRUSTS (Vol. 27, p. 334), by Prof. J. W. Jenks of New York University should be supplemented by the article GILDS (Vol. 12, p. 14), contributed by the late Professor Charles Gross of Harvard University, and for American Trust Legislation, by the articles INTERSTATE COMMERCE (Vol. 14, p. 711) and UNITED STATES, *History* (Vol. 27), especially pages 725-726, 729, 734. See also under separate state headings.

The article on Gilds just referred to will serve as an introduction to the subject of labour and labour organiza-

### Labour and Wages

tions. The most important articles on modern conditions are TRADE UNIONS (Vol. 27, p. 140); STRIKES AND LOCK-OUTS (Vol. 25, p. 1024); and LABOUR LEGISLATION (Vol. 16, p. 7), all with American sections by Carroll D. Wright, late U. S. Commissioner of Labor. On labour legislation see the special article EMPLOYERS' LIABILITY (Vol. 9, p. 356) and the sections on legislation and miscellaneous laws in separate state articles.

One of the great branches of economics is the study of statistics. Advisedly



we say "study of statistics" and in the  
 Britannica the student will find comparatively few statistical tables, but much analysis both of statistics and of their meaning. For statistics of population see, for instance, the section on population in the article UNITED STATES or in any one of the state or city articles. Under *Population and Social Conditions* in the article UNITED STATES (Vol. 27, pp. 634-638) are treated: growth of the nation geographically and in population, with special consideration of immigration; changes in localities; urban and rural population; interstate migration; sexes; vital statistics—death rate, marriage, families, birth-rate, illiteracy; religious statistics; occupations; national wealth. And the state articles give: total population at each census; foreign-born and of foreign parentage,—often with analysis and historical outlines of immigration and its variation and character and amount; religious statistics; negroes and whites, Indians, Asiatics, etc.; urban population, with list of larger cities and population of each. In articles on American cities and towns population figures are given from the last census; comparisons are made between native and foreign-born and the foreign-born are classified, and, where there is a predominant element, like the Germans in Cincinnati and St. Louis, an estimate of the influence of this element.

One of the problems of population peculiar to the United States, particularly the Southern states, is the negro. See the article NEGRO (Vol. 19, p. 344), especially the part dealing with the United States, which is by Walter F. Willcox, professor of social science and statistics in Cornell University and chief statistician of the U. S. Census Bureau. This article and that on DIVORCE (Vol. 8, p. 334)—another urgent American problem—are remarkable examples of the

treatment of a social question from the point of view of a statistician in a most interesting and illuminating manner, although based on dry statistics, and in a manner all the more satisfying and accurate because it has carefully analyzed figures at the back of it.

The status of the negro in different states is described in the separate state articles, and there, too, the reader will find a summary of local divorce laws.

Other articles coming under the head of population are INFANTICIDE, ILLEGITIMACY, LEGITIMACY and LEGITIMATION.

In the chapter in this Guide on *Questions of the Day* attention is called to the increasing tendency of the state to control and regulate matters which a generation or so ago were considered outside the sphere of government. Two particular economic questions—"social evils" we sometimes call them—are foremost in this category and on these the student of economics should read in the Britannica:

The article PROSTITUTION (Vol. 22, p. 457), by Dr. Arthur Shadwell, member of the Council of the Epidemiological Society and author of *Industrial Efficiency and Drink, Temperance and Legislation*, and the articles LIQUOR LAWS (Vol. 16, p. 759) and TEMPERANCE (Vol. 26, p. 578), also by Dr. Shadwell. These should be supplemented by accounts of local legislation against liquor, as for example in the articles MAINE, KANSAS, SOUTH CAROLINA, etc. On the Gothenburg system of Sweden and Norway see Vol. 16, pp. 769 and 780, and Vol. 26, p. 587, where we learn that the essence of this method of conducting the retail traffic is that the element of private gain is eliminated. See besides biographies of temperance reformers—e.g., THEOBALD MATHEW, NEAL DOW, JOHN B. GOUGH, etc.

Another great problem which the state and the municipality are attempting to

solve, or to help solve, by means of legislation is that of housing. See the article HOUSING (Vol. 13, p. 814), which comprises not only the topic of city housing and its faults due to overcrowding, excessive value of land in great cities, etc., but the subject of rural housing, and the experiments in garden cities, model towns, etc. See also the article OCTAVIA HILL (Vol. 13, p. 465), and for American model towns, HOPEDALE, PULLMAN, etc.

Many movements for social welfare are of a very different character and are based on an entirely different principle

**Social Welfare** from that of repressive or controlling legislation. Charities, education, care of insane, training of defectives, prison reform—such are a few of these topics, and the student will quickly learn that these burdens have been borne quite as much by the individual as by the State, and that in many instances individual initiative has by long and laborious effort succeeded in reforming in this field abuses which had flourished under government care.

Of prime importance to the student is the elaborate article on CHARITY AND CHARITIES (Vol. 5, p. 860), by Dr. Charles Stewart Loch, secretary to the council of the London Charity Organization Society and author of *Charity Organization, Methods of Social Advance*, etc. This article, equivalent in contents to 100 pages of this Guide, is made up of an introduction and six parts, as follows:

Introduction: "Charity," as used in New Testament, means love and mercy—an ideal social state.

Part I.—Primitive Charity—highly developed idea of duty to guest or stranger, whether beggar or vagrant.

Part II.—Charity among the Greeks. "In Crete and Sparta the citizens were wholly supported out of the public resources." In Athens, charity by: legal enactment for release of debts; assisted

emigration; gifts of grain; poor relief for infirm and for orphans of soldiers; pay for public service; private charity; loan societies.

Part III.—Charity in Roman Times. "The system obliged the hard-working to maintain the idlers, while it continually increased their number." "The effect on agriculture, and proportionally on commerce generally, was ruinous."

Part IV.—Jewish and Christian Charity. In Christianity a fusion of Jewish and Greco-Roman practice. Summary of Hebrew Charity. "To mark the line of development, we compare: 1. The family among Jews and in the early Christian church. 2. The sources of relief and the tithe, the treatment of the poor and their aid, and the assistance of special classes of poor. 3. The care of strangers; and, lastly, we would consider the theory of alms giving, friendship or love, and charity."

Part V.—Medieval Charity and its Development. St. Francis and his influence. St. Thomas Aquinas. Medieval endowed charities.

Part VI.—After the Reformation. "The religious life was to be democratic—not in religious bodies, but in the whole people; and in a new sense—in relation to family and social life—it was to be moral. That was the significance of the Reformation." Organization of municipal relief. Poor relief acts and statutory serfdom. Progress of thought in 18th and 19th century: influence of Rousseau, of Law, of Howard, of Bentham, of Non-conformists, particularly Friends in England; Society for Bettering the Condition of the Poor (1796). The Poor Law. Movement for Old Age Pensions. Charity Organization. Hospitals.

American charities and their peculiar problems.

Other articles bearing on the subject are:

POOR LAW (Vol. 22, p. 74), for the British system, and Dr. T. A. Ingram's articles UNEMPLOYMENT (Vol. 27, p. 578) and VAGRANCY (Vol. 27, p. 837).

One of the earliest and most important definite charitable movements was prison

reform. On this subject see in the Britannica the articles,—**Prisons** all by Major Arthur Griffiths, British inspector of prisons,—**PRISON, CRIME, CRIMINOLOGY, CHILDREN'S COURTS, POLICE, JUVENILE OFFENDERS, DEPORTATION, FINGER PRINTS, IDENTIFICATION.** This series of articles shows both the improvements in methods of treating criminals, in itself a means of protecting society, and the better methods of defense and of police.

On the treatment of the insane and feeble-minded, on the gradual assumption of responsibility for them by governments, and on the transition from the prison-like asylum to the modern hospital, see the article **INSANITY**, particularly part III (Vol. 14, p. 616), on Hospital Treatment, by Dr. Frederick Peterson, professor of psychiatry, Columbia University, author of *Mental Diseases*, etc.

As great as the change in treatment of the insane has been that in the treatment of the deaf and blind. On this subject read the **Deaf and Blind** articles: **BLINDNESS** (Vol. 4, p. 59), by Sir Francis J. Campbell, principal of the Royal Normal College for the Blind; and **DEAF AND DUMB** (Vol. 7, p. 880), by the Rev. Arnold Hill Payne, chaplain of the Oxford Diocesan Mission to the Deaf and Dumb. Both these authors have had experience in teaching in the United States as well as in Great Britain,—one of the many striking instances of

the wisdom displayed in the choice of contributors to the Britannica. And see the articles on **GALLAUDET** (Vol. 11, p. 416), the great teacher of the deaf, and **S. G. HOWE** (Vol. 13, p. 837), the educator of the blind.

The following list, arranged for the most part in chronological order, gives some of the names of reformers and philanthropists about whom there are separate articles.

**Biographies** These biographical sketches will be of great value for the study of the history and development of charitable work for the public welfare.

|                        |                         |
|------------------------|-------------------------|
| John Kyrle             | J. B. A. Godin          |
| Thomas Guy             | John B. Gough           |
| Thomas Coram           | George Jacob Holyoake   |
| Adam Anderson          | Madhowdas Vurjeevan-    |
| Gen. Booth             | das                     |
| John Howard            | Clara Barton            |
| Tuke (family)          | Louis Adolphe Bertillon |
| Baron de Montyon       | Henri Cernuschi         |
| Granville Sharp        | Mary Ashton Livermore   |
| Johann Beckmann        | Sir Francis Galton      |
| Sir Thomas Bernard     | Geo. Thorndike Angell   |
| Robert Owen            | Sir D. M. Pettit        |
| François Charles Marie | George Smith of Coal-   |
| Fourier                | ville                   |
| George Birkbeck        | M. E. L. Walras         |
| Elizabeth Fry          | Emily Faithfull         |
| Sir M. H. Montefiore   | Lyman Judson Gage       |
| Sir Thomas F. Buxton   | Octavia and Miranda     |
| Theobald Mathew        | Hill                    |
| Lucretia Mott          | A. Carnegie             |
| Joseph Sturge          | Baron Rowton            |
| Sir Rowland Hill       | J. D. Rockefeller       |
| B. N. M. Appert        | Benjamin Waugh          |
| Gerrit Smith           | Frances E. Willard      |
| Framjee Nasarwanjee    | F. A. Bebel             |
| Patel                  | Charles Booth           |
| Victor P. Considerant  | Gabriel Tarde           |
| E. Vansittart Neale    | Laurence Gronlund       |
| Baroness Burdett       | Samuel Gompers          |
| Coutts                 | Sidney Webb             |
| Grace Horshey Darling  | Jane Addams             |
|                        | Helen Gould             |

## CHAPTER XLIX

### HEALTH AND DISEASE

**Y**OU may have happened to glance at one of the text-books written for the use of medical students and of doctors, and found that you could hardly understand a word of it. And yet you have found, when you consulted a specialist, and he wanted to explain to you just what was wrong with some part of your body, that he could make it all quite clear to you. The six hundred articles on health and disease in the Britannica are written by specialists, most of them, indeed, by professors in the leading medical schools; and these contributors to the Britannica are also the authors of many of the best text-books that practising physicians and surgeons habitually use. But in the Britannica the specialists were writing for the general public; and for that reason they have taken care not to be too technical either in their point of view or in the language they use.

In this present chapter of the Reader's Guide, the subject of health and disease is treated just as the Guide treats any

#### Right and Wrong Way to Read

other department of knowledge. You may want to learn something about it because it is one of the most wonderful branches of science, just as you would take up the course of reading on astronomy. Or you may feel that you ought to know more than you do about your own body, about the way you should live in order to preserve your health, and about the causes of the diseases to which you are exposed. Some

people will tell you that it is unwise to read about the subject at all. That is absurd. There are no doubt exceptional people, with unsound nerves, who will imagine they must take every patent medicine they see advertised, and who long to try every newly discovered serum that the newspapers tell them about.

Again, you may be told that if you try to learn something about health and disease, you will be tempted to think you

#### The Danger of "Doctoring" Yourself

know as much as the doctor; and so neglect to go to him when you need his advice. But this objection, again, applies only to people who lack good sense. For example, if you read the article on DENTISTRY, by Dr. E. C. Kirk, dean of the Dental Faculty of the University of Pennsylvania, it will help you to understand whatever your dentist may be doing for you. But it will certainly not give you the idea that you could fill your own teeth.

When you find your watch has stopped, you wind it. Then, if it does not start, you take it to the watchmaker. If, instead of doing that, you tried to tinker with it yourself, you would soon be in trouble. On the other hand, it would be ridiculous to go to the watchmaker without first finding out whether the watch merely wanted winding, and a man ought to know enough about his watch to connect the fact that it has stopped with the probability that he has forgotten to wind it. The daily winding is his work, not the watchmaker's. The chemical and me-

chanical work that is going on within you is as complicated as anything in a watch or anything that you could see in a laboratory or factory. It is your business (*and your most important business, for if you neglect it, you will not be able to do anything properly, for yourself or for anybody else*) to keep this machinery running, and to do that is not so simple as to wind a watch. Your body needs food and warmth. It very probably gets too much of both. Furthermore, the food is often unwholesome, and the warmed air is often bad air. But unless you are a millionaire invalid, you do not have a private doctor with you at all hours to watch the food put on your plate and to ventilate your room.

The average watch is better treated than the average human body, and when the average body goes wrong, through the

### The Kind of Knowledge You Need

average man's thoughtlessness, he proceeds, without in the least knowing what is wrong, to

take violent medicines, or to experiment with some fad about diet or underclothing or gymnastics, and to make matters very much worse. The knowledge he can gain from the Britannica will tend to keep him from being careless, and also from trying to doctor himself when he needs professional care. Whether you undertake a complete course of medical reading or not, it is certainly worth your while to read the first group of articles mentioned in this chapter—those which have to do with the healthy routine of life.

You will find the best introduction to the subject of diet in general in a section (Vol. 26, p. 799) of the article THERAPEUTICS, by Sir

### Eating and Drinking

Lauder Brunton. He is one of the most famous consulting physicians in the world, and he gives you advice which your own doctor will certainly confirm when he tells you that the way to avoid indigestion is to masticate your

food well and sip half a pint of hot water four times a day—when you go to bed, when you get up, and again about an hour before luncheon and dinner, instead of drinking anything with any meal except your breakfast. If you try that treatment for a week, you will be glad that you looked at this chapter of the Guide. NUTRITION (Vol. 19, p. 920), by Prof. Noel Paton and Dr. Cathcart, describes the process of nourishment and shows how important it is to chew the food thoroughly, not only in order to break it up, but also in order to combine with it a sufficient supply of the chemical juices which come from the glands in the mouth. DIETETICS (Vol. 8, p. 214) shows what use your body makes of each kind of food that you eat. This article, by the late Dr. Atwater of the United States Department of Agriculture, who conducted the famous government investigation of diet, and R. D. Milner, also of the Department, contains tables showing the amount of nourishment required by persons who are doing light or heavy muscular work, as well as by those who lead a sedentary life. It will interest you to see (p. 218) how the food of an American business man compares with that of an American working in a lumber camp. The article DIETARY (Vol. 8, p. 212), describing the food given to prisoners, soldiers and sailors in various parts of the world, contains some striking information as to the possibilities of the simple life. In Sweden prisoners get only two meals a day, and those consisting chiefly of porridge or gruel; and the "punishment diet" in English prisons is one pound of bread a day, and nothing else but water. The article WATER SUPPLY (Vol. 28, p. 387), by G. F. Deacon, deals with the storage and distribution of water, and shows how it should be filtered for drinking. SEWERAGE (Vol. 24, p. 735) describes the sanitary systems which prevent the pollution of streams and wells. MINERAL WATERS (Vol. 18, p. 517) describes the great variety of springs from



which the table-waters in general use are obtained. Their medicinal values are also indicated, and in the table which classifies thirty of the most important American springs it is curious to see that nearly all of them lie in the Appalachian Mountain chain.

**VEGETARIANISM** (Vol. 27, p. 967), by Dr. Josiah Oldfield, describes the various systems of diet which reject flesh, the most extreme of which exclude everything but nuts, fruit and cereals, all to be eaten raw. **COOKERY** (Vol. 7, p. 74) shows how the digestibility of food is influenced by methods of cooking, and unhesitatingly condemns the general practice of baking meat. **ADULTERATION** (Vol. 1, p. 218), by Dr. Otto Hehner, describes the dangers to health which arise from the use of preservatives as well as substitutes. For the use of boracic acid, which has been proved to be slightly unwholesome, but not really dangerous, there is at any rate the excuse that it keeps food from spoiling, but the article

has nothing but  
**Hurtful Foods** blame for the "coppering" of vegetables. "Many years ago some artful, if stupid, cook found that green vegetables like peas or spinach, when cooked in a copper pan, by preference a dirty one, showed a far more brilliant colour than the same vegetable cooked in earthenware or iron. The manufacturer who puts up substances like peas in pots or tins for sale produces the same effect which the cook obtained by the wilful addition of a substance known to be injurious to health, namely, sulphate of copper." **FOOD PRESERVATION** (Vol. 10, p. 612) also shows the risks of using carelessly canned goods. **TEMPERANCE** (Vol. 26, p. 578), by Dr. Arthur Shadwell, tells the story of the reforms that have been effected since the 18th century days when London bars used to put up signs inviting customers to get "drunk for one penny" or "dead drunk for twopence;" and **LIQUOR LAWS** (Vol. 16, p. 759) describes

temperance legislation in all parts of the world, with a most interesting section on prohibition in the United States. **DRUNKENNESS** (Vol. 8, p. 601) deals specifically with the effects of excess on the health.

**ALIMENTARY CANAL** (Vol. 1, p. 663), by Dr. Chalmers Mitchell, describes all the organs of the body that deal with food. **DIGESTIVE ORGANS** (Vol. 8, p. 262), by Dr. Andrew Gillespie, shows how indigestion arises, and **DYSPEPSIA** (Vol. 8, p. 786) describes the symptoms caused by habitual indigestion. **METABOLIC DISEASES** (Vol. 18, p. 195), by Dr. Noel Paton, covers all the maladies arising from defective nutrition. **CORPULENCE** (Vol. 7, p. 192) tells about the reduction of superfluous fat, while **FASTING** (Vol. 10, p. 193) and **HUNGER AND THIRST** (Vol. 13, p. 931) discuss the intentional or accidental cutting down of the usual food supply. **FAMINE** (Vol. 10, p. 166) gives a most interesting account of the disasters with which crop failures still threaten Asiatic countries. The feeding of young children is, of course, a distinct subject, and is treated in great detail in the article **INFANCY** (Vol. 14, p. 513), by Dr. Harriet Hennessy.

**SLEEP** (Vol. 25, p. 238), by Prof. McKendrick, is an elaborate study of the curious changes in the action of the brain and other organs

**Sleep and the** which take place  
**Want of it** during slumber.

**INSOMNIA** (Vol. 14, p. 644) is a practical article on the causes and treatment of sleeplessness. Between absolutely lying awake and obtaining a really good night's rest there are many intermediate stages, and the article **DREAM** (Vol. 8, p. 558) contains a great deal of curious information about disturbed sleep. **SOMNAMBULISM** (Vol. 25, p. 393) shows that when dreams are vivid enough to produce sleepwalking there must be nervous trouble calling for immediate treatment. **NARCOTICS** (Vol. 19, p. 239) describes the dangers of the drugs to produce sleep; and in **HYPNO-**

TISM (Vol. 14, p. 201) and SUGGESTION (Vol. 26, p. 48) there is a full account of the treatment frequently used for sleeplessness and other nervous disorders.

The effect of climates upon health is the subject of a special section (Vol. 6, p. 526) of the article CLIMATE. VENTILA-

### The Right Kind of Air

TION (Vol. 27, p. 1008) shows how to secure fresh air in the house without draughts. DUST (Vol. 8, p. 713), by Dr. Aitken, the inventor of the ingenious machine for counting the particles of dust floating in the atmosphere, gives a very full account of the impurities in the air. HEATING (Vol. 13, p. 160) contains descriptions and diagrams of the best methods of warming houses, and there is at the end of the article an account of the system of steam heating employed at Lockport, N. Y., where buildings anywhere within three miles of the central plant are heated at a very moderate cost.

BATHS (Vol. 3, p. 514), and HYDRO-PATHY (Vol. 14, p. 165), and BALNEO-THERAPEUTICS (Vol. 3, p. 284) describe all the bathing treatments in which water, steam and hot air are employed.

Electric baths are described in ELECTRO-THERAPEUTICS (Vol. 9, p. 249), and AEROTHERAPEUTICS deals with compressed air baths. MASSAGE (Vol. 17, p. 863), by Dr. Arthur Shadwell, describes all the systems of rubbing. GYMNASTICS (Vol. 12, p. 752) gives an account of the Swedish and other systems of hygienic exercise; and outdoor exercises of every kind are described in the articles mentioned in the chapter of *Readings in Connection with Recreations and Vacations*. Two other articles which relate to general hygiene are DISINFECTANTS (Vol. 8, p. 312) and ANTISEPTICS (Vol. 2, p. 146). The proper care of the hair is indicated in the article BALDNESS (Vol. 3, p. 243), where prescriptions for lotions are given.

The articles already named cover very

fully the application of medical science to the ordinary routine of life, and will

### Various Diseases

help you to regulate wisely your habits in regard to eating, sleeping and to the general care of your body. It may be the case that you wish, for your own sake, or for the sake of some member of your family, to carry your reading further in respect to some one disease or some one part of the body. In the list of articles at the end of this chapter you will find more than two hundred, each of which deals with one disease, such as rheumatism, catarrh, malaria or neuralgia. In the case of a very simple trouble you will find directions for treatment, as for example in the article CORN, where you are advised to use a solution of salicylic acid in collodion, or, for a soft corn, to paint it with spirits of camphor. Where the trouble is anything more serious, you should of course consult a doctor, but you will understand what he tells you all the better, and worry less, if you have read an article which describes the usual course of the disease.

Again, you may have a special reason for wishing to learn all you can about some one part of the body: the eye, the

### Parts of the Body

ear, or the heart. There are fifty articles, in the list below, each dealing with some one organ or part of the body. The illustrations in these articles will help you to understand the exact position of any trouble which you have read about in the article on a disease affecting that particular part. Another set of articles divides the body into groups of organs, one dealing with the NERVOUS SYSTEM, another with the MUSCULAR SYSTEM, another with the RESPIRATORY SYSTEM, and so on. Then you have the five general articles: ANATOMY, PHYSIOLOGY, PATHOLOGY, THERAPEUTICS and SURGERY, which outline all medical science. The article MEDICINE gives a complete history of medical science, and its

section on *Modern Progress* reviews all that has been accomplished within recent years.

Beginning with the six articles just mentioned, and then taking the more detailed articles in the groups into which their subjects divide

**More Advanced Study** them, it is quite possible to follow in the

Britannica a complete course of reading on medicine and surgery, and you may desire to do that, just as someone else likes to read about geology or astronomy. But do not forget that no amount of reading can give you more than a theoretical knowledge. When your doctor discovers what is the nature

of your illness (which is much the most difficult part of his work), and when he gives you the treatment you need, his eye is comparing what it sees in your case, and his hand is comparing what it touches in your case, with the thousands of observations that he has made in the wards and in the operating theatre of the hospital. Without going through the course that he has gone through in the dissecting room, and studying the living body as he has studied it, you can never know what he knows. But you will be a more understanding patient, and a better nurse, if occasion brings nursing for you to do, if you have learned something of medical science from the Britannica.

#### ALPHABETICAL LIST OF ARTICLES IN THE ENCYCLOPAEDIA BRITANNICA RELATING TO MEDICAL SCIENCE

|                        |                    |                      |                        |
|------------------------|--------------------|----------------------|------------------------|
| Abattoir               | Aphasia            | Bladder and Prostate | Cleft Palate and Hare- |
| Abdomen                | Aphemia            | Diseases             | Lip                    |
| Abortion               | Apnoea             | Blindness            | Clinic                 |
| Abscess                | Aponeurosis        | Blister              | Club-foot              |
| Abscission             | Apophysis          | Blood                | Cod-Liver Oil          |
| Acne                   | Apoplexy           | Blood-letting        | Ceolom and Serous      |
| Aconite                | Apothecary         | Boil                 | Membranes              |
| Acromegaly             | Appendicitis       | Bone                 | Colic                  |
| Actinomycosis (Strep-  | Apyrexia           | Bow-leg              | Colon                  |
| totrichosis)           | Araroba Powder     | Brain                | Coma                   |
| Acupressure            | Arm                | Breast               | Connective Tissues     |
| Acupuncture            | Arnica             | Bright's Disease     | Constipation           |
| Adam's Apple           | Arteries           | Bronchiectasis       | Convulsions            |
| Addison's Disease      | Arthritis          | Bronchitis           | Corn                   |
| Adenoids               | Articulation       | Bronchotomy          | Corpulence or Obesity  |
| Adulteration           | Arytenoid          | Bunion               | Cramp                  |
| Aerotherapeutics       | Asafetida          | Burns and Scalds     | Crenation              |
| Ague                   | Ascites            | Caesarean Section    | Cretinism              |
| Ala                    | Asphyxia           | Caisson Disease      | Croton Oil             |
| Albuminuria            | Asthma             | Cajaput Oil          | Croup                  |
| Alienist               | Athetosis          | Calabar Bean         | Cubeb                  |
| Alimentary Canal       | Atrophy            | Cancer, or Carcinoma | Cupping                |
| Amaurosis              | Auscultation       | Cantharides          | Delirium               |
| Ambulance              | Autopsy            | Capsicum             | Dengue                 |
| Anaemia                | Bacteriology       | Carbuncle            | Dentistry              |
| Anaesthesia and Anaes- | Baldness           | Cartilage            | Diabetes               |
| thetics                | Balneotherapeutics | Castor Oil           | Diaphoretics           |
| Anatomy                | Balsam             | Catalepsy            | Diaphragm              |
| Aneurysm, or Aneurism  | Baths              | Catarrh              | Diarrhoea              |
| Angina Pectoris        | Bedsore            | Caul                 | Dietary                |
| Animal Heat            | Belladonna         | Chicken-pox          | Dietetics              |
| Ankle                  | Beri-beri          | Chilblains           | Digestive Organs       |
| Ankylosis, or Anchy-   | Bhang              | Chirurgion           | Digitalis              |
| losis                  | Bibirine           | Cholera              | Dilatation             |
| Ankylostomiasis        | Bilharziosis       | Chamomile, or Camo-  | Dill                   |
| Anodyne                | Blackwater Fever   | mile Flowers         | Diphtheria             |
| Antiseptics            | Bladder            | Climacteric          | Dipsomania             |

|   |                         |                           |                             |
|---|-------------------------|---------------------------|-----------------------------|
| Disinfectants                                 | Heel                    | Mineral Waters            | Poultice                    |
| Diuretics                                     | Hernia                  | Morphine                  | Prognosis                   |
| Dropsy  | Herpès                  | Mortification             | Pruritus                    |
| Drowning and Life Saving                      | Hip                     | Mouth and Salivary Glands | Psoriasis                   |
| Drug  | Homoeopathy             | Mumps                     | Psorospermiasis             |
| Drunkenness                                   | Hospital                | Muscle and Nerve          | Ptomaine Poisoning          |
| Ductless Glands                               | Humane Society, Royal   | Muscular System           | Puberty                     |
| Dysentery                                     | Hunger and Thirst       | Myelitis                  | Public Health, Law of       |
| Dyspepsia                                     | Hydrocele               | Myxoedema                 | Purperal Fever              |
| Ear   | Hydrocephalus           | Naevus                    | Purpura                     |
| Eczema  | Hydrophobia, or Rabies  | Narcotics                 | Pulse                       |
| Elaterium                                     | Hygiene                 | Navel                     | Quarantine                  |
| Elbow   | Hypertrophy             | Necrosis                  | Quassia                     |
| Electrotherapeutics                           | Hypnotism               | Nepenthes                 | Quinine                     |
| Elephantiasis                                 | Hypocondriasis          | Nerve                     | Quinsy                      |
| Emetics                                       | Hysteria                | Nervous System            | Raynaud's Disease           |
| Emphysema                                     | Ichthyosis or Xeroderma | Nettlerash, or Urticaria  | Relapsing Fever             |
| Enteritis                                     | Imbecile                | Neuralgia                 | Reproductive System         |
| Epilepsy                                      | Infancy                 | Neurasthenia              | Respiratory System          |
| Epistaxis                                     | Influenza               | Neuritis                  | Rhamnus Purshiana           |
| Epithelial, Endothelial and Glandular Tissues | Insanity                | Neuropathology            | Rhatany, or Krameria        |
| Equilibrium                                   | Insomnia                | Nose                      | Root                        |
| Ergot, or Spurred Rye                         | Intestinal Obstruction  | Nosology                  | Rheumatism                  |
| Erysipelas                                    | Intestine               | Nostalgia                 | Rheumatoid Arthritis        |
| Eucalyptus                                    | Intoxication            | Nursing                   | Rhubarb                     |
| Euphorbium                                    | Ipecacuanha             | Nutrition                 | Rickets                     |
| Excretion                                     | Jaborandi               | Nux Vomica                | Ringworm                    |
| Eye   | Jalap                   | Obstetrics                | St. Vitus' Dance, or Chorea |
| Face  | Jaundice                | Oesophagus                | Salep                       |
| Fauces  | Jaw                     | Official                  | Salicin, Salicinum          |
| Favus   | Joints                  | Olfactory System          | Sanatorium                  |
| Fever   | Kámala                  | Ophthalmology             | Sandalwood                  |
| Fibrin  | Kala-Azar               | Opium                     | Sandarach                   |
| Filariasis                                    | Kidney Diseases         | Ovariotomy                | Santonin                    |
| Finger  | Kino                    | Pain                      | Sarsaparilla                |
| Fistula                                       | Knee                    | Palate                    | Scabies, or Itch            |
| Food  | Koussou                 | Pancreas                  | Scalp                       |
| Foot  | Laryngitis              | Paralysis or Palsy        | Scarlet Fever               |
| Frostbite                                     | Laudanum                | Paranoia                  | Sciatica                    |
| Fumigation                                    | Lead Poisoning          | Parasitic Diseases        | Scrofula, or Struma         |
| Galangal                                      | Leg                     | Pathology                 | Scurvy                      |
| Galbanum                                      | Leontiasis Ossea        | Pediculosis               | Sea-Sickness                |
| Gall  | Leprosy                 | Pellagra                  | Seborrhoea                  |
| Gamboge                                       | Lethargy                | Pelvis                    | Senega                      |
| Gangrene                                      | Lichen                  | Pemphigus                 | Senna                       |
| Gastric Ulcer                                 | Ligament                | Pepsin                    | Sepsis                      |
| Gastritis                                     | Lip                     | Peritonitis               | Sewerage                    |
| Gelsemium                                     | Liver                   | Perspiration              | Shock or Collapse           |
| Ginseng                                       | Lobe                    | Phagocytosis              | Shoulder                    |
| Goitre  | Locomotor Ataxia        | Pharmacology              | Sinew                       |
| Gout  | Lumbago                 | Pharmacopoeia             | Skeleton                    |
| Guaco, Huaco, or Guao                         | Lung                    | Pharmacy                  | Skin and Exoskeleton        |
| Guaiacum                                      | Lupus                   | Pharyngitis               | Skin Diseases               |
| Guarana                                       | Lymph                   | Pharynx                   | Skull                       |
| Guinea-Worm                                   | Lymphatic System        | Phlebitis                 | Slaughter-house             |
| Gynaecology                                   | Malaria                 | Phrenology                | Sleep                       |
| Haematocoele                                  | Malta Fever             | Phthisis                  | Sleeping-sickness           |
| Haemophilia                                   | Mammary Gland           | Physiology                | Smallpox                    |
| Haemorrhage                                   | Massage                 | Picrotoxin                | Sneezing                    |
| Haemorrhoids                                  | Matrix                  | Pinto                     | Somnambulism                |
| Hammer-toe                                    | Measles                 | Pityriasis Versicolor     | Spinal Cord                 |
| Hand  | Medicine                | Placenta                  | Spleen                      |
| Hashish                                       | Medical Education       | Plague                    | Sprue                       |
| Hay Fever, or Summer Catarrh                  | Medical Jurisprudence   | Pleurisy or Pleuritis     | Squill                      |
| Head  | Ménière's Disease       | Pneumonia                 | Stammering or Stuttering    |
| Heart   | Meningitis              | Podophyllin               | Starvation                  |
|   | Metabolic Diseases      | Poison                    | Stethoscope                 |
|   | Midwife                 | Polypus                   |                             |

|                      |              |                  |                  |
|----------------------|--------------|------------------|------------------|
| Stomach              | Temperance   | Typhoid Fever    | Voice            |
| Stramonium           | Tetanus      | Typhus Fever     | Wart             |
| Strychnine           | Therapeutics | Ulcer            | Water-supply     |
| Sumbul, or Sumbal    | Thorax       | Upas             | Whitlow          |
| Sunstroke            | Throat       | Urinary System   | Whooping-Cough   |
| Supra-renal Extract  | Thyroid      | Vaccination      | Windpipe         |
| Surgery              | Tongue       | Valerian         | Wound            |
| Surgical Instruments | Tonsillitis  | Varicose Veins   | Wrist            |
| Sweating-sickness    | Toxicology   | Vascular System  | Wry-neck         |
| Sweetbread           | Tracheotomy  | Vegetarianism    | X-Ray Treatment  |
| Sympathetic System   | Trachoma     | Veins            | Yaws             |
| Syncope              | Trichinosis  | Veneral Diseases | Yellow Fever     |
| Taraxacum            | Tuberculosis | Viburnum         | Zymotic Diseases |
| Teeth                | Tumour       | Vivisection      |                  |

## CHAPTER L

### GEOGRAPHY AND EXPLORATION

**T**HE Britannica devotes nearly one fourth of all its space to geographical subjects. You may miss the full significance of this statement; therefore let us put it differently. The matter in the Britannica on geography is equivalent to more than 100 ordinary volumes each containing 100,000 words, which, put on shelves about 5 feet long, would fill a section in your

**A Library of Geography** library 5 shelves high. But by the use of new India paper, this same material on geography, combined with three times as much on other subjects of importance, occupies in the Britannica less than 3 feet of shelf space. The unity of plan and treatment and the high authority of the Britannica in these articles are far beyond comparison with that you could get in the most wisely and carefully selected hundred volumes on Geography that would give an equivalent number of words.

Geographical information is so useful

that the student is likely to overlook the scientific importance of geography

**A Science as well as a Body of Facts**

in itself. The articles in the Encyclopaedia Britannica described in this chapter, besides giving the fullest information on countries, cities, towns, rivers, mountains, etc., trace the development of the science from its beginning; and the gradual increase of geographical knowledge, as told in the Britannica, is a story of fine out-of-door adventure, of just the kind of spirited action that has supplied the theme of the most popular works of fiction.

This chapter will suggest an outline course of reading in geography, systematically grouping the more important articles in the Britannica.

The starting point for this course of study is the article GEOGRAPHY (Vol. 11, p. 619), equivalent in length to 70 pages of this Guide, written by Hugh R. Mill, author of *Hints on the Choice of Geo-*



*graphical Books*, etc. The story that it tells us is a most interesting one.

The early Greeks thought of the earth as a flat disk, circular or elliptical in outline; and even in Homeric times this supposition had

**What Early Writers Taught about the Earth**

“acquired a special definiteness by the introduction of the idea of the ocean river bounding the whole.” Hecataeus recognized two continents on the circular disk. Herodotus, traveler and historian both (see the article HERODOTUS Vol. 13, p. 381, by George Rawlinson and Edward M. Walker), who knew only the lands around the roughly elliptical Mediterranean Sea, was certain that the earth was not a circle because it was longer from east to west than from north to south, and he distinguished *three* continents, adding Africa to Europe and Asia. “The effect of Herodotus’s hypothesis that the Nile must flow from west to east before turning north in order to balance the Danube running from west to east before turning south lingered in the maps of Africa down to the time of Mungo Park.” Aristotle (see also the article ARISTOTLE, Vol. 2, p. 501, by Thomas Case, president of Corpus Christi College, Oxford, and author of *Physical Realism*, etc.,) was the real founder of scientific geography. “He demonstrated the sphericity of the earth by three arguments, two of which are important . . . only a sphere could always throw a circular shadow on the moon during an eclipse; and that the shifting of the horizon and the appearance of new constellations . . . as one travelled from north to south, could only be explained on the hypothesis that the earth was a sphere . . . . He formed a comprehensive theory of the variations of climate with latitude and season . . . speculated on the differences in the character of races of mankind living in different climates, and correlated the political forms of

communities with their situation on a seashore, or in the neighborhood of natural strongholds.” The article PTOLEMY (Vol. 22, p. 618), equivalent to 27 pages of this Guide, by the late Sir Edward Herbert Bunbury, the historian of ancient geography, and Dr. C. R. Beazley, author of *The Dawn of Modern Geography*, etc., should be studied in conjunction with the summary, in the article GEOGRAPHY, of Ptolemy’s achievements. “He concentrated in his writings the final outcome of all Greek geographical learning,” but his great aim was to collect and compare all existing determinations of latitude and estimates of longitude, and to solve the problem of representing the curved surface of the earth on the flat surface of a map.

The science of geography was at a low ebb in Christendom during the Middle Ages, when verbal interpretation of the Scriptures led the Church to oppose the spherical theory and also the theory of the motion of the earth. But among the Arabs, geography was kept alive—especially by Al-Mamun (see the article MAMUN (Vol. 17, p. 533), who had Ptolemy translated into Arabic.

The story of the great discoveries of the 15th and 16th centuries is outlined later in the article GEOGRAPHY. The effect on geographical theory was enormous.

The old arguments of Aristotle and the old measurements of Ptolemy were used by Toscanelli and Columbus in urging a westward voyage to India; and mainly on this account did the crossing of the Atlantic rank higher in the history of scientific geography than the laborious feeling out of the coast-line of Africa. But not until the voyage of Magellan shook the scales from the eyes of Europe did modern geography begin to advance. Discovery had outrun theory; the rush of new facts made Ptolemy practically obsolete in a generation, after having been the fount and origin of all geography for a millennium.

In the century and a half after the discovery of America important theoretical work was done by Peter Apian, Sebastian Münster, Philip Cluwer, Nathanael Carpenter and Bernhard Varenius, for which see the biographical articles. The next century (1650–1760) saw little worth mentioning in geographical theory or method. Then, with the sudden burst of activity that so often follows scientific hibernation, came the important work of Torbern Bergman, a Swedish chemist and a pupil of the great botanist Linnaeus, and the lectures delivered at Königsberg after 1765 by the German philosopher Kant. They both put new stress on physical geography—see the articles on BERGMAN (Vol. 3, p. 774) and KANT (Vol. 15, p. 662). Alexander von Humboldt and Karl Ritter (see the articles on both) in the first half of the 19th century supported, the one the unity of nature, and the other the comparative method, thus preparing the way for Darwin's evolutionary theory, which "has become the unifying principle in geography." Since the adoption of this theory, some of the more important names in geographical theory—each the subject of an article in the Britannica which the student should read—are: Baron von Richthofen, Hermann Wagner, Elisée Reclus and A. de Lapparent.

Early travel and exploration is a story of varied interest even when we approach it from the only side on which we have material—that is to say "geographical exploration from the Mediterranean centre."

Early conquest of outlying peoples by the warlike kings of Egypt and Assyria may have momentarily increased geographical knowledge, but it is unimportant in the large story. The first great explorers were the earliest traders, the Phoenicians and their African colonists, the Carthaginians, who traded throughout the Mediterranean, possibly

on the east coast of Africa and in the northern seas, and almost certainly on the west coast of Africa. For details supplementing the outline in the article GEOGRAPHY (p. 623, Vol. 11), see the articles PHOENICIA (Vol. 21, pp. 454–455), SIDON, TYRE, OPHIR, CARTHAGE, and HANNO, the African explorer. On the only Greek explorer of eminence see the article on PYTHEAS of Marseilles (Vol. 22, p. 703), who, about 330 B.C., explored the British coast and the Baltic, and may have gone as far north as Iceland. Alexander the Great (see the biographical article) and his successors explored the East, "thus opening direct intercourse between Grecian and Hindu civilization."

The Romans were poor seamen and accomplished little as explorers. It has often been pointed out that the Greeks spoke of the "watery ways" of the sea, considering it a highway, but that the Romans, centuries later too, called the sea "dissociable," that is "preventing and hindering intercourse."

The Arabs were the leading geographers of the Middle Ages, and among their great travelers on whom there are separate articles in the Britannica are MASUDI, IBN HAUKAL, IDRISI, and in the 14th century IBN BATUTA. In the 9th and 10th centuries, the Norseman Ohthere rounded the North Cape and saw the midnight sun; Iceland was colonized from Norway; Eric the Red discovered Greenland; and his son Leif Ericsson sailed along a part of the North American coast: see the articles ICELAND, GREENLAND, VINLAND, LEIF ERICSSON and THORFINN KARLSEFNI.

The crusades made Europe a little more familiar with the East and opened the way for travel and pilgrimage. In general see the summary *Results of the Crusades* (p. 546, Vol. 7) at the close of the article CRUSADES; and particularly see BENJAMIN OF TUDELA (Vol. 3,

p. 739) for a Jewish traveler of the 12th century who went as far east as the frontiers of China.

Before the new age of real exploration began, in the 15th century, there was an age of travel, especially

**13th Century** in Asia during the 13th century, which did much to rouse popular curiosity about the ends of the earth. Though these travelers were not scientifically trained, modern research shows a remarkable proportion of fact in their stories. The great names of this era: Joannes de Plano Carpini, a friend of St. Francis of Assisi and head of a Catholic mission to Mongolia; William of Rubruquis, a Fleming who went to Tartary under orders from Louis IX of France; Hayton, King of Armenia, who traveled in Mongolia about the middle of the century; Odoric, a Catholic friar of the 14th century; and Marco Polo,

the first to trace a route across the whole longitude of Asia, naming and describing kingdom after kingdom which he had seen; the first to speak of the new and brilliant court which had been established at Peking; the first to reveal China in all its wealth and vastness, and to tell of the nations on its borders; the first to tell more of Tibet than its name, to speak of Burma, of Laos, of Siam, of Cochinchina, of Japan, of Java, of Sumatra and of other islands of the archipelago, of the Nicobar and Andaman Islands, of Ceylon and its sacred peak, of India but as a country seen and partially explored; the first in medieval times to give any distinct account of the secluded Christian Empire of Abyssinia, and of the semi-Christian island of Sokotra, and to speak, however dimly, of Zanzibar, and of the vast and distant Madagascar; whilst he carries us also to the remotely opposite region of Siberia and the Arctic shores, to speak of dog-sledges, white bears and reindeer-riding Tunguses.

See the articles **CARPINI**, **RUBRUQUIS**, **HAYTON**, **ODORIC**, and **POLO**, by C. R. Beazley, author of *The Dawn of Modern Geography*, and Sir Henry Yule, author of *Cathay and the Way Thither* and *The Book of Ser Marco Polo*.

A little later were the Spaniard Ruy Gonzalez de Clavijo who traveled to

Samarkand; the Italians Nicola de'Conti whose travels in India were written by Poggio Bracciolini, secretary to Pope Eugene IV, and Ludovico di Varthema, who made the pilgrimage to Mecca in 1503. See the articles **CLAVIJO**, **CONTI**, **POGGIO**, himself a traveler, and **VARTHEMA**.

The construction of the mariner's compass gave a new impulse to navigation and discovery. "Portugal took the lead along this new path, and foremost among her pioneers stands Prince

**Portuguese Explorers** Henry the Navigator (1394-1460) . . . The great westward projection of the coast of Africa and the islands to the north-west of that continent, were the principal scene of the work of mariners sent out at his expense; but his object was to push onward and reach India from the Atlantic." The account of Portuguese discoveries in the article **GEOGRAPHY** (p. 625) should be supplemented by the articles **HENRY OF PORTUGAL** (Vol. 13, p. 296), by C. R. Beazley, author of *Prince Henry the Navigator* and *The Dawn of Modern Geography*; **DIAGO GOMEZ** and **BARTOLOMEU DIAZ DE NOVAES** (Vol. 8, p. 172), also by C. R. Beazley, **PERO DE COVILHAM**, **VASCO DA GAMA**, **PRESTER JOHN**, by Sir Henry Yule, and **FERNAO MENDES PINTO**, by Edgar Prestage, lecturer in Portuguese, University of Manchester.

We have now come to a point in the story where it begins to be more familiar to us all. "The Portuguese, following

the lead of Prince **Columbus and America** Henry, continued to look for the road to India by the Cape of Good Hope. The same end was sought by Christopher Columbus, following the suggestion of Toscanelli, and under-estimating the diameter of the globe, by sailing due west." The discovery and early exploration of America are told in the following articles, selected

from a long list—see also the chapter in this Guide on *American History*:—

COLUMBUS and VESPUCCI, both by C. R. Beazley; PINZON, dealing with the three members of the family; CABOT, by H. P. Biggar, author of *The Voyages of the Cabots to Greenland*; PIZARRO; BALBOA; CORTEZ; SOTO; AVILES; CARTIER, by H. P. Biggar; RIBAULT; HAKLUYT, by C. R. Beazley and C. H. Coote, formerly of the map department, British Museum; and for exploration in the Pacific, MAGELLAN, by C. R. Beazley, DRAKE, THOMAS CAVENDISH, JOHN DAVIS, SIR RICHARD HAWKINS, etc.

Exploration in the United States, particularly as connected with westward expansion may be studied to advantage in the Britannica.

**Recent American Exploration** See especially the articles DANIEL BOONE, RUFUS PUTNAM, GEORGE ROGERS CLARK, WILLIAM CLARK, MERIWETHER LEWIS, ZEBULON M. PIKE, STEPHEN AUSTIN, MARCUS WHITMAN, JOHN C. FREMONT, F. V. HAYDEN, J. W. POWELL, and B. L. E. BONNEVILLE; and also the earlier part of the historical section in each article on a state of the Union.

In the Orient the principal explorers mentioned in the article GEOGRAPHY and treated each in a separate article are: the Englishmen,

**The Far East** SIR JAMES LANCASTER, THOMAS CORYATE, SIR ANTHONY SHIRLEY, SIR THOMAS HERBERT and SIR THOMAS ROE; the German ENGELBRECHT KAEMPFER; and, among many great Dutch navigators, ABEL JANSZON TASMAN. On this period see also INDIA (especially pp. 404-406, Vol. 14); JAPAN, *Foreign Intercourse* (p. 224, et seqq., Vol. 15); FRANCISCO DE XAVIER; MALAY ARCHIPELAGO (p. 469, Vol. 17); TASMANIA; NEW GUINEA, etc.

The geographical work of missionaries has been remarkable—perhaps none of it more so than the survey of China by

Jesuit missionaries. "They first prepared a map of the country round Peking, which was submitted to the emperor Kang-hi, and, being satisfied with the accuracy of the European method of surveying, he resolved to have a survey made of the whole empire on the same principles. This great work was begun in July, 1708, and the completed maps were presented to the emperor in 1718. The records preserved in each city were examined, topographical information was diligently collected, and the Jesuit fathers checked their triangulation by meridian altitudes of the sun and pole star and by a system of remeasurements. *The result was a more accurate map of China than existed, at that time, of any country in Europe.*"

There was some 18th century exploration of importance in Arabia: see the article KARSTEN NIEBUHR; in Africa: see the articles JAMES BRUCE; JOHN LEDYARD, an American; and MUNGO PARK; and in South America: see C. M. DE LA CONDAMINE, PIERRE BOUGUER, etc. But the Pacific was the great field of exploration in this century and "the three voyages of Captain James Cook form an era in the history of geographical discovery." See the articles JAMES COOK, COMTE DE LA PEROUSE, JOSEPH-ANTOINE BRUNI D'ENTRECASTEUX, WILLIAM BIGH, GEORGE VANCOUVER, and local articles like HAWAII, TAHITI, etc.

The story of Polar exploration is told in brief in the article GEOGRAPHY (p. 629) but there are more detailed accounts

in the article **Arctic Exploration** POLAR REGIONS, by H. R. Mill and Fridtjof Nansen, the polar explorer, which is illustrated with maps of the North Polar and South Polar regions. This should be further supplemented by the following biographical sketches: PYTHEAS, CABOT, CORTE-REAL, WILLOUGHBY, STEVEN BOROUGH, FROBISHER, JOHN DAVIS, BARENTS, HUDSON,



BAFFIN, SCORESBY, BERING, JAMES COOK, JOHN FRANKLIN, SIR W. E. PARRY, SIR JOHN ROSS, JOHN RAE, SIR R. J. L. M. McCLURE, SIR F. L. McCLINTOCK, SIR E. A. INGLEFIELD, E. K. KANE, CHARLES HALL, NORDENSKIÖLD, NARES, SIR C. R. MARKHAM, DELONG, A. W. GREELY, NANSEN, PEARY, etc., and on antarctic exploration the articles DUMONT D'URVILLE, CHARLES WILKES, SIR JAMES C. ROSS, etc. The article POLAR REGIONS includes an elaborate account of the physiography of the Arctic region (p. 954, Vol. 21) and of the Antarctic (p. 969 of same Vol.), dealing with geology, climate, pressure, flora, fauna, people, ocean depths, temperature and salinity, and marine biological conditions, etc.

The student of geography should read with great care the article MAP (Vol. 17, p. 629), equivalent to 110 pages of this Guide, written by Lieut.

**Maps** Col. Charles Frederick Close, author of *Text-Book of Topographical Surveying*, Alexander Ross Clark, lately in charge of the trigonometrical operations of the British Ordnance Survey, and Dr. Ernest George Ravenstein, author of *A Systematic Atlas*, etc. The article has 59 illustrations and it deals with: classification, scale, delineation of ground, contours, selection of names and orthography; measurement on maps; relief maps; globe; map printing; history of cartography (equivalent to 55 pages of this Guide), with reproductions of many early maps; topographical surveys, summarizing the work done in different parts of the world; and map projections.

The maps in the Britannica are of the utmost value. They include nearly 150 full-page maps, many of them in colours, all prepared especially for this edition, and in accordance with the principles laid down in the article MAP.

Of articles on physiographic topics possibly the most important are those on the several continents, each accompanied by a map in colours from the

great German cartographic establishment of Justus Perthes, Gotha. Of particular importance to the American reader

are the contributions of Prof. W. M. Davis of Harvard on physiography in the articles AMERICA and NORTH AMERICA, and of J. C. Branner, now president of Leland Stanford University, on SOUTH AMERICA. Then read the article OCEAN AND OCEANOGRAPHY, by Dr. Otto Krümmel, professor of geography at Kiel and author of *Handbuch der Ozeanographie*, and H. R. Mill, editor of *The International Geography*. This single article is equivalent to 65 pages of this Guide. Then study the articles on the different seas—for instance, ATLANTIC OCEAN, by H. N. Dickson, author of *Papers on Oceanography*, etc.; PACIFIC OCEAN, by the same author, with a section on its islands, and with a map in colours; Dr. Dickson's article on the MEDITERRANEAN SEA; the article GREAT LAKES, the separate article on each of these lakes, GREAT SALT LAKE, etc., and the article LAKE, by Sir John Murray, the famous British geographer, which contains statistical tables of the important lakes.

Two important general articles are: CLIMATE AND CLIMATOLOGY, with 2 plates, 13 figures and several tables, by R. DeCourcy Ward, professor of climatology, Harvard; and METEOROLOGY, by Dr. Cleveland Abbe, professor of meteorology, U. S. Weather Bureau. These articles, both by Americans, deal with these subjects with particular attention to American conditions. They should be supplemented by a study of the articles: SKY; ATMOSPHERIC ELECTRICITY; CLOUDS, illustrated with remarkably fine pictures of the different cloud-types; and the separate articles on meteorological instruments.

What has already been said, although it suggests rather than exhausts the subject of geography in the Britannica,



will show that the student will find in it a text-book of geography which is unparalleled elsewhere in size, scope, authority and interest. Besides, the Britannica contains the equivalent of a great gazetteer and atlas. Place-names are so entered in the Index (Vol. 29) that their location on maps may be discovered immediately and the articles on towns, villages, cities, states, etc., are full and authoritative. The reader who turns to an article in the Britannica on some small town or city with a population of 5,000 or less finds there within the limits of a few lines of print the results of elaborate research and laborious correspondence with local authorities. Such articles give not merely location, population, railway service, commercial and manufacturing information, description of buildings, etc., but a historical sketch of the place, in which every date and detail has been verified with no sparing of expense or pains.

The Encyclopaedia Britannica is not merely a geographical text-book and as a Guide Book gazetteer, however. It is an excellent guide book. The same care in details

that makes it valuable as a gazetteer makes it a wonderful companion for the traveler, full of literary charm and readability. Such articles as NEW YORK, PHILADELPHIA, BOSTON, SAN FRANCISCO and ST. LOUIS contain valuable sketches of the culture, literary and artistic, of these cities. The world's "show" and vacation spots have elaborate treatment—for instance the English LAKE DISTRICT, RIVIERA, CATSKILLS, LAKE GEORGE, YOSEMITE, GRAND CANYON, etc.

Besides the student can turn immediately in the Britannica, as he could in no book purely geographical, from the description of a locality, say Mount Vernon, Stockbridge, Cooperstown, Tarrytown or Salem, to the biographies that these articles make him need,—Washington, Jonathan Edwards, Cooper, Irving and Hawthorne. See the last chapter in this Guide for an illustration of this use of the Britannica.

The following list of *general* articles on geography will give the reader an idea of the great scope of the Britannica in geographical literature. If this list included all the geographical articles in the Britannica it would be nearly 60 times as long. For a complete list classified by different continents and countries see the Index Volume, beginning on p. 895.

|                      |                      |                       |                      |
|----------------------|----------------------|-----------------------|----------------------|
| Afterglow            | Beach                | Climate and Climatol- | Dip                  |
| Aiguille             | Beaufort Scale       | ogy                   | Divide               |
| Alp                  | Bench-mark           | Cloud                 | Doldrums             |
| Anemometer           | Bergschrund          | Cloudburst            | Donga                |
| Antarctic            | Berm                 | Coast                 | Down                 |
| Anthelion            | Bight                | Col                   | Dust                 |
| Anticyclone          | Blizzard             | Combe                 | Eagre                |
| Antilia              | Bog                  | Continent             | Earth, Figure of the |
| Antipodes            | Bora                 | Continental Shelf     | Earth Pillar         |
| Antonini Itinerarium | Bore                 | Contour, Contour-line | El Dorado            |
| Aquae                | Brazil               | Coral-recfs           | Esker                |
| Archipelago          | Breeze               | Cordillera            | Estuary              |
| Arctic               | Brickfielder         | Corrie                | Etesian Wind         |
| Arete                | British Empire       | Crag                  | Euroclydon           |
| Arroyo               | Brocken, Spectre of  | Creek                 | Fell                 |
| Atlantis             | Butte                | Crevasse              | Ferrel's Law         |
| Atmosphere           | Buys Ballot's Law    | Cuesta                | Fjord                |
| Atoll                | Canyon               | Cyclone               | Floe                 |
| Aurora Polaris       | "Challenger" Expedi- | Dalle                 | Flood Plain          |
| Avalanche            | tion                 | Dawn                  | Fog                  |
| Bahr                 | Chart                | Delta                 | Föhn                 |
| Bar                  | Chinook              | Desert                | Frost                |
| Bayou                | Cirque               | Dew                   | Geodesy              |

|                    |             |                    |                     |
|--------------------|-------------|--------------------|---------------------|
| Geography          | Kame        | Nunatak            | Sounding            |
| Geoid              | Khamsin     | Nyanza             | Squall              |
| Giant's Kettle     | Kuro Siwo   | Oasis              | Steppe              |
| Glacier            | Lagoon      | Ocean and Oceanog- | Storm               |
| Great Circle       | Lake        | raphy              | Sudd                |
| Gromatici          | Latitude    | Ophir              | Sunshine            |
| Ground Ice         | Leste       | Orography          | Surge               |
| Gulf Stream        | Levée       | Pampero            | Surveying           |
| Hachure            | Leveche     | Peninsula          | Swallow-hole        |
| Hail               | Lightning   | Plain              | Tacheometry         |
| Halo               | Lithosphere | Plateau            | Tarn                |
| Harmattan          | Longitude   | Playa              | Thalweg             |
| Helm Wind          | Lowland     | Polder             | Theodolite          |
| Hill               | Loxodrome   | Pond               | Thule               |
| Horse Latitudes    | Maelstrom   | Prairie            | Thunder             |
| Horst              | Maestro     | Quagmire           | Timber-line         |
| Hummock            | Maidan      | Rain               | Topography          |
| Hurricane          | Map         | Rainbow            | Tornado             |
| Hydrography        | Marsh       | Rand               | Trade Winds         |
| Hygrometer         | Massif      | Ras                | Tundra              |
| Iceberg            | Meridian    | Reef               | Twilight            |
| Isabnormal (or Is- | Mesa        | River              | Typhoon             |
| anomalous) Lines   | Meteorology | Roaring Forties    | V-shaped Depression |
| Island             | Mirage      | Sahel              | Volcano             |
| Isles of the Blest | Mistral     | St. Elmo's Fire    | Wadi                |
| Isobar             | Monadnock   | Sargasso Sea       | Waterfall           |
| Isoclinic Lines    | Monsoon     | Savanna            | Watershed           |
| Isodynamic Lines   | Moor        | Sea                | Waterspout          |
| Isogonic Lines     | Moraine     | Seiche             | Weather             |
| Isotherm           | Moulin      | Simoom             | Wedge               |
| Isthmus            | Mountain    | Sirocco            | Wind                |
| Itinerarium        | Névé        | Sleet              | World               |
| Jebel              | Norther     | Snow               | Zone                |
| Jungle             | Nullah      | Snow-Line          |                     |

## CHAPTER LI

### ANTHROPOLOGY AND ETHNOLOGY

**T**HESE two sciences are devoted to the study of mankind before written history began; and they have an interest for every reader who has asked, when he was a child and had a story told him: "What happened *before* that?" In the chapter in this Guide on *Language and Writing*, we have told the story of those two great inventions which made civilization possible. The present chapter is devoted to the story of man before writing was commonly used—that is, before historical documents could exist.

Just as the study of children and their habits is something new and peculiarly characteristic of the last generation, so these sciences of anthropology and ethnology which deal with the childhood of the human race are of recent origin. But in comparison with child-psychology these two sciences are at a disadvantage in a very important respect: there are always children to be studied, but the childhood of the race is long past and remote from the student of it, save for the primitive tribes which can still be observed, and even these tribes are now scattered and few, and by contact with civilization they are rapidly losing the characteristics which invite scientific study. A hundred years ago, the opportunities for experiment and observation were far greater, but at that time savages were not seriously studied. There could, indeed, be no "science of man" before the evolutionary theory of Darwin, Wallace and Huxley had been generally accepted. Throughout this Guide we see how

this theory has affected all our modern thought, modified our sciences, and even created new sciences. The Eleventh Edition of the Encyclopaedia Britannica may, indeed, be described as the authoritative and interesting story of the human activities, critically studied from the point of view of evolution. The trustworthy material is chiefly derived from observations in Australia, in the South Seas, among the North American Indians and among the still savage tribes of Africa, and from studies of the tools and other remains of early peoples. All broad conclusions must be based upon the similarity of customs among races widely separated by time and place, and upon the fact that some traces of such customs are still found among more highly civilized peoples.

The first article in a course of reading on the "science of man" in the Britannica is ANTHROPOLOGY (Vol. 2, p. 108), equivalent to 40 pages in this Guide, illustrated, by Prof. Tylor, of Oxford University, one of the founders of the science, and author of *Researches into the Early History of Mankind, Primitive Culture*, etc.

This great article deals first with "man's place in Nature," the most interesting branch of the theory of evolution.

**Man's Origin** Prof. Tylor traces back the recognition of man's structural similarity to the higher apes to Linnaeus (1735) and to the less scientific Lord Monboddo (1774 and 1778), whose simple literary style as well as his theory of

the descent of man aroused the amusement and scorn of Dr. Samuel Johnson, who said that Monboddo was "as jealous of his tail as a squirrel."

Dr. Tylor remarks that:

There are few ideas more ingrained in ancient and low civilization than that of relationship by descent between the lower animals and man. Savage and barbaric religions recognize it, and the mythology of the world has hardly a more universal theme. But in educated Europe such ideas had long been superseded by the influence of theology and philosophy, with which they seemed too incompatible.

But in 1843 Dr. J. C. Prichard, to whom Tylor gives the title that many would give to Tylor himself, "founder of modern anthropology," insisted that

man is but an animal . . . composed of the same materials, and framed on the same principles, as the creatures which he has tamed to be the servile instruments of his will, or slays for his daily food.

Dr. Tylor shows how Wallace and Darwin established a theory of human descent, and sums up the similarities and dissimilarities in anatomical construction between man and the man-like apes. Even more interesting is what the article says (p. 110) about "assigning to man his place in nature on psychological grounds."

Huxley acknowledged an immeasurable and practically infinite divergence, ending in the present enormous psychological gulf between ape and man. It is difficult to account for this intellectual chasm as due to some minor structural difference. . . . Beyond a doubt, man possesses, and in some way possesses by virtue of his superior brain, a power of co-ordinating the impressions of his senses, which enables him to understand the world he lives in, and by understanding to use, resist, and even in a measure rule it. No human art shows the nature of this human attribute more clearly than does language

—although other animals have a sort of language. The article quotes Dr. A. Russel Wallace's conclusion that man stands "apart, as not only the head and culminating point of the grand series of organic nature, but as in some degree a new and distinct order of being." And another great anatomist, Prof. St. George

Mivart, says "Man's animal body must have had a different source from that of the spiritual soul which informs it, owing to the distinctness of the two orders to which these existences severally belong." Dr. Tylor, in citing these authorities, adds that "man embodies an immaterial and immortal spiritual principle which no lower creature possesses, and which makes the resemblance of the apes to him but a mocking simulance."

The answer to the question "How did man originate?" depends on the answer to the question "How did species originate?" The main points are summed up in the article ANTHROPOLOGY (on p. 112), which also deals with the fossil remains of man, especially skulls, and their bearing on the question. A more detailed discussion will be found in the articles EVOLUTION (Vol. 10, p. 22) and SPECIES (Vol. 25, p. 616).

The classification of man into different races is the topic next taken up by Dr. Tylor in the article ANTHROPOLOGY, and he deals particularly

**Races of Man** with classification by the "facial angle" (on which see also the article CRANIOMETRY, Vol. 7, p. 372). Different classifications are criticized and the article decides that "Huxley's division probably approaches more nearly than any other to such a tentative classification as may be accepted. . . . He distinguishes four principal types of mankind, the Australoid, Negroid, Mongoloid and Xanthochroic (fair whites), adding a fifth variety, the Melanchroic (dark whites)." That races are not species, zoologically, is made plain by the fact that the offspring of parents of different races are fertile—those of different species being infertile.

One of the questions connected with the origin of man is his antiquity. The Biblical chronology, as commonly reckoned and interpreted, allowed a time since the appearance of the original stock

**Antiquity of Man**

which seemed far too short for the apparent variation from the original species (see CHRONOLOGY, Vol. 6, p. 305). The natural sciences, notably geology, have "made it manifest that our earth must have been the seat of vegetable and animal life for an immense period of time; while the first appearance of man, though comparatively recent, is positively so remote, that an estimate between twenty and a hundred thousand years may fairly be taken as a minimum." This geological claim is supported by the evidence of prehistoric archaeology (see the article ARCHAEOLOGY, Vol. 2, p. 344). In the caves of France and Belgium human bones have been found with the remains of fossil species of elephant, rhinoceros, hyena, bear, etc., and "the co-existence of man with a fauna now extinct or confined to other districts was brought to yet clearer demonstration by the discovery in these caves of certain drawings and carvings of the animals done by the ancient inhabitants themselves, such as a group of reindeer on a piece of reindeer horn, and a sketch of a mammoth, showing the elephant's long hair, on a piece of a mammoth's tusk from La Madeleine." See Fig. 7, Plate facing p. 118, Vol. 2; the figures of the reindeer and mammoth, hairy and with upturned tusks, in Plate II, article ARCHAEOLOGY (following p. 348, Vol. 2); and of the reindeer in Plate I (Vol. 19, p. 462), and the old cave paintings of wild boars and bison from Altamira, reproduced in colour on Plate II, the next page. These paintings, marking by their technical excellence a high stage of art if not of civilization, are said by geologists to date back 50,000 years. The student will be repaid for turning a moment from the article ANTHROPOLOGY and the question of the antiquity of man to the article CAVE (Vol.

**Cave-  
Dwellers**

*Cave-hunting and Early Man in Britain.*

5, p. 573), by the eminent archaeologist,  
W. Boyd Dawkins,  
and the author of

He reconstructs the civilization of the inhabitants of the pleistocene caves of the European continent (p. 576), describes the carvings and drawings of which we have just spoken, and says of the cave-dwellers:

If these remains be compared with those of existing races, it will be found that the cave-men were in the same hunter stage of civilization as the Eskimos, and that they are unlike any other races of hunters. If they were not allied to the Eskimos by blood, there can be no doubt that they handed down to the latter their art and their manner of life. The bone needles, and many of the harpoons, as well as the flint spearheads, arrowheads and scrapers, are of precisely the same form as those now in use amongst the Eskimos. The artistic designs from the caves of France, Belgium and Switzerland, are identical in plan and workmanship with those of the Eskimos. . . . The reindeer, which they both knew, is represented in the same way by both. The practice of accumulating large quantities of the bones of animals round their dwelling-places, and the habit of splitting the bones for the sake of the marrow, are the same in both. The hides were prepared with the same sort of instruments, and the needles with which they were sewn together are of the same pattern. The stone lamps were used by both. In both there was the same disregard for sepulture. All these facts can hardly be mere coincidences caused by both peoples leading a savage life under similar conditions. The conclusion, therefore, seems inevitable that, so far as we have any evidence of the race to which the cave-dwellers belong, that evidence points only in the direction of the Eskimos. It is to a considerable extent confirmed by a consideration of the animals found in the caves. The reindeer and musk sheep afford food to the Eskimos now in the Arctic Circle, just as they afforded it to the cave-men in Europe; and both these animals have been traced by their remains from the Pyrenees to the north-east through Europe and Asia as far as the very regions in which they now live. The mammoth and bison also have been tracked by their remains in the frozen river gravels and morasses through Siberia as far as the American side of Bering Strait. Palaeolithic man appeared in Europe with the arctic mammalia, lived in Europe with them, and in all human probability retreated to the north-east along with them.

The antiquity of man may be estimated also by the time it must have taken to deposit the soil that overlies traces of civilization,—for instance in Egypt where pottery is found 60 feet deep, while inundations from the Nile probably have



not averaged more than a few inches in a century. "The most recent work of Egyptologists proves a systematic civilization to have existed in the valley of the Nile at least 6000 to 7000 years ago." Similar testimony is given by examining the lake-dwellings of Switzerland and the kitchen middens of Denmark. On these see the articles **LAKE DWELLINGS** (Vol. 16, p. 91), by Joseph Anderson, keeper of the National Museum of Antiquities, Edinburgh, and **SHELL-HEAPS** (Vol. 24, p. 882). The latter article, in a description of the middens of Denmark, says:

Among the bones were those of the wild bull or aurochs, beaver, seal and great auk, all now extinct or rare in this region. Moreover, a striking proof of the antiquity of these shell-heaps is that they contain full-sized shells of the common oyster, which cannot live at present in the brackish waters of the Baltic except near its entrance, the inference being that the shores where the oyster at that time flourished were open to the salt sea.

The article on **LAKE DWELLINGS** brings out very clearly the fact that this, like other early stages of development, is to be found at widely different periods of time: in Switzerland, thousands of years ago; in Scotland and Ireland (see also the article **CRANNOG**, Vol. 7, p. 377) during the Christian era; and in New Guinea and Central Africa within the last few years. This is in accordance with the fact that the human race has not "matured" with equal rapidity all over the earth—that even now one race is in infancy, another in childhood, another in a transition stage like adolescence, and another in the prime of civilization.

Returning to the article **ANTHROPOLOGY**, the next topic treated is **Language**. The more important points on this subject are stated in another chapter of this part of the Guide, on *Language and Writing*. Dr. Tylor says:

For all that known dialects prove to the contrary, on the one hand, there may have been one primitive language, from which the descendant languages have varied so widely,

that neither their words nor their formation now indicate their unity in long past ages, while, on the other hand, the primitive tongues of mankind may have been numerous, and the extreme unlikeness of such languages as Basque, Chinese, Peruvian, Hottentot and Sanskrit may arise from absolute independence of origin. The language spoken by any tribe or nation is not of itself absolute evidence as to its race-affinities. This is clearly shown in extreme cases. Thus the Jews in Europe have almost lost the use of Hebrew, but speak as their vernacular the language of their adopted nation, whatever it may be. . . . In most or all nations of mankind, crossing or intermarriage of races has taken place between the conquering invader and the conquered native, so that the language spoken by the nation may represent the results of conquest as much or more than of ancestry. . . . On the other hand, the language of the warlike invader or peaceful immigrant may yield, in a few generations, to the tongue of the mass of the population, as the Northman's was replaced by the French, and modern German gives way to English in the United States.

The last general topic in the article **ANTHROPOLOGY** is **Development of Civilization**. In connection with it the student should read the article **CIVILIZATION** (Vol. 6, p. 408), by Dr. H. S. Williams, editor-in-chief of *The Historian's History of the World*, and particularly the first part of it dealing with early times.

The comparatively brief article **ETHNOLOGY AND ETHNOGRAPHY** (Vol. 9, p. 849) takes up the story of man's progress at the point where **Ethnology** **ANTHROPOLOGY** stops, and deals particularly with the division of mankind into separate races. Was pleistocene man specifically one? The evidence to supply an answer to this question is of three kinds: anatomical, physiological and cultural and psychical. Human bones from this early period "show differences so slight as to admit of pathological or other explanation," and do not prove that there were separate species. The physiological answer, that there was only one species, is given and explained in the article **ANTHROPOLOGY**: species cannot breed with species, and hybrids are infertile. The

third answer is also in the negative. "The works of early man everywhere present the most startling resemblance." Dr. J. C. Prichard is quoted in the article as saying that

the same inward and mental nature is to be recognized in all races of men. When we compare this fact with the observations, fully established, as to the specific instincts and separate psychical endowments of all the distinct tribes of sentient beings in the universe we are entitled to draw confidently the conclusion that all human races are of one species and one family.

If man was specifically one, where did he originate and how did he spread over the world? "As to man's cradle-land there have been many theories, but the weight of evidence is in favour of Indo-Malaysia." The problem of distribution "has been met by geology, which proves that the earth's surface has undergone great changes since man's appearance, and that continents, long since submerged, once existed, making a complete land communication from Indo-Malaysia . . . Proofs no less cogent are available of the former existence of an Eurafian continent, while the extension of Australia in the direction of New Guinea is more than probable. . . . The western hemisphere was probably connected with Europe and Asia, in Tertiary times." The article ETHNOLOGY closes with a description of the four divisions of the human race proposed by Huxley, which have already been enumerated.

Separate articles supplementing these two main articles, ANTHROPOLOGY and ETHNOLOGY, especially in the field of comparative anatomy, are: ANTHROPOMETRY (Vol. 2, p. 119) for physical measurements, including the Bertillon system used to identify criminals; BRACHYCEPHALIC (Vol. 4, p. 366), or short-headed, a term applied to Indo-Chinese, Savoyards, Croats, Lapps, etc.; DOLICHOCEPHALIC (Vol. 8, p. 388), or long-headed, like Eskimos, negroes, etc.; MESOCEPHALIC (Vol. 18, p. 179), for the type between the two; PROGYNATHISM (Vol. 22, p. 424), for jaw protrusion; CRANIOMETRY (Vol. 7, p.

372) and CEPHALIC INDEX (Vol. 5, p. 684), for the measurement of skulls and heads; STEATOPYGIA (Vol. 25, p. 860), for a peculiar heaviness of hips found in some negro and other savage peoples; MONOGENISTS (Vol. 18, p. 730), on the theory that all men are descended from a common original stock; and POLYGENISTS (Vol. 22, p. 24) on the opposite theory.

One of the most elaborate ethnological articles in the Britannica is of particular interest to Americans, that on INDIANS, NORTH AMERICAN North American (Vol. 14, p. 452), by Indians Dr. A. F. Chamberlain, professor of anthropology, Clark University, Worcester, Mass. It is equivalent to more than 100 pages of this Guide, and there are also scores of brief articles on different North American Indian tribes. A few, only, of the many interesting topics treated in it may be mentioned:

The name "American Indians"—due to the mistaken early belief that the New World was a part of Asia. "Amerind" a suggested substitute. Various uses of "Indian." French "sauvage" the original of "Siwash." Popular fallacies of the origin of the Indians—Welsh, "lost Ten Tribes," etc.

Linguistic stocks. Table of languages. General description; varied character; enormous compound words, like *deyeknonhsedehrihadasterasterahetakwa* for "stove-polish." Indian literature.

Migrations of Indian stocks. Tabular conspectus of 180 tribes—situation and population, degree of intermixture, condition and progress, and authorities on each.

Population, physical characteristics, race mixture.

Culture, arts, industries, religion, mythology and games.

Social organization, contact of Indians and whites, Indian wars, missions, Indian talent and capacity, syllabaries invented by Indians.

In addition to the articles on Indian tribes there are many on Indian notables—for example, PONTIAC, TECUMSEH, KING PHILIP, BLACK HAWK, BRANT, and SITTING BULL.

Interest in the Indians of Central America, popularly called Aztecs, is rather archaeological than ethnological.

See in the Britannica the **Central America** article CENTRAL AMERICA (Vol. 5, p. 677), by Dr.

Walter Lehmann, directorial assistant of the Royal Ethnological Museum, Munich; and the article AMERICA, *Ethnology and Archaeology* (Vol. 1, p. 810), by O. T. Mason, late curator, Department of Anthropology, National Museum, Washington, dealing with the Indians of North, Central and South America in general. The other principal articles on races or tribes of

unusual ethnographic importance are:

NEGRO (Vol. 14, p. 344), by Thomas Athol Joyce, assistant in the Department of Ethnography, British Museum,—with a section on the negro in the United States, by Walter F. Willcox, late chief statistician, United States Census Bureau; supplemented by AFRICA, *Ethnology* (Vol. 1, p. 325), by Mr. T. A. Joyce, with a particularly valuable classified list (p. 329) of African tribal distribution, which may be made the basis for further study by reference to articles on the separate tribes, such as BERBERS, KABYLES, MZABITES, TUAREG, etc.

POLYNESIA (Vol. 22, p. 33) for the Polynesian race; and also SAMOA (Vol. 24, p. 115) and HAWAII (Vol. 13, p. 83)

AUSTRALIA, *Aborigines* (Vol. 2, p. 954) and *Maori*. The following is a list in alphabetical order of articles on races or tribes:

|                     |                        |                       |                    |
|---------------------|------------------------|-----------------------|--------------------|
| Ababda              | Babu                   | Boer                  | Choctaws           |
| Abipones            | Badagas                | Bogos (Bilens)        | Cholones           |
| Abnaki              | Baggára                | Bois Brûlés           | Chude              |
| Aborigines          | Bakalai                | Bongo                 | Chukchi            |
| Acholi              | Bakhtiári              | Botocudos             | Chuncho            |
| Afars (Danakil)     | Ba-Kwiri               | Bozdar                | Chuvashes          |
| Agaiambo            | Ba-Luba                | Brahui                | Circassia          |
| Ahom                | Bambute                | Bugis                 | Cocoma, or Cucamas |
| Aht                 | Banate                 | Bugti                 | Coeur d'Alène      |
| Ahtena              | Bangash                | Buriats               | Comanches          |
| Aimak, or Eimak     | Barabra                | Bushmen               | Conestoga          |
| Ainu                | Bari                   | Caddo                 | Conibos            |
| Akka                | Bashkirs               | Cagots                | Copts              |
| Alfuros             | Basques                | Cahita                | Cree               |
| Algonquin           | Battakhlin             | Cahokia               | Creek Indians      |
| Alur                | Battanni               | Cakchiquel            | Crow Indians       |
| Amarar              | Battas                 | Calchaqui             | Cunas              |
| Anti, or Campa      | Batwa                  | Caribs                | Curetus            |
| Apache              | Bazigars               | Cashibo, or Carapache | Czech              |
| Apalachee           | Bechuana               | Catauxi               | Dawari, or Dauri   |
| Arabs               | Bedouins               | Catawbas              | Delaware Indians   |
| Arapaho             | Beja, or Bija          | Celt                  | Dinka              |
| Araucanians         | Bellabella             | Chamkanni             | Dogra              |
| Arawak              | Bellacoola, or Bilqula | Changos               | Dravidian          |
| Areoi               | Beni-Amer              | Charrua               | Dualla             |
| Arikara, or Aricara | Beni-Israel            | Chechenzes            | Duk-Duk            |
| Artega              | Beothuk                | Chellian              | Duraní             |
| Ashraf (Shurefa)    | Berbers                | Cheremisses           | Dyaks              |
| Assiniboin          | Bertat                 | Cherokee              | Engis              |
| Athapascan          | Bhattiana              | Cheyenne              | Eskimo             |
| Attacapa            | Bhils, or Bheels       | Chickasaws            | Ewe                |
| Awadia and Fadnia   | Bimana                 | Chimesyan             | Falashas           |
| Aymara              | Bisharin               | Chinook               | Fang               |
| Aztecs              | Blackfoot              | Chiquitos             | Fanti              |

|                         |                   |                    |                       |
|-------------------------|-------------------|--------------------|-----------------------|
| Fellah                  | Kanaka            | Mishmi (tribe)     | Salishan              |
| Fiji                    | Kanuri (Beriberi) | Modoc              | Samoyedes             |
| Fingo, or Føngu         | Kara-Kalpaks      | Mohave             | Santals               |
| Finno-Ugrian            | Karen             | Mohawk             | Semang                |
| Flatheads               | Kashubes          | Mohican            | Seminole              |
| Fox Indians             | Kavirondo         | Mohmand            | Seneca                |
| Fula                    | Kaw (Kansa)       | Monassir           | Serers                |
| Funj                    | Kayasth           | Montagnais         | Shagia                |
| Furfoos                 | Khamtis           | Moors              | Shangalla             |
| Galchas                 | Khattak           | Moplah             | Shans                 |
| Gallas                  | Khazars           | Mordvinians        | Shawnee               |
| Gararish                | Khevsurs          | Moxos              | Sherani, or Shirani   |
| Ghilzai                 | Khonds            | Mpongwe (Pongos)   | Shilluh               |
| Gilyaks                 | Kickapoo          | Mundas             | Shilluk               |
| Gipsies                 | Kiowas            | Mundrucus          | Shinwari              |
| Golda                   | Kirghiz           | Muras              | Shukria               |
| Gonaguas                | Klamath           | Musa Khel          | Sienetjo              |
| Gros Ventres            | Koch              | Muskhogeian Stock  | Sikh                  |
| Guanches                | Kolis             | Mzabites, or Beni- | Sioux                 |
| Guaranis                | Kols              | Mzab               | Slavs                 |
| Guatos                  | Korkus            | Nahuatlan Stock    | Slovaks               |
| Guatusos                | Koryaks           | Namasudra          | Slovenes              |
| Guaycurus               | Kotas             | Nandi              | Songhoi               |
| Gumus                   | Krumen            | Navaho, or Navajo  | Sorbs                 |
| Hababs                  | Kubus             | Nayar, or Nair     | Swahili               |
| Hadendoa                | Kumyks            | Negritos           | Syryenians            |
| Haida                   | Kunbis            | Negro              | Tajik                 |
| Hakkas                  | Kurumbas          | Nez Percés         | Talaing               |
| Hamitic Races           | Kusan             | Niam-Niam          | Tamils                |
| Harratin                | Kutenai           | Nuer               | Tarkani               |
| Hassania                | Kwakiutl          | Oerlams            | Tatars                |
| Hausa                   | Laos              | Ojibway            | Tehuelche             |
| Hawawir                 | Lascar            | Omaguas            | Tembu                 |
| Hazara                  | Latuka            | Omahas             | Tibbu, or Tebu        |
| Heroro, or Ovaherero    | Legas             | Oneida             | Todas                 |
| Hindki                  | Lepcha            | Onondaga           | Toltecs               |
| Hipurnias               | Lipan             | Opata              | Troglodytes           |
| Hiung-nu                | Lolos             | Orakzai            | Tshi                  |
| Hopi                    | Madi              | Oraons             | Tuareg                |
| Hottentots              | Mabar             | Ostiaks            | Tukolor (Tuculers)    |
| Hova                    | Mahrattas         | Ottawa             | Tunguses              |
| Huambisas               | Makalaka          | Papuans            | Tupis                 |
| Huastecs                | Makaraka          | Pariah (caste)     | Turi                  |
| Huichol                 | Malays            | Parsees            | Turki                 |
| Huron                   | Mandan            | Pathan (people)    | Turkoman              |
| Indians, North American | Mandingo          | Pawnee             | Turks                 |
| Iquitos                 | Maneteneris       | Penobscot          | Tuscarora             |
| Iroquois                | Mangbettu         | Pequot             | U'ighur               |
| Irulas                  | Manyema           | Petchenegs         | Unyamwezi             |
| Itza                    | Maori             | Pima               | Ustarana              |
| Ja'alín                 | Marianas          | Polabs             | Ute (Utah)            |
| Jakuns                  | Mariposan         | Ponca              | Utman Khel            |
| Jats                    | Maroons           | Pondo              | Vaalpens              |
| Jeveros                 | Marri             | Potawatami         | Veddahs               |
| Jibitos                 | Masai             | Povindah           | Wa                    |
| Jicarilla               | Mashona           | Prabhu (caste)     | Wichita               |
| Juangas                 | Metabele          | Pueblo Indians     | Wochua                |
| Jur (Diur)              | Maya              | Puelche            | Wolof (Woloff, Jolof) |
| Juris                   | Mayoruna          | Pygmy              | Wvandot (Huron)       |
| Kabbabish               | Menangkabos       | Quiché, or Kichés  | Yaos                  |
| Kabyles                 | Mensa and Marea   | Quichua            | Yusafzai              |
| Kaffirs                 | Meshcheryaks      | Rajput             | Zaimukht              |
| Kakar                   | Meyrifab          | Riffians           | Zaparos               |
| Kalapuya                | Miami             | Ruthenians         | Zenaga                |
| Kalispel                | Miaotsze          | Sahos              | Zenata                |
| Kalkas                  | Micmac            | Sakai              |                       |
|                         | Mikirs            |                    |                       |

The technical terms of nearly every science are words coined from Latin and Greek roots, so that the student of these

### Terminology

languages is at an advantage in learning any science—its terms have some meaning to him no matter how strange the science itself. But in anthropology and ethnology we come across such terms as *taboo*, *totem*, *shaman* and *manitou*. For their comprehension Latin and Greek give no aid. Each of these terms comes into English from the language of a primitive people to convey an idea at once too primitive and too complex to be expressed by any English word or by a Greek or Latin compound. "Taboo" is a Malay word meaning both "unclean" (as that word is used in the Old Testament) and "sacred"; and the idea it conveys is characteristic of the religious and social system found among the Polynesians and nearly all other peoples in a comparatively low stage of civilization, which sets persons or things apart as sacred or accursed. "Totem" is a Chippewa (North American Indian) word denoting an animal, plant, or other object chosen as the name of a whole family or tribal division. The word "shaman" comes from the Ural-Altaic (Tungus), and means "medicine-man," a combination of priest, magician and exorcist. "Manitou" is another North American word meaning "spirit" or "genius."

The practice of taboo and totemism, although one word comes to us from the South Seas and the other from the American Indians, is found

### Taboo and Totem

all over the less civilized world, and— even more important—it explains many things in the social and religious life of more civilized communities. For instance, the account by modern students of Greek and Roman religion has had to be largely rewritten in the light of what we have learned in the last two generations about taboo and totemism.

The articles **TABOO** (Vol. 26, p. 337) and **TOTEMISM** (Vol. 27, p. 79) are both by Andrew Lang, author of *Custom and Myth* and other standard works on folklore. It is unnecessary to outline these two articles here, as the two words have been defined, and the importance of the subject suggested. The reader should refer to the article on **ANDREW LANG** (Vol. 16, p. 171), in which it is said that "he explained the irrational elements of mythology as survivals from earlier savagery . . . ." idealized "savage animism . . . maintained the existence of high spiritual ideas among savage races, and instituted comparisons between savage practices and the occult phenomena among civilized races." His appreciation of the culture of the savage and his remarkably interesting style should induce the student to read Lang's other and related articles in the Britannica. especially:

**FAMILY** (Vol. 10, p. 158), (equivalent to 27 pages of this Guide), dealing particularly with the question of marriage as related to totemism, and the practices of marrying only *out* of the tribe or totem, and of marrying only *within* the totem (see the articles **ENDO GAMY** and **EXO GAMY**, **MATRIARCHATE**, **POLYANDRY**, **POLYGAMY**, **LEVIRATE** and **COUVADE**).

**NAME** (Vol. 19, p. 157), which discusses the relation of the name to the totem, the strange primitive custom of the individual's having many names and concealing his true name, etc.; and also the articles **FAIRY** (Vol. 10, p. 134) and **MYTHOLOGY** (Vol. 19, p. 128).

For special forms of superstition, read the articles **MAGIC**, **SHAMANISM**, **WITCHCRAFT**, **DEMONOLOGY** and **LYCANTHROPY**,

and in the field of religion, **RELIGION**, *Primitive* (Vol. 23, p. 63), by R. R.

Marett, of Oxford University, author of *The Threshold of Religion*, etc. This article puts particular stress on the importance of ritual in early religion. Compare also the matter, already mentioned, on



religion in the article on North American Indians with the short articles MANITOU (Vol. 17, p. 568) and GHOST DANCE (Vol. 11, p. 925). Besides, the student should read ORDEAL (Vol. 20, p. 173), PRAYER (Vol. 22, p. 256), RITUAL (Vol. 23, p. 370), SACRIFICE (Vol. 23, p. 980), ANIMISM (Vol. 2, p. 53), on the attempt to explain religion as due to the fear and worship of ghosts—and FETISHISM (Vol. 10, p. 295), by N. W. Thomas, government anthropologist to Southern Nigeria; ANCESTOR-WORSHIP (Vol. 1, p. 945), FUNERAL RITES (Vol. 11, p. 329) and PURIFICATION (Vol. 22, p. 660), all by Dr. F. C. Conybeare, author of *Myth, Magic and Morals*, etc.; TREE-WORSHIP (Vol. 27, p. 235) and SERPENT-WORSHIP (Vol. 24, p. 676), both bearing on totemism, by S. A. Cook, author of *Religion of Ancient Palestine*, etc.

A course of reading on anthropology

may well close with the study in the Britannica of the lives of some leaders in this science. The student will thus be familiarized with the theories of each great anthropologist—and will notice the manifold appeal of the science by seeing from what point each approached it—one from his interest in geology, another from travel, a third because of his studies in surgery or biology, another as a psychologist.

|                         |                        |
|-------------------------|------------------------|
| Avebury, 1st Baron      | Hale, Horatio          |
| Bandelier, Adolph F. A. | Hodgson, B. H.         |
| Bastian, Adolf          | Lartet, Edouard        |
| Brasseur de Bour-       | M'Lennan, John F.      |
| bourg, C. E.            | Mantegazza, Paolo      |
| Brinton, D. G.          | Morgan, Lewis Henry    |
| Broca, Paul             | Mortillet, L. L. G. de |
| Catlin, George          | Prichard, James Cowles |
| Christy, Henry          | Schoolcraft, H. R.     |
| Dawkins, William Boyd   | Taylor, Edward B.      |
| Deniker, Joseph         | Wagner, Rudolf         |
| Fletcher, Alice C.      | Waits, Theodor         |

## CHAPTER LII

### MATHEMATICS

**T**HERE is no single book in the English language, save the Britannica, in which the whole body of mathematical knowledge is examined and classified with special reference to the inter-relation of its various parts and to the results obtained in the neighboring domains of physics, chemistry, and engineering. Text-books necessarily have a somewhat narrow purpose, namely to teach the student how to solve problems in a single given field; wide views

over the surrounding country can, therefore, seldom be afforded. The Britannica, however, does for English readers, what the *Encyclopädie der Mathematischen Wissenschaften* does for German, and more, in that in the Britannica the shadowy borderlands are illuminated and the roads cleared which connect the mathematical and the experimental sciences. In fact if anyone possessed every mathematical text-book that had ever been published, he would still find

the articles full of suggestion to him, for in them the whole subject has been presented, in all its complex bearings, logically and as a whole.

It is nearly 4,000 years since a mathematician was last deified in the person of Amenophis, and as far as can be ascer-

**History** tained only one other of his calling ever received this honour, and he also was an Egyptian who had entered into his godship a full thousand years earlier (Vol. 9, p. 46). To the ancient Egyptians mathematics owes the first fragmentary ideas of arithmetic and mensuration, but little else, for despite their amazing mechanical achievements very little record of purely mathematical knowledge has come down from them. It was the Greeks, starting with Thales (600 B.C.), who really created the sciences of geometry and numbers. To them we owe the great abstract ideas which dominate the science. The Greek period lasted till the capture of Alexandria by the Mohammedans, A.D. 640, at which time the Arabian school took shape, and to it we owe the development of algebra (*al-jabr-wa'l-muqubala*, which means the transposition and removal [of terms of an equation]). With the Renaissance the centre of scientific research shifted to Western Europe and from then on the boundaries of mathematical knowledge were rapidly extended, till to-day the subject is the common ground on which all the physical sciences meet. The student is referred to the article **MATHEMATICS** (Vol. 17, p. 878), by A. N. Whitehead, fellow and senior lecturer in mathematics, Trinity College, Cambridge, for a brilliant exposition of the foundations of the subject.

The professed mathematician will, of course, not need any set guide to his reading, but it may be well to point out one or two articles which he will find especially worthy of his attention.

The article **PROBABILITY**, (Vol. 22, p. 376), by Professor Edgeworth, author

of *Mathematical Psychics*, and numerous papers on the cal-

**Leading** culus of probabili-  
**Articles** ties, gives, to the

best of our belief, the only statement of the whole problem in the English language. That on **ALGEBRAIC FORMS** (Vol. 1. p. 620), by Major Macmahon, former president of the London Mathematical Society, includes a number of results not previously published. The article **ELASTICITY** (Vol. 9, p. 141), by A. E. H. Love, professor of natural philosophy in the University of Oxford, embodies the experience of a distinguished mathematician who has made this subject the object of his special study for years. Sir George Darwin (son of Charles Darwin) in the article **TIDE** (Vol. 26, p. 938) summed up the results of his life's work. The new electrical theory of the properties of **MATTER** (Vol. 17, p. 891) is discussed by Sir J. J. Thomson, professor of physics, Cambridge, who has done more than anyone else to develop it. There are many other valuable articles, e.g., **GEOMETRY, Axioms** (Vol. 11, p. 730), and **GEOMETRY, Non-Euclidean** (Vol. 11, p. 724), by A. N. Whitehead; **UNITS, DIMENSIONS OF** (Vol. 27, p. 736), by Professor J. A. Fleming; **ENERGY and ENERGETICS** (Vol. 9, p. 398 and p. 390), by Sir Joseph Larmor; **GROUPS**, by Prof. Burnside, author of *Theory of Groups of Finite Order*. Articles which will be found highly useful to the engineer are **MENSURATION** (Vol. 18, p. 134); **EARTH, FIGURE OF** (Vol. 8, p. 801); **GEODESY** (Vol. 11, p. 607); **STRENGTH OF MATERIALS** (Vol. 25, p. 1007).

The mathematician will at once recognize the peculiar fitness of the contributors to deal with the subjects allotted to them, and this

**Leading** fitness is the more  
**Contributors** noticeable in the following list, ar-

ranged in alphabetical order, which names and briefly describes the dis-

tinguished mathematicians who have collaborated in the Britannica, and indicates the principal articles written by each.

H. F. Baker, Fellow and Lecturer of St. John's College, Cambridge. Cayley Lecturer in Mathematics in the University. Author of *Abel's Theory and the Allied Theory*, etc.:

DIFFERENTIAL EQUATION; FUNCTION, *Functions of Complex Variables*.

Ludwig Boltzmann, formerly Professor of Theoretical Physics in the Universities of Munich, Vienna, and Leipzig. Author of *Lectures on the Theory of Gas; Lectures on Maxwell's Theory of Electricity and Light*:

MODEL.

W. Burnside, Professor of Mathematics, Royal Naval College, Greenwich. Hon. Fellow of Pembroke College, Cambridge. Author of the *Theory of Groups of Finite Order*, etc.:

GROUPS, THEORY OF

Arthur Cayley, formerly Professor of Pure Mathematics in the University of Cambridge. See the biographical article (Vol. 5, p. 589):

CURVE (in part); DETERMINANT; EQUATION; NUMBERS, PARTITION OF; SURFACE (in part); GAUSS, K. F.; MONGE, G.

George Chrystal, Professor of Mathematics and Dean of the Faculty of Arts, Edinburgh University, Hon. Fellow and formerly Fellow and Lecturer, Corpus Christi College, Cambridge:

PERPETUAL MOTION; PASCAL (in part); RIEMANN, GEORG.

Col. A. R. Clarke, Royal Medal of Royal Society 1887; in charge of trigonometrical operations of the Ordnance Survey 1854-1881:

EARTH, FIGURE OF THE (in part); GEODESY (in part); MAP, *Projections* (in part).

Agnes Mary Clerke, Author of *History of Astronomy in the 19th Century; The*

*System of the Stars; Problems in Astrophysics*; and many other astronomical books. See the biographical article (Vol. 6, p. 497):

ASTRONOMY, *History*: ZODIAC; BRAHE, TYCHO; COPERNICUS; FLAMSTEED; HALLEY; HUYGENS; KEPLER, etc.

Lt. Col. C. F. Close, head of the Geographical Section, British General Staff, formerly British Representative on the Nyasa-Tanganyika Boundary Commission. Author of *Text-Book of Topographical Surveying*, etc.:

MAPS, *Projections* (in part).

W. E. Dalby, Professor of Civil and Mechanical Engineering at the City and Guilds of London Institute, Central Technical College, South Kensington. Author of *The Balancing of Engines*, etc.:

MECHANICS, *Applied* (in part); and several engineering subjects.

Sir George H. Darwin, late Fellow of Trinity College, Cambridge, and Plumian Professor of Astronomy and Experimental Philosophy in the University. President of the British Association, 1905. Author of *The Tides and Kindred Phenomena in the Solar System*, etc.:

TIDE.

F. Y. Edgeworth, Professor of Political Economy in the University of Oxford, etc. Author of *Mathematical Psychics*, and numerous papers on the Calculus of Probabilities in the *Philosophical Magazine*, etc.:

PROBABILITY.

E. B. Elliott, Waynflete Professor of Pure Mathematics, and Fellow of Magdalen College, Oxford. Formerly Fellow of Queen's College, Oxford. President of the London Mathematical Society, 1896-1898. Author of *Algebra of Quantics*, etc.:

CURVE, (in part); GEOMETRY, IV *Analytical Geometry*.

C. Everitt, Magdalen College, Oxford: ALGEBRA, *History*: DENSITY; LIGHT, *Introduction, History*, etc.:

J. A. Ewing, Director of (British) Naval Education. Hon. Fellow of King's College, Cambridge. Formerly Professor of Mechanism and Applied Mechanics in the University of Cambridge. Author of the *Strength of Materials*, etc:

STRENGTH OF MATERIALS, and several engineering subjects.

J. A. Fleming, Pender Professor of Electrical Engineering in the University of London. Fellow of University College, London. Formerly Fellow of St. John's College, Cambridge, and Lecturer on Applied Mechanics in the University. Author of *Magnets and Electric Currents*, etc.:

UNITS, PHYSICAL; and many articles on Electrical Science.

Rev. A. H. Frost:

MAGIC SQUARE.

W. Garnett, Educational Adviser to the London County Council; formerly Fellow and Lecturer of St. John's College, Cambridge. Principal and Professor of Mathematics, Durham College of Science. Author of *Elementary Dynamics*, etc.:

ENERGY (in part); HYDROMETER; KELVIN, LORD.

J. W. L. Glaisher, Fellow of Trinity College, Cambridge. Formerly President of the Cambridge Philosophical Society and the Royal Astronomical Society, Editor of *Messenger of Mathematics* and the *Quarterly Journal of Pure and Applied Mathematics*:

LOGARITHM; TABLE, MATHEMATICAL; LEGENDRE, A. M.; NAPIER, JOHN.

J. H. Grace, Lecturer in Mathematics at Peterhouse and Pembroke College, Cambridge. Fellow of Peterhouse:

GEOMETRY, *Line Geometry*.

Sir A. G. Greenhill, formerly Professor of Mathematics in the Ordnance College, Woolwich. Author of *Differential and Integral Calculus with Applications; Hydrostatics; Notes on Dynamics*, etc.:

BALLISTICS; GYROSCOPE AND GYROSTAT; HYDROMECHANICS.

Sir Thomas Little Heath, Assistant-Secretary to the Treasury, London. Fellow of Trinity College, Cambridge. Author of *Apollonius of Perga; Treatise on Conic Sections; The Thirteen Books of Euclid's Elements*, etc.:

ANTHEMIUS; APOLLONIUS OF PERGA; ARCHIMEDES; HERO OF ALEXANDRIA; PAPPUS OF ALEXANDRIA; PORISM, etc.

F. R. Helmert, Professor of Geodesy in the University of Berlin:

EARTH, FIGURE OF THE (in part); GEODESY (in part).

O. M. F. Henrici, Professor of Mechanics and Mathematics in the Central Technical College of the City and Guilds of London Institute. Author of *Vectors and Rotors; Congruent Figures*, etc.:

CALCULATING MACHINES; GEOMETRY, I. *Euclidean*; II. *Projective*; III. *Descriptive*; PERSPECTIVE; PROJECTION.

E. W. Hobson, Fellow and Tutor in Mathematics, Christ's College, Cambridge. Stokes Lecturer in Mathematics in the University:

FOURIER'S SERIES; SPHERICAL HARMONICS; TRIGONOMETRY.

A. E. Jolliffe, Fellow, Tutor and Mathematical Lecturer, Corpus Christi College, Oxford. Senior Mathematical Scholar, 1892:

CONTINUED FRACTIONS; MAXIMA AND MINIMA; SERIES.

H. Lamb, Professor of Mathematics, University of Manchester, formerly Fellow and Assistant Tutor of Trinity College, Cambridge; Member of Council of Royal Society, 1894-1896. Royal Medallist, 1902. President of London Mathematical Society 1902-1904. Author of *Hydrodynamics*, etc.:

DYNAMICS; HARMONIC ANALYSIS; MECHANICS, I. *Theoretical*; VECTOR ANALYSIS; WAVE.

- A. E. H. Love, Sedleian Professor of Natural Philosophy in the University of Oxford. Hon. Fellow of Queen's College; formerly Fellow of St. John's College, Cambridge; Secretary to the London Mathematical Society:  
ELASTICITY; VARIATIONS, CALCULUS OF; FUNCTION, *Functions of Real Variables*; INFINITESIMAL CALCULUS.
- W. H. Macaulay, Fellow and Tutor of King's College, Cambridge:  
MOTION, LAWS OF.
- Major P. A. Macmahon, Deputy Warden of the Standards, Board of Trade. Joint General Secretary, British Association. Formerly Professor of Physics, Ordnance College. President of London Mathematical Society, 1894-1896:  
ALGEBRAIC FORMS; COMBINATORIAL ANALYSIS; CAYLEY, ARTHUR.
- G. B. Mathews, formerly Professor of Mathematics, University College of N. Wales, sometime Fellow of St. John's College, Cambridge:  
ALGEBRA, *Special Kinds of Algebra*; NUMBER.
- J. Clerk Maxwell, former Professor of Experimental Physics in the University of Cambridge. See biographical article (Vol. 17, p. 929):  
CAPILLARY ACTION (in part); DIAGRAM.
- Simon Newcomb, former Professor of Mathematics and Astronomy, Johns Hopkins University, etc. See the biographical article (Vol. 19, p. 474):  
ASTRONOMY, *Descriptive*; and many other astronomical subjects.
- J. H. Poynting, Professor of Physics and Dean of the Faculty of Science in the University of Birmingham. Formerly Fellow of Trinity College, Cambridge. Joint-author of *Text-Book of Physics*:  
ACOUSTICS; GRAVITATION (in part); SOUND.
- F. Purser, formerly Fellow of Trinity College, Dublin; Professor of Natural Philosophy in the University of Dublin; Member of the Royal Irish Academy:  
SURFACE (in part).
- J. Purser, formerly Professor of Mathematics in Queen's College, Belfast. Member of the Royal Irish Academy:  
SURFACE (in part).
- W. J. M. Rankine, former Professor of Civil Engineering at Glasgow University. See the biographical article (Vol. 22, p. 894):  
MECHANICS, *Applied* (in part).
- Hon. B. A. W. Russell, formerly Fellow of Trinity College, Cambridge. Author of *Foundations of Geometry*; *Principles of Mathematics*, etc.:  
GEOMETRY, VI. *Non-Euclidean* (in part).
- W. F. Sheppard, Senior Examiner in the Board of Education; formerly Fellow of Trinity College, Cambridge; Senior Wrangler, 1884:  
ALGEBRA, *Principles of Ordinary Algebra*; ARITHMETIC; DIFFERENCES, CALCULUS OF; INTERPOLATION; MENSURATION.
- P. G. Tait, late professor of Natural Philosophy, Edinburgh University. Author of *Elementary Treatise on Quaternions*. Joint author with Lord Kelvin of *Treatise on Natural Philosophy*:  
KNOT; QUATERNIONS (in part); HAMILTON, SIR WILLIAM; MAXWELL, JAMES CLERK.
- Rev. Charles Taylor, formerly Master of St. John's College, Cambridge. Vice-Chancellor, Cambridge University, 1887-1888. Author of *Geometrical Conics*, etc.:  
GEOMETRICAL CONTINUITY.
- H. M. Taylor, Fellow of Trinity College, Cambridge; formerly Tutor and Lecturer. Smith's Prizeman, 1865. Editor of the Pitt Press *Euclid*:  
NEWTON, SIR ISAAC.
- Sir J. J. Thomson, Cavendish Professor of Experimental Physics and Fellow of Trinity College, Cambridge. Presi-



dent of the British Association, 1909-1910. Author of *A Treatise on the Motion of Vortex Rings; Application of Dynamics to Physics and Chemistry:*

MATTER; and several articles on Electrical Science.

J. Walker, Christ Church, Oxford. Demonstrator in the Clarendon laboratory. Formerly Vice-President of the Physical Society. Author of *The Analytical Theory of Light*, etc.:

POLARIZATION OF LIGHT; REFRACTION, *Double Refraction*.

A. N. Whitehead, Fellow and Lecturer in Mathematics, Trinity College, Cambridge. Author of *A Treatise on Universal Algebra*, etc.:

GEOMETRY VI. *Non-Euclidean Geometry* (in part); GEOMETRY VII. *Axioms on Geometry*; MATHEMATICS.

These are the men who are responsible for the mathematical sections of the Britannica. A fuller list of articles on mathematical subjects is given below.

- |                        |                          |                        |                         |
|------------------------|--------------------------|------------------------|-------------------------|
| Abel, Niels Henrik     | Cisoid                   | Frisi, Paolo           | Lagrange, Joseph L.     |
| Abscissa               | Clairault, A. C.         | Frustum                | Landen, John            |
| Acceleration           | Clifford, William K.     | Function               | Laplace, P. S., de      |
| Agnesi, Maria Gaetana  | Cocker, Edward           | Galloway, Thomas       | Lardner, Dionysius      |
| Aguillon, F. D.        | Colburn, Z.              | Galois, Evariste       | Legendre, A d r i e n   |
| Algebra                | Combinatorial Analysis   | Gauss, Karl Friedrich  | Marie                   |
| Algebraic Forms        | Conchoid                 | Geodesy                | Lemniscate              |
| Aliquot                | Cone                     | Geometrical Continuity | Leonardo of Pisa        |
| Allen, or Alleyn T.    | Conic Section            | Geometry               | Leslie, Sir John        |
| Amicable Numbers       | Conoid                   | Gnomon                 | Lever                   |
| Anderson, Alexander    | Continued Fractions      | Graphical Methods      | Lie, Marius Sophus      |
| Angle                  | Cotes, Roger             | Gravitation            | Limaçon                 |
| Anthemius              | Cremona, Luigi           | Greaves, John          | Line                    |
| Apollonius of Perga    | Cube                     | Gregory (family)       | Lobachevskiy, N. I.     |
| Archimedes             | Curve                    | Gregory, Olinthus G.   | Locus                   |
| Argument               | Cycloid                  | Groups, Theory of      | Logarithm               |
| Arithmetic             | Cylinder                 | Gunter, Edmund         | Logocyclic Curve, Stro- |
| Autolycus of Pitane    | Demoivre, Abraham        | Gyroscope and Gyro-    | phoid or Foliate        |
| Axis                   | De Morgan, Augustus      | stat                   | MacCullagh, James       |
| Babbage, Charles       | Determinant              | Hachette, J. N. P.     | Maclaurin, Colin        |
| Baldi, Bernardino      | Diagonal                 | Hamilton, Sir W. R.    | Magic Square            |
| Ballistics             | Diagram                  | Harmonic               | Map                     |
| Barlow, Peter          | Diameter                 | Harmonic Analysis      | Mascheroni, Lorenzo     |
| Barrow, Isaac          | Differences, Calculus of | Harriot, T.            | Mathematics             |
| Bernoulli (family)     | Differential Equation    | Hero of Alexandria     | Matter                  |
| Bessel Function        | Dimension                | Hodograph              | Maupertuis, Pierre de   |
| Binomial               | Diophantus of Alex-      | Hutton, Charles        | Maxima and Minima       |
| Biquadratic            | andria                   | Huygens, Christian     | Maxwell, J. Clerk       |
| Bisectrix              | Ditton, Humphry          | Hydrodynamics          | Mechanics               |
| Boole, George          | Dodecahedron             | Hydromechanics         | Mensuration             |
| Borda, Jean Charles    | Dynamics                 | Hydrostatics           | Mersenne, Marin         |
| Boscovich, Roger J.    | Earth, Figure of the     | Hyperbola              | Monge, Gaspard          |
| Bouguer, Pierre        | Elasticity               | Icosahedron            | Montucia, Jean-Étienne  |
| Bowditch, Nathaniel    | Ellipse                  | Inaudi, Jacques        | Motion, Laws of         |
| Brachistochrone        | Ellipsoid                | Infinite               | Murphy, Robert          |
| Briggs, Henry          | Emerson, William         | Infinitesimal Calculus | Napier, John            |
| Buxton, Jedediah       | Energetics               | Interpolation          | Newton, Sir Isaac       |
| Calculating Machines   | Energy                   | Inversion              | Nicomachus of Ge-       |
| Camus, Charles E. L.   | Epicycloid               | Involution             | rasa                    |
| Cardan, Girolamo       | Equation                 | Ivory, Sir James       | Number                  |
| Cardioid               | Euclid                   | Jacobi, Karl G. J.     | Numbers, Partition of   |
| Castel, Louis Bertrand | Euler, Leonard           | Kelvin, William Thom-  | Numeral                 |
| Catenary               | Fermat, Pierre de        | son, 1st baron         | Octahedron              |
| Cauchy, A. L., baron   | Figure Numbers           | Kinematics             | Ordinate                |
| Cayley, Arthur         | Focus                    | Kinetics               | Oughtred, William       |
| Charles, J. A. C.      | Folium                   | Kircher, Athanasius    | Oval                    |
| Chebichev, P. L.       | Fourier, J. B. J.        | Knot                   | Pantograph              |
| Circle                 | Fourier's Series         | Kovalevsky, Sophie     | Pappus of Alex-andria   |

|                       |                       |                       |                         |
|-----------------------|-----------------------|-----------------------|-------------------------|
| Parabola              | Projection            | Snell, Willebrord     | Tetrahedron             |
| Peacock, George       | Quadratrix            | Sphere                | Theodosius of Tripolis  |
| Peirce, Benjamin      | Quaternions           | Spherical Harmonics   | Thompson, T. P.         |
| Pell, John            | Recorde, Robert       | Spheroid              | Tide                    |
| Perpetual Motion      | Riccati, J. F., count | Spiral                | Todhunter, Isaac        |
| Perspective           | Riemann, G. F. B.     | Spottiswoode, W.      | Triangle                |
| Pfaff, J. F.          | Roberval, G. P. de    | Statics               | Trigonometry            |
| Playfair, John        | Robins, Benjamin      | Steiner, Jakob        | Trisectrix              |
| Plücker, Julius       | Roulette              | Stevinus, Simon       | Units, Dimensions of    |
| Poinsot, Louis        | Routh, Edward John    | Stirling, James       | Units, Physical         |
| Poisson, Siméon Denis | Russell, John Scott   | Stokes, Sir George G. | Variations, Calculus of |
| Polygon               | Salmon, George        | Strength of Materials | Vector Analysis         |
| Polygonal Numbers     | Saunderson, N.        | Sturm, J. C. F.       | Vernier, Pierre         |
| Polyhedral Numbers    | Serenus of Antissa    | Surface               | Vieta (or Viète), F.    |
| Polyhedron            | Series                | Sylvester, J. J.      | Wallace, William        |
| Poncelet, Jean Victor | Serpentine            | Table, Mathematical   | Wallis, John            |
| Porism                | Simpson, Thomas       | Tait, Peter G.        | Wave                    |
| Price, Bartholomew    | Simson, Robert        | Tartaglia, Niccolo    | Witch of Agnesi         |
| Prism                 | Smith, H. J. S.       | Taylor, Brook         | Zero                    |
| Probability           | Smith, Robert         |                       |                         |

## CHAPTER LIII

### ASTRONOMY

NO greater homage has ever been paid to the progress of American science than when the planning and supervision of the astronomical section of the new Encyclopaedia Britannica was entrusted to the late Prof. Simon Newcomb, who was also the only American save Benjamin Franklin ever elected an associate of the French Institute. His death occurred some time before the Britannica was completed, but he had already finished the articles which he had undertaken personally to contribute, and read a great number of the other articles which had, at his suggestion, been assigned to eminent astronomers in various parts of the world. His famous handbook, *Popular Astronomy*, has been translated into all the European languages, and into Japanese as well; but the unlimited resources in the way of collabora-

tion which the editorial organization of the Britannica put at his disposal, enabled him to assemble in these volumes a complete body of astronomical knowledge which is the greatest of his educational achievements.

The making of a lens for a great telescope is the most difficult undertaking in all craftsmanship, and the mounting of the telescope itself a triumph of mechanical ingenuity. Yet the stars and planets have been guide-posts for the shepherd and the sailor throughout the ages, and have told the farmer when to sow and when to reap, and, even in our day, observations made by an amateur, through a common field-glass, have in more than one instance yielded results of serious value.

Progress is from one point of view so slow that astronomers are now compiling

data regarding fixed stars of which the motion cannot be

**A Few Facts** deduced for centuries to come; yet some of the changes to be observed are so swift that solar prominences often rise at the rate of 350,000 miles an hour, and have been seen to rise to that height. The temperature of the sun's envelope, 6000° C., greatly exceeds any that we can artificially create, and would convert into gas any substance we know; and for every unit of heat it sends to the earth, a hundred million other units, poured into space, are absolutely lost for any purposes of mechanical effect.

Astronomy deals with objects so minute that even a shooting star evolving, as it passes through our atmosphere, so much light that we can trace its course with the naked eye, may be no larger than a grain of sand; deals, too, with objects of so shadowy a nature that the white clouds in our sky are, in comparison, solid blocks; and deals, again, with distances and surfaces so vast that numerical description fails to convey any impression but one of confusion.

It is not easy to conceive, when we see a balloon in the air, the remainder that would exist if the bag, the car, and the cordage were all subtracted. There would be, until the gas mixed with the atmosphere, a sphere of gas. The stars, our sun included, seem to be masses of incandescent gas, possessing fairly definite boundaries, and not far from spherical in shape; the nebulae seem also to be masses of incandescent gas, irregular in form and having no clearly marked limits; even the nucleus of a comet is apparently not solid enough to be opaque; and as the four great planets also seem to be gaseous, it is probable that only the smaller bodies, like our earth, the moon, and Mars, are solid.

To the rule that we can handle none of the matter that originates beyond the limits of our atmosphere, the meteorites supply an exception. Seventy years ago,

a mass of stone, cold and invisible, flying through the aether of space at the rate of some hundred thousand miles an hour, entered our atmosphere, became so hot, as the air's friction checked its speed, that bits of its surface, fused to crust, flicked off and floated in the air, leaving a shining trail; then as its speed was reduced to some three hundred miles an hour, cooled until it was no hotter than a laundress likes her iron to be. At Mhow, in India, as it made a dent in the earth, it killed a man—the only man known to history who has died so uncanny a death. But near Wold Cottage, in Yorkshire, England, thirty years before, another meteorite had fallen only ten yards from a labourer; and only thirty years ago another arrived on a Yorkshire railway line, forty yards from a gang of platelayers. The largest meteoric mass known weighs about fifty tons, but most of them seem to have split in the course of their journey; and at Hessele, a hundred thousand fragments spread, like grapeshot from a giant gun, over an area of some thirty square miles. See METEORITE (Vol. 18, p. 262).

Although the closest scrutiny has not discovered in any meteorite a shred of life, even the lowest, we obtain, from another source, and by **Life on Mars** a different method of observation, evidence—as yet inconclusive,—that not only life, but intelligent life exists beyond our planet. As in respect of other astronomical problems, the Britannica is singularly clear, impartial and authoritative in its treatment of this question. The article MARS (Vol. 17, p. 761) was written by Professor Newcomb, but Professor Percival Lowell contributes a summary of the recent investigations and deductions relating to Mars with which his name is associated. In 1877, Schiaparelli, adopting the old belief now abandoned by all astronomers, that oceans occupied the darker-coloured regions of Mars, observed dark streaks connecting these dark patches, and, believing them to be

strips of water, described them by the Italian word "canale," by which he meant channels, or natural bodies of water. An absurd misconception of his meaning gave wide currency to the idea that these strips were artificial *canals*, a manifest impossibility, as they are many miles in width. No canal, properly so called, could be so wide, and no reservoir could conceivably be so extensive. There is, in the existence of such patches, even if they were bodies of water, as no one now believes them to be, not the slightest indication of excavation. In 1894, Professor Lowell, an American astronomer of great authority, established, for the special purpose of observing Mars, the Lowell Observatory at Flagstaff, in Arizona, 7,250 feet above sea level, in singularly clear, dry air, equipped with a twenty-four-inch telescope. This observatory unquestionably commands greater penetration than any other, and Professor Newcomb says that the work there upon Mars "has been continued with such care and assiduity that its results must take precedence of all others." Professor Lowell's first announcement that he had detected evidences of the existence of extensive artificial canals, which would of course absolutely prove Mars to be inhabited by intelligent creatures, was received with derision by many critics who jumped to the conclusion that he meant artificial canals many miles in width. Fuller statements from Professor Lowell showed that he believed Schiaparelli's

wide strips to be not water, *but areas of vegetation lying on each side of artificial irrigating canals of no extraordinary width*, by a network of which water is brought to, and distributed throughout, the temperate and equatorial zones of Mars from the extreme North and South, as the polar snow caps melt; and that this irrigation gives the rainless area a seasonal fertility, just as the melting of Abyssinian snows fecundates the distant valley of the lower Nile. These strips, according to Professor Lowell and other observers, are at one season of a bluish-green colour suggesting prosperous vegetation, then fade to a paler shade or in some places to a tawny brown. The strips are thousands of miles in length, perfectly straight. No one claims to have seen the artificial canals, but if there are areas of vegetation, they must be due to irrigation performed by waterways. If continued observations confirm the existence of these strips, it will become certain that they are not telescopic illusions, but the results of engineering operations on a scale unknown to our planet. The readings indicated in this chapter will yield a survey of this special field, as of all other fields of current research in astronomy, and give new interest to current investigations.

A brief account of some of the principal astronomical articles is printed here in tabular form, and a fuller list, alphabetically arranged, follows this topical outline.

### Topics for Reading

Early Interest in the Sky.

Astral theology — the 'assumption of a close link between the movements going on in the heavens and occurrences on the earth.' The history of astrology traced to ancient Babylonia (about 3000 B.C.).

Story of the Constellations. A Map of the Heavens.

### Article and Contributor

ASTROLOGY (Vol. 2, p. 795), and BABYLONIAN AND ASSYRIAN RELIGION (Vol. 3, p. 114), by Dr. Morris Jastrow, author of *Religion of the Babylonians and Assyrians*.

CONSTELLATION — with star-maps and tables (Vol. 7, p. 11), by Charles Evertt, fellow Royal Astronomical Society. See also separate articles on the principal constellations and stars.

- Development of Astronomy.  
 Scientific knowledge of the ancient Chinese, Egyptians and Babylonians. Revolutionary cycle of the planets.
- First conception of the earth as a globe. "The harmony of the spheres." Identification of morning and evening stars (about 520 B.C.).
- The Greeks measure the earth by astronomical means (about 200 B.C.).
- The first observatory.
- The first systematic astronomer, Ptolemy and his System (A.D. 150).
- Revival of heliocentric theory (A.D. 1506-1512).
- Plan of Solar System realized. The founder of descriptive astronomy (1564-1642).
- Newton's contributions to astronomy and astronomical physics (1585-1586).
- Continuation of Newton's work.
- Nebular hypothesis of Laplace (1796).
- The New Astronomy.  
 Work of Wollaston, Fraunhofer, Kirchoff, and Rowland in spectrum analysis.
- Discoveries during recent eclipses. Photographing the Heavens, Star-charts, etc.
- Measuring light and heat from the stars,—radio-micrometer.
- New method of photographing the sun and the results of this mode of study.
- Principles of Astronomy.  
 How the positions and motions of the heavenly bodies are defined. System of co-ordinates.
- Distance of sun from earth the fundamental celestial measurement.
- ASTRONOMY, *History* (Vol. 2, p. 808), by Agnes M. Clerke, author of *A Popular History of Astronomy*.
- PYTHAGORAS (Vol. 22, p. 699), by Dr. A. S. Pringle-Pattison, author of *Man's Place in the Cosmos*, etc.
- ERATOSTHENES OF ALEXANDRIA (Vol. 9, p. 733), by Sir Thomas Little Heath, author of *Treatise on Conic Sections*.
- OBSERVATORY (Vol. 19, p. 954), by J. L. E. Dreyer, Director of Armagh Observatory.
- PTOLEMY, *Mathematics* (Vol. 22, p. 620), by Prof. George J. Allman, Queen's, Galway; COPERNICUS (Vol. 7, p. 100), by Agnes M. Clerke.
- KEPLER, JOHANN (Vol. 15, p. 749), by Agnes M. Clerke.
- GALILEO GALILEI (Vol. 11, p. 406), by Agnes M. Clerke.
- NEWTON, SIR ISAAC (Vol. 19, p. 586), by Henry M. Taylor, Fellow of Trinity College, Cambridge.
- EULER, LEONHARD (Vol. 9, p. 887).
- NEBULAR THEORY (Vol. 19, p. 333), by Sir Robert S. Ball, author of *The Story of the Heavens*, etc.
- ASTROPHYSICS (Vol. 2, p. 819), by Dr. Simon Newcomb, late director National Observatory, Washington.
- PHOTOGRAPHY, CELESTIAL (Vol. 21, p. 523), by Prof. H. H. Turner, Oxford, author of *Modern Astronomy*, etc.
- PHOTOMETRY, *Celestial, or Stellar Photometry* (Vol. 21, p. 580), by Dr. H. H. Turner, Oxford.
- SPECTROHELIOGRAPH, illustrated (Vol. 25, p. 618), by Dr. George E. Hale, inventor of the spectroheliograph.
- ASTRONOMY, *Spherical or Geometrical Astronomy* (Vol. 2, p. 801), by Dr. Simon Newcomb.
- PARALLAX (Vol. 20, p. 760), by Dr. Simon Newcomb.



- Methods of determining distances of stars. STAR, *Distances and Parallaxes of the Stars* (Vol. 25, p. 789), by Arthur S. Eddington, Royal Observatory, Greenwich.
- Apparent motion of the heavenly bodies. ABERRATION, *Aberration of Light* (Vol. 1, p. 54), by Dr. S. Otto Eppenstein, Zeiss Optical Works, Jena, Germany.
- Eclipses and their recurrence. List of solar eclipses. Methods of computing eclipses. ECLIPSE (Vol. 8, p. 887), by Dr. Simon Newcomb.
- Diameter of earth as an astronomical unit. Determination of diameter and figure of earth. EARTH, *FIGURE OF THE* (Vol. 8, p. 801), by Alexander R. Clarke, Ordnance Survey, and Prof. F. R. Helmert, University of Berlin.
- The Stars. The two Star-Streams. Milky Way. Distribution of stars. STAR (Vol. 25, p. 785), by Arthur S. Eddington, Royal Observatory, Greenwich.
- True nebulae. Constitution. How they differ from star-clusters. NEBULA, illustrated (Vol. 19, p. 332), by Arthur S. Eddington.
- Comets—origins and orbits. Physical constitution. List of periodic comets. COMET, illustrated (Vol. 6, p. 759), by Dr. Simon Newcomb.
- Shooting Stars. History of meteoric showers. METEOR (Vol. 18, p. 260), by W. F. Denning, formerly president, Liverpool Astronomical Society.
- Constitution of Shooting Stars. METEORITE (Vol. 18, p. 262), by Lazarus Fletcher, author of *Introduction to the Study of Meteorites*.
- General description of the Solar System. SOLAR SYSTEM (Vol. 25, p. 357), by Dr. Simon Newcomb.
- The photosphere, chromosphere and corona, dimensions, temperature, and age of the sun, sun-spots. SUN, illustrated (Vol. 26, p. 85), by Dr. Ralph A. Sampson, Astronomer Royal for Scotland.
- The vast envelope which surrounds the sun. ZODIACAL LIGHT (Vol. 28, p. 998), by Dr. Simon Newcomb.
- Are Northern Lights due to emanations from the sun? AURORA POLARIS, illustrated (Vol. 2, p. 934), by Dr. Charles Chree, president Physical Society of London.
- Opaque Bodies, members of the Solar System. Their relation to each other. Their spectra, atmosphere, temperatures. First planetoid discovered (Jan. 1, 1801). Groupings of the planetoids. PLANET, illustrated (Vol. 21, p. 714), and PLANETS, MINOR (Vol. 21, p. 717), both by Dr. Simon Newcomb.
- The smallest major planet. How it presents the same face always to the sun. MERCURY (Vol. 18, p. 154), by Dr. Simon Newcomb.
- Venus: Its peculiar rotation and cloudy atmosphere. Has Venus a satellite? VENUS (Vol. 27, p. 1018), by Dr. Simon Newcomb.
- The earth as a member of the solar system. EARTH (Vol. 8, p. 799).

- Our nearest neighbour. Is it inhabited? Similarity of physical conditions to those of the earth.
- The largest planet. Its belts, spots, markings and surface. Is the great red spot a floating island? The ringed planet. Physical constitution of rings.
- Uranus: Its discovery, physical characteristics and satellites.
- The outermost known planet. Dimensions. Resemblance to Uranus. Wonderful story of its discovery (1845).
- The moon. Its aspects, phases and constitution. Its mountains and atmosphere.
- Development of Practical and Observational Astronomy.
- Current mode of star nomenclature adopted (1603). First planetary transit observed by Gassendi (1631).
- Astronomical Instruments.
- How co-ordinates used in astronomical research are determined.
- Telescope: Discovery and history. Parts and mounting. Great telescopes of the world.
- The Transit Circle due to Tycho Brahe. Description and use.
- Measuring machines. Importance and use in astronomy.
- Measuring the sun's diameter.
- Old-time instruments. "Nearly every one of the modern instruments used for the observatories of practical astronomy is part of the perfected astrolabe."
- Complete list of observatories throughout the world, date of foundation, their equipment and their specialized work.
- MARS, illustrated (Vol. 17, p. 761), by Dr. Simon Newcomb, with a summary by Professor Lowell, of the observations at Flagstaff.
- JUPITER, illustrated (Vol. 15, p. 562), by W. F. Denning, formerly president, Liverpool Astronomical Society.
- SATURN (Vol. 24, p. 232), by Dr. Simon Newcomb.
- URANUS (Vol. 27, p. 788), by Dr. Simon Newcomb.
- NEPTUNE (Vol. 19, p. 385), by Dr. Simon Newcomb.
- ADAMS, JOHN COUCH (Vol. 1, p. 177).
- LEVERRIER, U. J. J. (Vol. 16, p. 510), by Agnes M. Clerke, author of *A Popular History of Astronomy*.
- MOON, illustrated (Vol. 18, p. 802), by Dr. Simon Newcomb.
- ASTRONOMY, *History of Astronomy* (Vol. 2, p. 813), by Agnes M. Clerke, author of *A Popular History of Astronomy*.
- ASTRONOMY, *Practical Astronomy* (Vol. 2, p. 807), by Dr. Simon Newcomb.
- TELESCOPE, illustrated (Vol. 26, p. 557), by Sir David Gill, formerly Astronomer Royal at the Cape of Good Hope, and H. Dennis Taylor, inventor of the Cooke Photographic Lens.
- TRANSIT CIRCLE, illustrated (Vol. 27, p. 181), by J. L. E. Dreyer, Armagh Observatory, author of *Planetary Systems from Thales to Kepler*, etc.
- MICROMETER, illustrated (Vol. 18, p. 381), by Sir David Gill.
- HELIOMETER, illustrated (Vol. 13, p. 224), by Sir David Gill.
- ASTROLABE, illustrated (Vol. 2, p. 795), by Lady Huggins, author of *Life and Work of G. P. Mazzini*.
- OBSERVATORY (Vol. 19, p. 953), by J. L. E. Dreyer, director Armagh Observatory, author of *Planetary Systems from Thales to Kepler*.

## LIST OF ARTICLES IN THE ENCYCLOPAEDIA BRITANNICA ON ASTRONOMY

|                              |                                 |                          |   |
|------------------------------|---------------------------------|--------------------------|---|
| Aberration                   | Comet                           | Heliocentric             | Perihelion                                  |
| Ablatitious                  | Comet-Seeker                    | Heliometer               | Perseus                                     |
| Adams, John Couch            | Compression                     | Hercules                 | Phoebe                                      |
| Airy, Sir George B.          | Conjunction                     | Herschel, Caroline L.    | Photography, Celestial                      |
| Albatagnius                  | Conon                           | Herschel, Sir F. W.      | Photometry, Celestial                       |
| Albedo                       | Constellation                   | Herschel, Sir J. F. W.   | Piazzi, Giuseppe                            |
| Albumazar (Abu-<br>Maaschar) | Copernicus, Nicolaus            | Hevelius, Johann         | Pickering, E. C.                            |
| Algol                        | Corona                          | Hipparchus               | Pisces                                      |
| Alidade                      | Coronium                        | Horizon                  | Planet                                      |
| Almacantar                   | Cosmic                          | Horrocks, Jeremiah       | Planets, Minor                              |
| Altitude                     | Culmination                     | Hour Angle               | Pleiades                                    |
| Amici, Giovanni B.           | Cunitz, Maria                   | Huggins, Sir William     | Pond, John                                  |
| Amplitude                    | Cycle                           | Hydra                    | Pons, Jean Louis                            |
| Andromeda                    | Cygnus                          | Ideler, C. L.            | Precession of the Equi-<br>noxes            |
| Andronicus of Cyrrhus        | Cynosure                        | Immersion                | Prime Vertical                              |
| Anomaly                      | Declination                     | Inghirami, G.            | Pritchard, Charles                          |
| Ansa                         | Dee, John                       | Ingress                  | Proctor, Richard A.                         |
| Aphelion                     | Deferent                        | Invariable Plane         | Ptolemy (Claudius)                          |
| Apse and Apsides             | Delambre, J. B. J.              | Janssen, Pierre Jules C. | Quadrature                                  |
| Aquarius                     | De la Rue, Warren               | Jupiter                  | Quetelet, L. A. Jacques                     |
| Aquila                       | Delisle, Joseph N.              | Kepler, Johann           | Ramsden, Jesse                              |
| Areturus                     | Delphinus                       | Lacaille, N. I. de       | Regiomontanus                               |
| Argelander, F. W. A.         | Dial and Dialling               | Lalande, J. J. L. de     | Reichenbach, G. von                         |
| Aries                        | Dick, Thomas                    | Lamont, Johann von       | Repsold, Johann G.                          |
| Aristarchus, of Samos        | Direct Motion                   | Latitude                 | Retrograde                                  |
| Armillar                     | Diurnal Motion                  | Lemonnier, Pierre C.     | Rheticus, or Rhaeticus                      |
| Astrolabe                    | Donati, Giovanni B.             | Leo                      | Right Ascension                             |
| Astrology                    | Draco                           | Leverrier, U. J. J.      | Rittenhouse, David                          |
| Astronomy                    | Dupuis, Charles F.              | Libra                    | Robinson, J. T. R.                          |
| Astrophysics                 | Earth                           | Libration                | Roemer, Ole                                 |
| Auriga                       | Eccentric                       | Lilly, William           | Rosse, William Parsons,<br>3rd earl of      |
| Azimuth                      | Eclipse                         | Lockyer, Sir J. Norman   | Rümker, C. L. C.                            |
| Baily, Jean S.               | Ecliptic                        | Longitude                | Sabine, Sir Edward                          |
| Baily, Francis               | Egress                          | Longomontanus, C. S.     | Sacro Bosco, Johannes<br>de (John Holywood) |
| Bainbridge, John             | Ellipticity                     | Lunation                 | Sagitta                                     |
| Bessel, Friedrich W.         | Elongation                      | Lyra                     | Sagittarius                                 |
| Bianchini, Francesco         | Encke, Johann Franz             | Magellanic Clouds        | Santini, Giovanni                           |
| Binary System                | Ephemeris                       | Mars                     | Satellite                                   |
| Biquintile                   | Epicycle                        | Mayer, Johann Tobias     | Saturn                                      |
| Black Drop                   | Epoch                           | Mercury                  | Schiaparelli, G. V.                         |
| Bode, Johann Elert           | Equation of the<br>Centre       | Meridian                 | Schönfeld, Eduard                           |
| Boötes                       | Equation of Time                | Meteor                   | Schröter, Johann H.                         |
| Bradley, James               | Equator                         | Metonic Cycle            | Schumacher, H. C.                           |
| Brahe, Tycho                 | Equinox                         | Micrometer               | Schwabe, Samuel H.                          |
| Brisbane, Sir Thomas<br>M.   | Eratosthenes of Alex-<br>andria | Mitchel, Ormsby M.       | Scorpio                                     |
| Brünnow, F. F. E.            | Eridanus                        | Mitchell, Maria          | Secchi, Angelo                              |
| Calvisius, Sethus            | Eros                            | Möbius, August F.        | Serpentarius or Ophiu-<br>chus              |
| Campani-Alimenis, M.         | Establishment of a<br>Port      | Moon                     | Sextant                                     |
| Cancer                       | Evection                        | Mouchez, A. E. B.        | Smyth, Charles Piazzi                       |
| Canes Venatici               | Facula                          | Nadir                    | Solar System                                |
| Canis Major                  | Firmament                       | Nebula                   | Solstice                                    |
| Capricornus                  | Flamsteed, John                 | Nebular Theory           | Somerville, Mary                            |
| Carrington, R. C.            | Galileo, Galilei                | Neptune                  | Sosigenes                                   |
| Cassini (family)             | Gegenschein                     | Newcomb, Simon           | Spectroheliograph                           |
| Cassiopeia                   | Gemini                          | Node                     | Star  |
| Celsius, Anders              | Geocentric                      | Nostradamus              | Stationary                                  |
| Centaurus                    | Gould, B. A.                    | Nutation                 | Stone, Edward James                         |
| Cepheus                      | Grant, Robert                   | Observatory              | Struve, E. G. W.                            |
| Cetus                        | Halley, Edmund                  | Occultation              | Sun   |
| Chromosphere                 | Hansen, Peter Andreas           | Olbers, Heinrich W. M.   | Synodic Period                              |
| Clerke, Agnes Mary           | Hansteen, Christopher           | Orbit                    | Syzygy                                      |
| Colure                       | Heliacal                        | Orion                    |   |
| Coma Berenices               |                                 | Parallax                 |   |
|                              |                                 | Penumbra                 |   |
|                              |                                 | Perigee                  |   |

|                       |                         |                    |                    |
|-----------------------|-------------------------|--------------------|--------------------|
| Taurus                | Tisserand, F. F.        | Uranus             | Walker, Sears Cook |
| Telescope             | Transit Circle, or Mer- | Ursa Major         | Walther, Bernhard  |
| Terminator            | idian Circle            | Ursa Minor         | Zach, Baron von    |
| Three Bodies, Problem | Trepidation             | Venus              | Zenith             |
| Tide                  | Troughton, Edward       | Vertical           | Zodiac             |
| Time, Measurement of  | Ulugh Beg               | Virgo              | Zodiacal Light     |
| Time, Standard        | Umbra                   | Vulpecula et Anser | Zöllner, J. K. F.  |

## CHAPTER LIV

## PHYSICS

**M**ORE than two thousand years ago the poet Lucretius, reviewing the physical knowledge and theories of the Greeks, described, as the Britannica tells us, how "the world was formed by the conjunctions of streams of atoms, which condensed into the earth,

#### Early Ideas of the World

with its attendant water, air, and æther, to form a self-contained whole," and went on to tell how in the changes of infinite time all possible forms of life appeared, but only those fittest to survive persisted. Here we have an unconscious anticipation of the nebular hypothesis and the theory of natural selection, two of the most tremendous of modern speculations. Four hundred years earlier Democritus, the greatest of the Greek natural philosophers, had said: "According to convention there is a sweet and a bitter, and according to convention there is colour. In truth there are atoms and a void." Democritus came near announcing the doctrines of the indestructibility of matter and the conservation of energy, yet the conventions which he assailed persisted for generations: colour, taste and other qualities of a substance

being regarded as of its essence and as much realities as the substance itself. The theories of the Greeks in fact held the field for centuries, until, during the Renaissance, men's minds attacked the secrets of nature in a more modern spirit. Yet, long as has been its history, physical science, as we know it to-day, is but a few years old, the result of the feverish activity which has been the obsession of the generation now passing (Vol. 24, p. 396).

There are many entertaining touches in the historical account of the development of the physical sciences with which this section of the Britannica is enriched, for every branch of the subject has been treated from the historical point of view. The articles, too, have been written by masters who can describe clearly because they see clearly, and no reader, desiring a sound knowledge of the general principles on which science rests, and of the conclusions to which the latest investigations have directed scientific thought, will go away empty handed.

The section of the Physical Sciences in the Britannica covers, of course, an enormous field which for general purposes may be conveniently divided into:--

- (i) *Matter and Motion*      (iii) *Light*  
 (ii) *Sound*                      (iv) *Heat*  
 (v) *Electricity and Magnetism*

As a preliminary to any one of these and to the whole subject the reader will be well advised to read the article *SCIENCE* (Vol. 24, p. 396), by W. C. D. Whetham of Trinity College, Cambridge, author of *Recent Development of Physical Science*; those on *UNITS, PHYSICAL* (Vol. 27, p. 738), and *UNITS, DIMENSIONS OF* (Vol. 27, p. 736), are also of fundamental importance; and those on *SPACE AND TIME* (Vol. 25, p. 525), and *TIME, MEASUREMENT OF* (Vol. 26, p. 983), may profitably be consulted.

### (I) *Matter and Motion*

Since all physical phenomena are manifestations, in one form or other, of matter in motion, this first division of the subject is introductory to **Matter** all the rest, and should preferably be studied first.

The latest theories in connection with the properties of **MATTER** (Vol. 17, p. 891) are discussed by Sir J. J. Thomson, professor of experimental physics, Cambridge University, who has led the way in the investigation of the electrical theory of matter. The article is directed to the establishment of the electronic theory, and in view of the vast amount of original work which the author has carried out in this field, his treatment in the *Britannica* should be welcome to all students of physical science. Supplementing this are the following: *ELEMENT*, by Wilhelm Ostwald (Nobel Prizeman in Chemistry, 1909), especially the concluding remarks (Vol. 9, p. 253); *ATOM* (Vol. 2, p. 870); *ELECTRICITY, Electronic Theory* (Vol. 9, p. 192). Early hypotheses are described under *SCIENCE* (Vol. 24, p. 397); *MOLECULES* (Vol. 18, p. 654); *ALCHEMISTRY* (Vol. 1, p. 521); and modern conceptions are discussed under *LIQUID GASES, Cohesion* (Vol. 16, p. 756); and *SPECTROSCOPY* (Vol. 25, p. 625). Reference should also be made to the articles

*DENSITY* (Vol. 8, p. 46); *DIFFUSION* (Vol. 8; p. 255); and especially *GRAVITATION* (Vol. 12, p. 384), by Professor Poynting of the University of Birmingham, and *AETHER* (Vol. 1, p. 292), by Sir Joseph Larmor, secretary of the Royal Society.

The principal articles dealing with motion are: *MOTION, LAWS OF* (Vol. 18, p. 906), which deals mainly with Newton's *Laws*; and *ENERGY (Motion)* (Vol. 9, p. 398), and *ENERGETICS* (Vol. 9, p. 390), both by Sir Joseph Larmor. Of as great importance from the physical point of view are *WAVE* (Vol. 28, p. 424), the part of the article *MECHANICS* dealing with simple harmonic motion (Vol. 17, p. 975) and elliptic harmonic motion (p. 978), and *HARMONIC ANALYSIS* (Vol. 12, p. 956), all by Professor Lamb of the University of Manchester. Other articles which should be consulted are *CAPILLARY ACTION* (Vol. 5, p. 256), and *PERPETUAL MOTION* (Vol. 21, p. 180).

### (II) *Sound*

The main article *SOUND* (Vol. 25, p. 437) is by Prof. J. H. Poynting of the University of Birmingham, and very completely covers the subject; the reader will, however, wish to refer to several other articles for supplementary information. Thus in the article *HEARING* (Vol. 13, p. 124), the range of audibility is discussed (see also *TARTINI*, Vol. 26, p. 436, for an account of Tartini's tones), while with regard to quality of tone the reader will find suggestive matter under *VIOLIN* (Vol. 28, p. 104). An account of experiments in balloons on the propagation of sound, will be found (Vol. 1, p. 267) under *AERONAUTICS*. Reference should also be made to the articles *WAVE* (Vol. 28, p. 425), *ELASTICITY, Vibrations and Waves* (Vol. 9, p. 158), and *HARMONIC ANALYSIS* (Vol. 12, p. 956) for a discussion of the form of sound waves. For applications of the principles of sound production, see also the articles *PHONOGRAPH* (Vol. 21, p. 467), *GRAMOPHONE*



(Vol. 12, p. 333), and especially *STRINGED INSTRUMENTS* (Vol. 25, p. 1038), *WIND INSTRUMENTS* (Vol. 28, p. 709), and other articles on musical instruments (see the chapter on *Music* in this Guide). For accounts of the researches of *KUNDT* (Vol. 15, p. 946), *LAGRANGE* (Vol. 16, p. 75) and *STOKES* (Vol. 25, p. 951), see those articles.

### (III) Light

The main article *LIGHT* (Vol. 16, p. 608) is in four parts. The *Introductory* and *Historical* sections are by C. Everitt; that on the *Nature* of Light by Professor Lorentz of the University of Leiden; that on its *Velocity* by the late Simon Newcomb, the eminent American astronomer. The different phenomena connected with the subject may conveniently be grouped and studied as follows:—

(a) *COLOUR* (Vol. 6, p. 728); *Intensity*, see *PHOTOMETRY* (Vol. 21, p. 525), a brilliant article by Prof. H. H. Turner, of Oxford University; *ILLUMINATION* (Vol. 14, p. 320).

(b) *REFLECTION OF LIGHT* (Vol. 23, p. 2); *ABSORPTION* (Vol. 1, p. 76); *REFRACTION* (Vol. 23, p. 25); *DISPERSION* (Vol. 8, p. 315); *INTERFERENCE* (Vol. 14, p. 685); *POLARIZATION OF LIGHT* (Vol. 21, p. 932).

(c) *SHADOW* (Vol. 24, p. 738); *DIFFRACTION* (Vol. 8, p. 238); *CALORESCENCE* (Vol. 5, p. 60); *FLUORESCENCE* (Vol. 10, p. 375); *PHOSPHORESCENCE* (Vol. 21, p. 476).

(d) *MIRROR* (Vol. 18, p. 575); *LENS* (Vol. 16, p. 421); *CAUSTIC* (Vol. 5, p. 558); *ABERRATION* (Vol. 1, p. 54).

(e) *CORONA* (Vol. 7, p. 184); *HALO* (Vol. 12, p. 864); *MIRAGE* (Vol. 18, p. 573); *RAINBOW* (Vol. 22, p. 861); *SKY* (Vol. 25, p. 202); *TWILIGHT* (Vol. 26, p. 492)—see also *DUST* (Vol. 8, p. 713).

(f) *TELESCOPE* (Vol. 26, p. 557); *MICROSCOPE* (Vol. 18, p. 392); *OBJECTIVE* (Vol. 19, p. 948); *CAMERA LUCIDA* (Vol. 5, p. 104); *CAMERA OBSCURA* (Vol. 5, p. 104); *BINOCULAR INSTRUMENT* (Vol. 3,

p. 949); *STEREOSCOPE* (Vol. 25, p. 895).  
(g) *VISION* (Vol. 28, p. 130).

Far reaching developments are described in *PHOTOGRAPHY* (Vol. 21, p. 485) and *SPECTROSCOPY* (Vol. 25, p. 619). In the former article Sir W. de W. Abney describes in great detail photographic *Processes*; Major-General Waterhouse, *Apparatus* and *Lenses*, while A. H. Hinton discusses the *Pictorial* aspect of the subject. There are also valuable articles on *CELESTIAL PHOTOGRAPHY* (Vol. 21, p. 523), by Professor Turner, and on the *SPECTRO-HELIOGRAPH* (Vol. 25, p. 618), by the inventor, G. E. Hale, director of the Solar Observatory of the Carnegie Institution at Mount Wilson, Cal. The relation between magnetism and light is discussed in an article *MAGNETO-OPTICS* (Vol. 17, p. 388), by Sir J. J. Thomson.

### (IV) Heat

The treatment of this subject in the *Encyclopaedia Britannica* has been generally organized by Prof. H. L. Callendar, of the Royal College of Science, London, who was designated by Lord Kelvin as his successor in this department of the work. In pursuing the subject the following order may conveniently be followed:

(a) *HEAT* (Vol. 13, p. 135), *THERMOMETRY* (Vol. 26, p. 821), *CALORIMETRY* (Vol. 5, p. 60), and *THERMODYNAMICS* (Vol. 26, p. 808), all by Professor Callendar; *COLD* (Vol. 6, p. 663).

(b) *CONDUCTION OF HEAT* (Vol. 6, p. 890); *RADIATION, THEORY OF* (Vol. 22, p. 785); *RADIOMETER* (Vol. 22, p. 806).

(c) *FUSION* (Vol. 11, p. 369); *VAPORIZATION* (Vol. 27, p. 897); *CONDENSATION OF GASES* (Vol. 6, p. 844); *LIQUID GASES* (Vol. 16, p. 744); *THERMOELECTRICITY* (Vol. 26, p. 814).

### (V) Electricity and Magnetism

We are so accustomed to think of electricity as the peculiar possession of our own age (the first crude attempts at an electric light were only two score years ago)

that we are apt to forget that the first experiments in the science were made at least 2500 years ago.

### Historical

The first effort to place it on a true experimental and inductive basis dates back more than three centuries to the publication of the researches of WILLIAM GILBERT (see Vol. 12, p. 9), the most distinguished man of science of his time, whom Queen Elizabeth appointed her private physician at the "usual" salary of £100. A hundred years later, VOLTA (Vol. 28, p. 198), who might be called the patron saint of electricity, produced the first electric current with the pile which bears his name. Meanwhile BENJAMIN FRANKLIN (Vol. 11, p. 30) had been experimenting with his famous kite, and CAVENDISH (Vol. 5, p. 580) and COULOMB (Vol. 7, p. 508) had been paving the way for the startling developments which resulted from Volta's invention. In the 19th century FARADAY (Vol. 10, p. 173), AMPÈRE (Vol. 1, p. 878), OHM (Vol. 20, p. 34), LORD KELVIN (Vol. 15, p. 721), JAMES CLERK MAXWELL (Vol. 17, p. 929) and other brilliant investigators in rapid succession developed the field, until the science and application of electricity have attained a position absolutely dominating our daily life.

The section of the Britannica treating this great subject is therefore one of the most important in the whole work, and it was in the fullest

### Analysis of the Subject

recognition of the fact that the editor asked Prof. J. A. Fleming, of the University of London, famous for his original work in both the mathematical and the experimental branches of the science, to organize the sections for the new edition. The ground is generally covered in the four articles, on electricity, electrostatics, electrokinetics, and electromagnetism, all contributed by Prof. Fleming himself. The article ELECTRICITY (Vol. 9, p. 179) is the key

article to the subject, and should be read first. The two great branches of electrical theory then follow: (a) ELECTROSTATICS (Vol. 9, p. 240), in connection with which the article ELECTRICAL MACHINE (Vol. 9, p. 176) should also be studied, with reference to ELECTROSCOPE (Vol. 9, p. 239) and ELECTROPHORUS (Vol. 9, p. 237). (b) ELECTROKINETICS (Vol. 9, p. 210) and, supplementing it, CONDUCTION, ELECTRIC (Vol. 6, p. 855). The latter is divided into three parts: (i.) *Conduction in Solids*, by Prof. Fleming; (ii.) *Conduction in Liquids* by W. C. D. Whetham; (iii.) *Conduction in Gases*, by Sir J. J. Thomson. In connection with (ii.) should be read ELECTROLYSIS (Vol. 9, p. 217), by W. C. D. Whetham, and with (iii.) RÖNTGEN RAYS (Vol. 23, p. 694) and VACUUM TUBE (Vol. 27, p. 834), both by Sir J. J. Thomson, whose article ELECTRIC WAVES (Vol. 9, p. 203) is of fundamental importance. The general principles of electrical engineering are set out in the article ELECTRIC SUPPLY (Vol. 9, p. 193) with reference to DYNAMO (Vol. 8, p. 764); MOTORS, ELECTRIC (Vol. 18, p. 910); TRANSFORMERS (Vol. 27, p. 173); ACCUMULATOR (Vol. 1, p. 126); POWER TRANSMISSION, *Electric* (Vol. 22, p. 233); TRACTION, *Electric Traction* (Vol. 27, p. 120); LIGHTING, *Electric* (Vol. 16, p. 659); see also ELECTROCHEMISTRY (Vol. 9, p. 208) and ELECTROMETALLURGY (Vol. 9, p. 232); TELEGRAPH (Vol. 26, p. 510); TELEPHONE (Vol. 26, p. 547).

A bridge to MAGNETISM (Vol. 17, p. 321), an article by Shelford Bidwell, former president of the Physical Society, is the article ELECTROMAGNETISM (Vol. 9, p. 226), by Prof. Fleming. This article leads also to the study of manifestations in nature of electricity and magnetism: see the articles ATMOSPHERIC ELECTRICITY (Vol. 2, p. 860); AURORA POLARIS (Vol. 2, p. 927); EARTH CURRENTS (Vol. 8, p. 813); and MAGNETISM, TERRESTRIAL (Vol. 17, p. 353); and to the applications of its prin-

ciples in the COMPASS (Vol. 6, p. 804).

An alphabetical list of the articles in the Britannica on the subjects treated in this chapter is given below. The biog-

raphies of distinguished physicists, included in the list, are valuable as containing accounts of their contributions to science, and are full of human interest.

#### ARTICLES ON THE PHYSICAL SCIENCES IN THE BRITANNICA, INCLUDING THOSE ON FAMOUS PHYSICISTS

|                         |                          |                          |                        |
|-------------------------|--------------------------|--------------------------|------------------------|
| Aberration              | Capillary Action         | Fahrenheit, G. D.        | Leyden Jar, or Con-    |
| Absorption of Light     | Carat                    | Fathom                   | denser                 |
| Accumulator             | Carnot, Sadi N. L.       | Fizeau, A. H. I.         | Lichtenberg, G. C.     |
| Achromatism             | Carucate                 | Fluorescence             | Light                  |
| Acoustics               | Caustic                  | Forbes, James David      | Lighting               |
| Acre                    | Cavallo, Tiberius        | Forman, Simon            | Lightning Conductor    |
| Actinometer             | Cinematograph            | Foucault, J. B. L.       | Liquid Gases           |
| Adhesion                | Claudet, A. F. J.        | Fraunhofer, J. von       | Lodge, Sir Oliver J.   |
| Aepinus, F. U. T.       | Clausius, Rudolf J. E.   | Fresnel, Augustin J.     | Magnetism              |
| Aether, or Ether        | Cold                     | Furlong                  | Magnetism, Terrestrial |
| Aggregation             | Colour                   | Fusion                   | Magnetometer           |
| Agonic Lines            | Compass                  | Fuze, or Fuse            | Magnetometer           |
| Aldini, Giovanni        | Condensation of Gases    | Gallon                   | Magneto-Optics         |
| Alhazen                 | Conduction, Electric     | Galvanometer             | Malus, E. L.           |
| Amontons, Guillaume     | Conduction of Heat       | Geissler, Heinrich       | Manometer              |
| Ampère, A. M.           | Cornu, Marie Alfred      | Gibbs, J. W.             | Mariotte, Edme         |
| Amperemeter or Am-      | Coulomb, C. A.           | Gilbert, or Gylberde, W. | Marum, Martin van      |
| meter                   | Curie, Pierre            | Graduation               | Matter                 |
| Anderson, John          | Cyclometer               | Glaisher, James          | Matteucci, Carlo       |
| Angström, A. J. and     | Daguerre, L. J. M.       | Gramophone               | Maxwell, J. Clerk      |
| K. J.                   | Dallmeyer, John Henry    | Gravitation              | Mayer, Julius R.       |
| Aperture                | De la Rive, A. A.        | Gray, Elisha             | Melloni, Macedonio     |
| Arago, D. F. J.         | Della Porta, G. Battista | Grove, Sir William R.    | Meter, Electric        |
| Armature                | Demijohn                 | Guericke, Otto von       | Metric System          |
| Arnaldus de Villa Nova  | Density                  | Harris, Sir W. S.        | Michell, John          |
| Arrhenius, S. A.        | Diamagnetism             | Hearing                  | Microscope             |
| As                      | Dielectric               | Heat                     | Mirror                 |
| Atmospheric Electricity | Diffraction of Light     | Heliostat                | Model                  |
| Atwood, George          | Diffusion                | Helmholtz, H. L. F. von  | Molecule               |
| Auncel                  | Dimension                | Henry, Joseph            | Morgen                 |
| Avogadro, Amedeo        | Dispersion               | Hertz, Heinrich R.       | Morse, S. F. B.        |
| Avoirdupois             | Dolland, John            | Hogshead                 | Motion, Laws of        |
| Ayrton, W. E.           | Duhamel, J. B.           | Hooke, Robert            | Motors, Electric       |
| Bache, Alexander D.     | Dynamo                   | Hopkinson, John          | Musschenbroek, P. van  |
| Baker, Henry            | Earth Currents           | Hour-glass               | Neckam, A.             |
| Balance                 | Edison, T. A.            | Hughes, D. E.            | Nicholson, W.          |
| Barleycorn              | Electrical or Electro-   | Hydrometer               | Nicol, William         |
| Barometer               | static Machine           | Hypsometer               | Nieppe, J. Nicéphore   |
| Barometric Light        | Electricity              | Hysteresis               | Nobili, Leopoldo       |
| Barrel                  | Electricity Supply       | Illumination             | Nollet, Jean Antoine   |
| Battery                 | Electric Waves           | Inch                     | Objective, or Object   |
| Beccaria, G. B.         | Electrochemistry         | Inclinometer             | Glass                  |
| Becquerel (family)      | Electrokinetics          | Induction Coil           | Ohm, Georg Simon       |
| Bell, A. Graham         | Electrolysis             | Interference of Light    | Ohmmeter               |
| Binocular Instrument    | Electromagnetism         | Jablochkov, Paul         | Olmsted, Denison       |
| Biot, Jean Baptiste     | Electrometallurgy        | Joule, J. P.             | Optics                 |
| Boyle, Robert           | Electrometer             | Kaleidoscope             | Oscillograph           |
| Brewster, Sir David     | Electron                 | Kater, Henry             | Ounce                  |
| Bushel                  | Electrophorus            | Kelvin, Ist baron        | Papin, Denis           |
| Cagniard de la Tour, C. | Electroplating           | Kirchhoff, G. R.         | Peck                   |
| Calibration             | Electroscope             | König, K. R.             | Peltier, J. C. A.      |
| Calorescence            | Electrostatics           | Kundt, A. A. E. E.       | Permeability, Magnetic |
| Calorimetry             | Electrotyping            | Lambert, J. H.           | Permeameter            |
| Camera Lucida           | Energetics               | Langley, S. P.           | Perpetual Motion       |
| Camera Obscura          | Energy                   | Lantern                  | Phonograph             |
| Canton, John            | Erman, Paul              | Lens                     | Phosphorescence        |

|                       |                        |                       |                       |
|-----------------------|------------------------|-----------------------|-----------------------|
| Photography           | Refraction             | Stereoscope           | Tyndall, John         |
| Photometry            | Rod                    | Stewart, Balfour      | Units, Dimensions of  |
| Pint                  | Röntgen Rays           | Sun or Photo Copying  | Units, Physical       |
| Plateau, J. A. F.     | Röntgen, W. K.         | Swan, Sir Joseph W.   | Vacuum Tube           |
| Pneumatics            | Rowland, Henry A.      | Tait, Peter G.        | Vaporization          |
| Poggendorff, J. C.    | Rumford, Count         | Talbot, W. H. Fox     | Vision                |
| Polarity              | Saussure, H. B. de     | Talent                | Volta, Alessandro     |
| Polarization of Light | Science                | Tartini, G.           | Voltmeter             |
| Pood                  | Shadow                 | Telegraph             | Wattmeter             |
| Potentiometer         | Siemens, E. Werner von | Telephone             | Wave                  |
| Pound                 | Sky                    | Thermodynamics        | Weber, W. E.          |
| Power Transmission    | Sound                  | Thermoelectricity     | Weighing Machines     |
| Prévost, Pierre       | Space and Time         | Thermometry           | Weights and Measures  |
| Pyrometer             | Spectacles             | Thomson, James        | Wheatstone's Bridge   |
| Radiation, Theory of  | Spectroscopy           | Torricelli, E.        | Wheatstone, Sir Chas. |
| Radiometer            | Speculum               | Transformers          | Wiedemann, G. H.      |
| Rayleigh, Lord        | Spherometer            | Trumpet, Speaking and | Young, Thomas         |
| Reflection of Light   | Standard               | Hearing               |                       |

## CHAPTER LV

### CHEMISTRY

**W**E have traveled far since Chemistry had as its simple basis four elements: fire, air, water, and earth, regarded as perfect and complete since they embody every essence of which a body was supposedly capable: for fire was hot and dry; air, hot and wet; water, cold and wet; earth, cold and dry. We have outlived the belief in the philosopher's stone which animated the Middle Ages. Yet these fallacies are but manifestations of the effort—old as thought—to reduce the manifoldness of matter to primordial elements, from which, in one form or other, every substance should be capable of being built up. The ultimate problem of chemistry is, therefore, the constitution of matter, and the fight around this is waged on the marches of the physical and chemical sciences.

The great commercial triumphs of chemistry are, of course, those due to the

conquest of waste, to the utilization of by-products which for thousands of years had been regarded as useless.

**Triumphs of Chemistry**

We are all familiar with the uses to which the by-products of coal-tar are put; we swallow one derivative to relieve headache, we may sugar our tea and flavour our ice-cream with others; with one derivative we clean our clothes which have been dyed with others; and we disinfect them with yet another. Phenacetin, saccharin, synthetic vanilla, benzine, naphthaline, aniline dyes, carbolic acid, are only a few of the many substances won to the consumer by the chemist in his laboratory; and this is only one field of research. The chemist is always busy (as now with rubber, camphor, etc.), working at the synthesis of natural products in the hope that he will be able to

find a means of manufacturing them in quantities at a cost which will make them commercially possible, and thus lessen the drain on the world's natural supply. In almost every detail of our lives this science enters so familiarly that we forget that the many things made possible by the chemist do not simply "happen," but are the result of laborious research in the laboratory.

It is not possible to attain proficiency in any experimental science without laboratory work; but to the student of chemistry the lucid and original articles in the *Britannica* will provide a most useful commentary on his work with test-tube and burner. The general reader will find in these articles an admirable survey of the subject, and of its bearings on problems of daily life. The main article CHEMISTRY (Vol. 6, p. 33) generally covers the ground, and serves as an introduction to separate articles on important divisions of the subject. Following its arrangement the scheme outlined below suggests a useful course of reading.

(i.) Chemistry, *History* (Vol. 6, p. 33). Supplementary to this section are the articles ALCHEMY (Vol. 1, p. 519), ELEMENT (Vol. 9, p. 253), MOLECULE (Vol. 18, p. 654), ATOM (Vol. 2, p. 870); and reference may also be made to MEDICINE, *Iatro-chemical School* (Vol. 18, p. 50).

(ii.) Chemistry, *General Principles* (Vol. 6, p. 39), with reference to VALENCY (Vol. 27, p. 847), CHEMICAL ACTION (Vol. 6, p. 26), CATALYSIS (Vol. 5, p. 501), ISOMERISM (Vol. 14, p. 881), STEREO-ISOMERISM (Vol. 25, p. 890), RADIO-ACTIVITY (Vol. 22, p. 793).

(iii.) *Inorganic Chemistry* (Vol. 6, p. 44). See also ACID (Vol. 1, p. 145), ALKALI (Vol. 1, p. 674), and the list of 138 elements and compounds under this heading below.

(iv.) *Organic Chemistry* (Vol. 6, p. 47),

with all the 240 articles enumerated under this heading below, especially that on POLYMETHYLENES (Vol. 22, p. 29); see also EXPLOSIVES (Vol. 10, p. 81).

(v.) *Analytical Chemistry* (Vol. 6, p. 60), with which may be consulted, BLOW PIPE (Vol. 4, p. 89), DISTILLATION (Vol. 8, p. 318), ELECTROLYSIS (Vol. 9, p. 217), INDICATOR (Vol. 14, p. 482), SOLUTION (Vol. 25, p. 368), STOICHIOMETRY (Vol. 25, p. 939).

(vi.) *Physical Chemistry* (Vol. 6, p. 65) supplemented by ENERGETICS (Vol. 9, p. 390), CHEMICAL ACTION (Vol. 6, p. 26), THERMOCHEMISTRY (Vol. 26, p. 804), SOLUTION (Vol. 25, p. 368), DISTILLATION (Vol. 8, p. 318), CONDENSATION OF GASES (Vol. 6, p. 844), with the important articles PHOTOCHEMISTRY (Vol. 21, p. 484), ELECTROCHEMISTRY (Vol. 9, p. 208), METALLURGY (Vol. 18, p. 203), ELECTROMETALLURGY (Vol. 9, p. 232), ASSAYING (Vol. 2, p. 776).

Among the contributors to the chemical department of the *Britannica* are: Professor Ernest Rutherford, of the University of Manchester; Walter Nernst, professor of physical chemistry in the University of Berlin; W. C. D. Whetham, author of *Theory of Solution*, etc.; Prof. James Walker of the University of Edinburgh; Johannes Diderik van der Waals, professor of physics, University of Amsterdam; W. R. E. Hodgkinson, professor of chemistry and physics, Ordnance College, Woolwich, perhaps the greatest living authority on explosives.

The following is a classified list of the articles on Chemistry which are contained in the *Britannica*. For discussions of the application of chemistry to photography, the reader should consult the article PHOTOGRAPHY (Vol. 21, p. 485), of which the chemical section is by Sir W. de W. Abney, adviser in Science to the English Board of Education.



## CHEMISTRY—GENERAL

|                    |                  |                |                  |
|--------------------|------------------|----------------|------------------|
| Affinity, Chemical | Chemistry        | Elixir         | Molecule         |
| Alchemy            | Combustion       | Equivalent     | Photochemistry   |
| Alembic            | Condenser        | Explosives     | Pigments         |
| Allotropy          | Crystallization  | Flame          | Pyrophorus       |
| Amorphism          | Decolourizing    | Formula        | Radioactivity    |
| Analysis           | Desiccation      | Gas            | Solution         |
| Assaying           | Dialysis         | Hydrolysis     | Stereochemistry  |
| Atmolysis          | Dissociation     | Iatrochemistry | Stereo-isomerism |
| Atom               | Distillation     | Indicator      | Stoichiometry    |
| Blowpipe           | Electrochemistry | Isomerism      | Thermochemistry  |
| Catalysis          | Electrolysis     | Matrass        | Valency          |
| Chemical Action    | Element          |                |                  |

## INORGANIC CHEMISTRY

|                             |                       |                   |                           |
|-----------------------------|-----------------------|-------------------|---------------------------|
| Acid                        | Carborundum           | Iodine            | Rust                      |
| Algaroth, Powder of         | Caustic               | Iron              | Ruthenium                 |
| Alkali                      | Cerium                | Kelp              | Sal Ammoniac              |
| Alkali Manufacture          | Charcoal              | Kermes            | Salt                      |
| Alkaline Earths             | Chlorates             | Lamp-black        | Saltpetre                 |
| Alum                        | Chlorine              | Lanthanum         | Samarium                  |
| Aluminium                   | Chromium              | Lead              | Scandium                  |
| Amalgam                     | Cobalt                | Lime              | Schlippe's Salt           |
| Ammonia                     | Colcothar             | Lithium           | Selenium                  |
| Antimony                    | Columbium, or Niobium | Magnesium         | Silica                    |
| Argon                       | Copper                | Manganese         | Silicon                   |
| Arsenic                     | Copperas              | Mercury           | Silver                    |
| Azoimide, or Hydrazoic Acid | Corrosive Sublimate   | Microcosmic Salt  | Sodium                    |
| Azoth                       | Didymium              | Molybdenum        | Steam                     |
| Barium                      | Earth                 | Nickel            | Strontium                 |
| Base                        | Epsom Salts           | Niobium           | Sulphur                   |
| Beryllium, or Glucinum      | Erbium                | Nitre             | Sulphuric Acid            |
| Bichromates and Chromates   | Europium              | Nitric Acid       | Tantalum                  |
| Bismuth                     | Fluorine              | Nitrogen          | Tellurium                 |
| Bittern                     | Gadolinium            | Ochres            | Terbium                   |
| Borax                       | Gallium               | Orpiment          | Thallium                  |
| Boric Acid, or Boracic Acid | Germanium             | Osmium            | Thorium                   |
| Boron                       | Glauber's Salt        | Oxide             | Tin                       |
| Brimstone                   | Glucinum              | Oxygen            | Titanium                  |
| Bromine                     | Gold                  | Oxyhydrogen Flame | Tungsten                  |
| Cadmium                     | Gunpowder             | Ozone             | Ultramarine               |
| Caesium                     | Halogens              | Palladium         | Umber                     |
| Calcium                     | Hartshorn, Spirits of | Phosphates        | Uranium                   |
| Calomel                     | Helium                | Phosphorus        | Vanadium                  |
| Carbide                     | Hydrate               | Plaster of Paris  | Vermillion                |
| Carbon                      | Hydrazine             | Platinum          | Vitriol                   |
| Carbonates                  | Hydrochloric Acid     | Potashes          | Water                     |
| Carbon Bisulphide           | Hydrogen              | Potassium         | Ytterbium (Neo-ytterbium) |
| Carbonic Acid               | Hydroxylamine         | Radium            | Yttrium                   |
|                             | Hyposulphite of Soda  | Rare Earths       | Zinc                      |
|                             | Ice                   | Rhodium           | Zirconium                 |
|                             | Indium                | Rouge             |                           |
|                             |                       | Rubidium          |                           |

## ORGANIC CHEMISTRY

|                    |                     |               |               |
|--------------------|---------------------|---------------|---------------|
| Acenaphthene       | Adipocere           | Allantoin     | Aniline       |
| Acetic Acid        | Albumin, or Albumen | Alloxan       | Anthracene    |
| Aceto-acetic Ester | Alcohol             | Alloxantin    | Anthraquinone |
| Acetone            | Alcohols            | Allyl Alcohol | Antipyrine    |
| Acetophenone       | Aldehydes           | Amidines      | Argol         |
| Acetylene          | Alizarin            | Amines        | Asparagine    |
| Acid Amides        | Alkahest            | Amygdalin     | Azo Compounds |
| Acridine           | Alkaloid            | Amyl Alcohols | Azoximes      |
| Adenine            | Alkanet             | Amyl Nitrite  | Benzaldehyde  |

|                       |                        |                 |                       |
|-----------------------|------------------------|-----------------|-----------------------|
| Benzene               | Ethyl                  | Lactones        | Pyrene                |
| Benzidine             | Ethyl chloride         | Laevulinic Acid | Pyridine              |
| Benzoic Acid          | Ethylene               | Litmus          | Pyrimidines           |
| Benzoin               | Eugenol                | Malic Acid      | Pyrocatechin          |
| Benzophenone          | Eupion                 | Malonic Acid    | Pyrogallol            |
| Benzyl Alcohol        | Flavin                 | Mandelic Acid   | Pyrones               |
| Berberine             | Fluoranthene           | Marsh Gas       | Pyrrrol               |
| Betaine               | Fluorene               | Mellitic Acid   | Pyruvic Acid          |
| Brucine               | Fluorescein            | Mercaptans      | Quercitron            |
| Butyl Alcohols        | Formalin, or Formalde- | Mesoxalic Acid  | Quinazolines          |
| Butyric Acid          | hyde                   | Methyl Alcohol  | Quinoline             |
| Caffeine              | Formic Acid            | Mucic Acid      | Quinones              |
| Camphors              | Fructose, or Fruit-    | Murexide        | Quinoxalines          |
| Carbazol              | sugar                  | Mustard Oils    | Resorcin              |
| Carbohydrate          | Fuchsine               | Naphtha         | Retene                |
| Carbolic Acid, or     | Fulminic Acid          | Naphthalene     | Saccharic Acid        |
| Phenol                | Fumaric and Maleic     | Naphthols       | Saccharin             |
| Carvacrol             | Acids                  | Naphthylamines  | Safranine             |
| Cellulose             | Furazanes              | Nicotine        | Salicylic Acid        |
| Chloral               | Furfurane, or Furane   | Nitrobenzene    | Stearic Acid          |
| Chloroform            | Fusel Oil              | Nitro Compounds | Styrolene             |
| Chlorophyll           | Gallic Acid            | Nitroglycerin   | Succinic Acid         |
| Chlorpicrin           | Gelatin or Gelatine    | Olefine         | Sugar                 |
| Chrysene              | Glucose                | Oleic Acid      | Sulphonal             |
| Cinnamic Acid         | Glucoside              | Orcin           | Sulphonic Acids       |
| Cinnolin              | Glutaric Acid          | Oxalic Acid     | Tannin or Tannic Acid |
| Citric Acid           | Glycerin               | Oxazoles        | Tar                   |
| Coal-tar              | Glycols                | Oximes          | Tartar                |
| Cocaine               | Guanidine.             | Palmitic Acid   | Tartaric Acid         |
| Collodion             | Gun-cotton             | Paraffin        | Terpenes              |
| Conine                | Hippuric Acid          | Paraldehyde     | Tetrazines            |
| Coumarin              | Hydantoin              | Phenacetin      | Tetrazoles            |
| Coumarones            | Hydracrylic Acid       | Phenanthrene    | Thiazines             |
| Creosote              | Hydrastine             | Phenazine       | Thiazoles             |
| Cresols               | Hydrazone              | Phenolphthalein | Thiophen              |
| Crotonic Acid         | Hydrocarbon            | Phthalazines    | Thymol                |
| Cyanamide             | Imidazoles or Glyoxa-  | Phthalic Acids  | Toluene               |
| Cyanic Acid and Cyan- | lines                  | Picene          | Triazines             |
| ates                  | Indazoles, or Glyoxa-  | Picric Acid     | Triazoles             |
| Cyanide               | lines                  | Pilocarpine     | Triphenylmethane      |
| Cyanogen              | Indazoles              | Piperazin       | Tropine               |
| Cytisine              | Indene                 | Piperine        | Urea, or Carbamide    |
| Dextrine              | Indigo                 | Piperonal       | Urethane              |
| Diazo Compounds       | Indole                 | Polymethylenes  | Uric Acid             |
| Diphenyl              | Indulines              | Primuline       | Urotropin             |
| Durene                | Inulin                 | Propiolic Acid  | Valeric Acid          |
| Dynamite              | Iodoform               | Propyl Alcohols | Verdigris             |
| Ecgonine              | Isatin                 | Prussic Acid    | Veronal               |
| Erythrite             | Isoxazoles             | Purin           | Xanthic Acid          |
| Esters                | Ketenes                | Pyrazines       | Xanthone              |
| Ether                 | Ketones                | Pyrazoles       | Xylene                |
| Ethers                | Lactic Acid            |                 |                       |

## BIOGRAPHIES

|                        |                       |                       |                        |
|------------------------|-----------------------|-----------------------|------------------------|
| Abel, Sir Frederick A. | Boussingault.         | Davy, Sir Humphry     | Fresenius, Karl R.     |
| Achard, F. C.          | Brande, William       | Dewar, Sir James      | Friedel, Charles       |
| Andrews, Thomas        | Thomas                | Döbereiner, J. W.     | Fuchs, Johann N. von   |
| Baeyer, Adolf von      | Brown, S. M.          | Dulong, Pierre Louis  | Gannal, J. N.          |
| Balard, Antoine J.     | Bunsen, R. W. von     | Dumas, J. B. A.       | Gay-Lussac, J. I.      |
| Baumé, Antoine         | Calvert, F. Crace     | Erdmann, Otto Linné   | Geber                  |
| Becher, J. J.          | Cannizzaro, Stanislaw | Fehling, Hermann von  | Geoffroy, E. F.        |
| Bell, Jacob            | Cavendish, Henry      | Fischer, Emil         | Gerhardt, Charles F.   |
| Bergman, Torbern Olof  | Chevreul, M. E.       | Fittig, Rudolf        | Gibbs, Oliver Wolcott  |
| Berthelot, M. P. E.    | Clark, Thomas         | Flamel, Nicolas       | Gilbert, Sir Joseph H. |
| Berthollet, C. L.      | Crookes, Sir William  | Fourcroy, A. F., de   | Gladstone, John Hall   |
| Berzelius, J. J.       | Dalton, John          | Frankland, Sir Edward | Glaser, Christopher    |
| Black, Joseph          | Daniell, John F.      | Frémy, Edmond         | Glauber, Johann R.     |

|                        |                        |                        |                    |
|------------------------|------------------------|------------------------|--------------------|
| Gmelin (family)        | Lunge, Georg           | Perkin, Sir W. H.      | Silliman, Benjamin |
| Graham, Thomas         | Magnus, H. G.          | Pettenkofer, M. J. von | Stahl, G. E.       |
| Guimet, Jean B.        | Marggraf, Andreas S.   | Plattner, K. F.        | Stas, J. S.        |
| Guyton de Morveau      | Marignac, J. C. G. de  | Priestley, Joseph      | Tennant, Charles   |
| Harcourt, W. Vernon    | Mayow, John            | Proust, Joseph Louis   | Tennant, Smithson  |
| Helmont, Jean B. van   | Mendeléeff, Dmitri I.  | Prout, William         | Thénard, L. J.     |
| Henry, William         | Meyer, J. Lothar       | Ramsay, Sir William    | Thomsen, Julius    |
| Hofmann, A. W. von     | Meyer, Victor          | Raoult, François M.    | Thomson, Thomas    |
| Homberg, William       | Mitscherlich, E.       | Regnault, H. V.        | Van't Hoff, J. H.  |
| Kekulé, F. August      | Mohr, K. Friedrich     | Richter, J. B.         | Vauquelin, L. N.   |
| Klaproth, M. H.        | Moissan, Henri         | Roebuck, John          | Weldon, Walter     |
| Kolbe, A. W. Hermann   | Mond, Ludwig           | Roscoe, Sir H. E.      | Wenzel, K. F.      |
| Kopp, Hermann F. M.    | Murray, John           | Rose (family)          | Williamson, A. W.  |
| Kunkel von Lowenstjern | Muspratt, J. and J. S. | Rouelle, G. F.         | Wislicenus, J.     |
| Lavoisier, A. L.       | Newlands, John A. R.   | Sainte-Claire Deville  | Wöhler, Friedrich  |
| LeBlanc, Nicolas       | Nobel, Alfred B.       | Scheele, K. W.         | Wollaston, W. H.   |
| Lemery, Nicolas        | Pasteur, Louis         | Schönbein, C. F.       | Wurtz, C. A.       |
| Liebig, J. von, baron  | Pelouze, T. Jules      | Schützenberger, P.     | Young, James       |

## CHAPTER LVI

### GEOLOGY

**S**HAKESPEARE tells us that "there are sermons in stones." No science, except possibly astronomy, appeals more to the imagination or carries one further away from our present workaday world than geology. While geology "claims as its peculiar territory the rocky framework of the globe," its object is, says the Encyclopaedia Britannica (Vol.

#### The Province of Geology or Sermons in Stones

through its various stages of growth down to the present condition of things." It goes back millions and hundreds of millions of years to the first beginnings of things and unravels complicated processes by which the earth and each of the continents on it has been built up.

"It follows, even into detail, the varied sculpture of mountain and valley, crag and ravine." It shows "that the present races of plants and animals are the descendants of other and very different races which once peopled the earth. It teaches that there has been a progressive development of the inhabitants." Dead and cold though the rocks seem, they are filled, to one who can read their secret, with the tragedy of past life. Parts of Florida are but the graves where millions of corals, now crushed into massive limestone, once lived and died; the coal of Pennsylvania tells of ferns and other terrestrial plants matted together into a bed whence they originally grew; "the snails and lizards which lived and died within a hollow tree, the insects which have been imprisoned within the exuding resin of old forests, the footprints of birds and quadrupeds, the trails of worms

left upon former shores—these and innumerable other pieces of evidence” tell of the tragedies of former times and “enable the geologist to realize in some measure what the faunas and floras of successive periods have been.”

The foundation for the study of the whole subject in the *Britannica* is the article **GEOLOGY** (Vol. 11, p. 638), equivalent to 125 pages of this Guide. It is by the highest authority in the world, Sir Archibald Geikie, long director general of the Geological Survey of the United Kingdom, and director of the Museum of Practical Geology, London. It deals with the general principles and gives an outline of the subject matter of the science. In particular it treats of,

*The historical development of geological science;*

*The cosmical aspects of geology;*

*Geognosy;*

*Dynamical Geology;*

*Geotectonic or Structural Geology;*

*Palaeontological Geology;*

*Stratigraphical Geology;*

*Physiographical Geology.*

While the student will doubtless be interested equally in each of these departments, the general reader will be especially interested in the

**Age of the Earth** which—its historical development—

is almost the only concise account of geological history hitherto published in English. Especially interesting is the question, fully discussed, of the age of the earth. Lord Kelvin (Vol. 11, p. 653) declared some few years ago that the time “was more than twenty and less than forty millions of years and probably much nearer twenty than forty.” But the trend of later investigations, and especially the study of radio-activity, has led to the belief that the period must have been much longer. Sir Archibald Geikie sums up the evidence as follows (Vol. 11, p. 653): “In the present state of science it is out of our power to state positively what

must be the lowest limit of the age of the earth, but we cannot assume it to be less, and it may possibly have been much more than one hundred millions of years.”

The general reader will find of interest, too, the table (Vol. 11, p. 670) representing the geological record or order

### Geological Formations

of succession of the earth's crusts from the earliest Archean,

through Cambrian, Silurian, Devonian and Carboniferous to the Post-glacial or Human of to-day. A separate article is to be found on each of these different formations, namely: **ARCHEAN** (Vol. 2, p. 360); **CAMBRIAN** (Vol. 5, p. 86); **SILURIAN** (Vol. 25, p. 109); **DEVONIAN** (Vol. 8, p. 124); **CARBONIFEROUS** (Vol. 5, p. 309); **PERMIAN** (Vol. 21, p. 176); **TRIASSIC** (Vol. 27, p. 258); **JURASSIC** (Vol. 15, p. 567); **CRETACEOUS** (Vol. 7, p. 414); **Eocene** (Vol. 9, p. 661); **OLIGOCENE** (Vol. 20, p. 81); **MIOCENE** (Vol. 18, p. 565); **PLIOCENE** (Vol. 21, p. 846); **PLEISTOCENE** (Vol. 21, p. 835); Recent, Post-glacial or Human under article **QUATERNARY** (Vol. 22, p. 718).

Full local geological information is found in geographical articles. See, for instance, in the article **UNITED STATES**, the section on *Geology* (Vol. 27, pp. 624-632), by Professors R. D. Salisbury and T. C. Chamberlin of the University of Chicago; the section *Geology* in the article **ENGLAND** (Vol. 9, pp. 415-416), by H. R. Mill, editor of *The International Geography*; the section *Geology* in the article **AFRICA** (Vol. 1, pp. 323-325), by Walcot Gibson, author of *Mineral Wealth of Africa*, etc. These special treatments are accompanied by sketch maps. Similarly, the articles on each of the different states of the Union has a section giving information on the geology, the flora and fauna, the climate, and the geography of the state. And in such articles on geographic topics as **GREAT SALT LAKE, NIAGARA**, by G. Karl Gilbert,

and GRAND CANYON, by R. S. Tarr, there is valuable geological information.

Other important articles which the reader should consult are **PETROLOGY** (Vol. 21, p. 323), equivalent to 40 pages of this Guide, largely illustrated, by Dr. J. S. Fleet, petrographer to the Geological Survey of Great Britain; **MINERALOGY** (Vol. 18, p. 509), equivalent to 25 pages of this Guide, by L. J. Spencer, editor of the *Mineralogical Magazine*; **MINERAL DEPOSITS** (Vol. 18, p. 504), equivalent to 15 pages of this Guide, by James F. Kemp, professor of geology of Columbia University, and geologist to the United States and New York Geological Surveys; **CRYSTALLOGRAPHY** (Vol. 7, p. 569), equivalent to 60 pages of this Guide, also by L. J. Spencer; **MINING** (Vol. 18, p. 528), equivalent to 40 pages of this Guide, by Henry Smith Munroe, professor of mining, Columbia University, New York; **PALAEONTOLOGY** (Vol. 20, p. 579), profusely illustrated, equivalent to 35 pages of this Guide, by Prof. Henry Fairfield Osborn of Columbia University, and president of the American Museum of Natural History of New York; **PALAEOBOTANY** (Vol. 20, p. 524), profusely illustrated, equivalent to 100 pages of this Guide, written by three of the leading geological writers of the day: Dr. D. H. Scott, president of the Linnean Society, author of *Studies in Fossil Botany*; A. E. Steward, professor of botany of the University of Cambridge; and Clement Reid, author of *Fossil Flora of Tegelen*.

Of more popular interest are the three articles, Earthquake, Seismometer and Volcano. The article **EARTHQUAKE** is in two parts. The first (Vol. 8, p. 817) is an historical account telling of the extent and damage done by many earthquakes, including the terrible San Francisco earthquake of April 18, 1906, and that of Calabria and Sicily, December 28, 1908, by F. W. Rudler, president of the Geologists' Association; the other part (Vol. 8, p. 820), by Dr. J. Milne, late

professor of geology in the Imperial University of Tokio, deals with the physical theory of earthquakes. The article **VOLCANO** (Vol. 28, p. 178), equivalent to 45 pages of this Guide, is by F. W. Rudler, and gives us the reasons for and the history of volcanic disturbances. It is of interest both to the scholar and to the casual reader. Thus we learn that "while Herculaneum was buried beneath a flood of mud swept down from Vesuvius" in 79 A.D., Pompeii "was overwhelmed in great measure by loose ashes, capable of removal with comparative ease." Nearly everyone of middle age remembers the famous eruption of Krakatoa in 1883 and the famous sunsets of that year. Concerning this the Britannica article tells us (p. 180):

Enormous quantities of dust ejected from Krakatoa in 1883 were carried to prodigious distances, samples having been collected at more than a thousand miles from the volcano; whilst the very fine material in ultra-microscopic grains which remained suspended for months in the higher regions of the atmosphere seems to have enjoyed an almost world-wide distribution, and to have been responsible for the remarkable sunsets at that period.

The article **DUST** (Vol. 8, p. 713), by John Aitken, inventor of the machine for counting particles of dust, explains the mechanical causes of this suspension. Besides there is much concrete information about volcanoes in articles on volcanic regions: for instance, on volcanoes in the possessions of the United States, see articles **HAWAII**, **ALASKA**, **PHILIPPINES**.

The student should read also the articles on the different minerals, many of them long and important and all by well-known authorities. Thus the article **DIAMOND** (Vol. 8, p. 158), illustrated, equivalent to 20 pages of this Guide, is by Henry Alexander Miers, editor of the *Mineralogical Magazine*. Besides dealing with the general character of this stone, the article pays particular attention to diamond mining in South Africa, the text being illustrated by



plates showing the Kimberley and De-Beers workings. The article GEM (Vol. 11, p. 560), is equivalent to 25 pages of this Guide. The article GEM, ARTIFICIAL (Vol. 11, p. 569) is by the well-known chemist and physicist, Sir William Crookes. It tells of the changes induced by radio-active emanations and of the artificial production of the diamond, ruby, sapphire, Oriental emerald, amethyst and topaz. The reader will be interested, too, in the article LAPIDARY AND GEM CUTTING (Vol. 16, p. 195), by Dr. George F. Kunz, gem expert for Messrs. Tiffany & Co., New York.

There are special biographical articles in the Britannica on all the well-known geologists, and in these articles special stress has been laid on the part played by the subject of the memoirs in promoting the science. This is well shown, for instance, in the articles AGASSIZ (Vol. 1, p. 367); HUTTON (Vol. 14, p. 16) and LYELL (Vol. 17, p. 158).

Geology, by its study of earth deposits,

age of rocks, etc., and by its estimate of the date of certain extinct animals like the mammoth and hairy elephant, or of the time when certain animals, e.g., the elephant and reindeer, were found in parts of the world where they no longer occur, is an important adjunct to the science of anthropology, especially in the question of the antiquity of man. On this see the section of antiquity of man in the article ANTHROPOLOGY (Vol. 2, p. 114), and, in general, the chapter in this Guide on *Anthropology and Ethnology*.

From one point of view geology is only a branch of geography and the student of geology should consult the elaborate article on GEOGRAPHY in the Britannica, especially all parts dealing with physical geography or physiography. For a clue to this part of the book see the chapter in this Guide on *Geography*.

The following is a list of the more important articles on Geology in the Encyclopaedia Britannica:

#### LIST OF ARTICLES IN THE ENCYCLOPAEDIA BRITANNICA OF SPECIAL INTEREST TO STUDENTS OF GEOLOGY

|                            |                      |                           |                       |
|----------------------------|----------------------|---------------------------|-----------------------|
| Abich, O. W. H. von        | Amphibolite          | Asbestos                  | Batholite             |
| Abraum salts               | Amygdaloid           | Assise                    | Bathonian Series      |
| Acadian                    | Analcite             | Asteria, or Star-stone    | Bathvillite           |
| Acmite, or Aegirite        | Anatase              | Atacamite                 | Bauxite               |
| Agalmatolite               | Andalusite           | Atherstone, W. G.         | Bed                   |
| Agate                      | Andesine             | Augite                    | Beecher, C. E.        |
| Agglomerate                | Andesite             | Autunite                  | Belt, Thomas          |
| Agricola, Georg            | Anglesite            | Aventurine, or Avandurine | Bembridge Beds        |
| Aikin, Arthur              | Anhydrite            | Avonian                   | Benett, Etheldred     |
| Alabaster                  | Ankerite             | Axinite                   | Benitoite             |
| Albertite                  | Annabergite          | Aymestry Limestone        | Bernician Series      |
| Albian                     | Anning, Mary         | Azurite, or Chessylite    | Beryl                 |
| Albite                     | Anorthite            | Bagshot Beds              | Beryllonite           |
| Alexandrite                | Ansted, David Thomas | Baily, William Hellier    | Beudant, François S.  |
| Allophane                  | Anthracite           | Bain, Andrew Geddes       | Beyrich, H. E. von    |
| Allport, Samuel            | Apatite              | Bajocian                  | Bigsby, J. J.         |
| Alluvium                   | Aphanite             | Bakewell, Robert          | Binney, E. W.         |
| Almandine                  | Aplite               | Bala Series               | Biotite               |
| Alquifou                   | Apophyllite          | Barrande, Joachim         | Bismuthite            |
| Alunite, or Alumstone      | Aptian               | Barrett, Lucas            | Bitumen               |
| Amazon Stone, or Amazonite | Aquamarine           | Barrois, Charles          | Blanford, W. T.       |
| Amber                      | Aragonite            | Barton Beds               | Blende, or Sphalerite |
| Ambygonite                 | Archean System       | Barytes                   | Bloodstone            |
| Amethyst                   | Archiac, vicomte d'  | Barytocalcite             | Boase, Henry Samuel   |
| Amianthus                  | Arenig Group         | Basalt                    | Bole                  |
| Amphibole                  | Argentite            | Basin                     | Bomb                  |
|                            | Argyrodite           |                           | Bone Bed              |

|                        |                          |                          |                          |
|------------------------|--------------------------|--------------------------|--------------------------|
| Bonney, Thomas George  | Cinnamon Stone           | Dioptase                 | Gem                      |
| Boracite               | Clarke, William B.       | Diorite                  | Geology                  |
| Born, I. von           | Clay                     | Dolerite                 | Gesner, Abraham          |
| Borolanite             | Clay-with-Flints         | Dolomieu                 | Geyser                   |
| Bort, or Boart         | Clinoclastite            | Dolomite                 | Giebel, C. G. A.         |
| Bostonite              | Clintonite               | Dopplerite               | Gilbert, Grove K.        |
| Boucher de Crévecoeur  | Close, Maxwell H.        | Drift                    | Gilsonite                |
| de Perthes, J.         | Cobaltite                | Dufrenoy, O. P. A. P.    | Glacial Period           |
| Boué, Ami              | Colemanite               | Dumont, André Hubert     | Glauconite               |
| Boulder                | Columbite                | Dumortierite             | Gneiss                   |
| Boulder Clay           | Concretion               | Duncan, Peter Martin     | Godwin-Austen, R. A. C.  |
| Bournonite             | Conglomerate             | Durocher, J. M. E.       | Goldfuss, G. A.          |
| Bovey Beds             | Connellite               | Earth pillar             | Goniometer               |
| Bowerbank, J. S.       | Conybeare, W. D.         | Earthquake               | Göthite, or Goethite     |
| Bracklesham Beds       | Copalite, or Copaline    | Eclogite                 | Granite                  |
| Bradford Clay          | Cope, Edward D.          | Egerton, Sir P. de M.    | Granulite                |
| Brander, Gustavus      | Copper-glance            | Ehrenberg, C. G.         | Graphite                 |
| Breccia                | Copper-pyrites, or Chal- | Eichwald, K. E. von      | Gravel, or Pebble Beds   |
| Breislak, Scipione     | copyrite                 | Elaterite                | Green, A. H.             |
| Bristow, H. W.         | Coprolites               | Elie De Beaumont         | Greenockite              |
| Brocchi, G. B.         | Corallian                | Emerald                  | Greenough, G. B.         |
| Brochant de Villiers,  | Cornbrash                | Emery                    | Greensand                |
| A. J. F. M.            | Corundum                 | Emmons, Ebenezer         | Greisen                  |
| Brochantite            | Cotta, Bernard von       | Enniskillen, 3rd earl of | Greywacke                |
| Brodie, P. B.          | Covellite                | Enstatite                | Griffith, Sir Richard J. |
| Brogger, W. C.         | Crater                   | Eocene                   | Groth, P. H. von         |
| Bromlite               | Credner, C. F. H.        | Epidiorite               | Guettard, J. E.          |
| Brongniart, Alexandre  | Cretaceous System        | Epidosite                | Gumbel, K. W. von        |
| Bronn, Heinrich Georg  | Crocidolite              | Epidote                  | Guyot, A. H.             |
| Bronzite               | Crocoite                 | Erubescite               | Gypsum                   |
| Brookite               | Croll, James             | Erythrite                | Haast, Sir J. F. J. von  |
| Brucite                | Crosskey, Henry W.       | Escher von der Linth     | Haematite                |
| Brückmann, F r a n z   | Cryolite                 | Esker                    | Haidinger, W. K. von     |
| Ernst                  | Crystallite              | Etheridge, Robert        | Hall, James              |
| Buch, Baron von        | Crystallography          | Ettingshausen, Baron     | Hall, Sir James          |
| Buckland, William      | Culm                     | Euclase                  | Hallefinta               |
| Bunter                 | Cumming, Joseph G.       | Fall-line                | Harkness, Robert         |
| Bytownite              | Cuprite                  | Farey, John              | Harmotome                |
| Calnozoic              | Cyanite                  | Faujas de Saint-Fond     | Hatchettite              |
| Cairngorm              | Dacite                   | Fault                    | Hauer, F. von            |
| Calamine (Smithsonite) | Dalradian                | Favre, Jean Alphonse     | Haughton, Samuel         |
| Calcite                | Dana, James D.           | Felsite                  | Hausmann, J. F. L.       |
| Callovia               | Danburite                | Felspar                  | Hayden, F. V.            |
| Cambrian System        | Datolite                 | Fitton, William Henry    | Hebert, Edmond           |
| Cancrin, F. L. von     | Daubeny, Charles G. B.   | Flint                    | Heddle, M. F.            |
| Caradoc Series         | Daubree, G. A.           | Fluor-spar               | Heer, Oswald             |
| Carbonado              | Davidson, Thomas         | Flysch                   | Heim, A. von St. Gallen  |
| Carboniferous System   | Dawson, Sir John W.      | Fold                     | Helmersen, Gregor von    |
| Carnelian              | Dechen, E. H. K. von     | Forbes, David            | Hemimorphite             |
| Cassiterite            | De la Beche, Sir H. T.   | Forchhammer, J. G.       | Henslow, John Stevens    |
| Cat's-eye              | Delesse, A. E. O. J.     | Foster, Sir C. le Neve   | Henwood, William Jory    |
| Cave                   | Deluc, Jean Andre        | Fouque, F. A.            | Heulandite               |
| Celestine              | Demantoid                | Fournet, J. J. B. X.     | Hicks, Henry             |
| Cerargyrite            | Des Cloizeaux, Alfred    | Fox, Robert Were         | Hiddenite                |
| Ceruscite              | Descloizite              | Franklinite              | Hitchcock, Edward        |
| Chabazite              | Deshayes, G. P.          | Freestone                | Hochstetter, F. C. von   |
| Chalcedony             | Deslongchamps, J. A. E.  | Freieslebenite           | Holocene                 |
| Chalk                  | Desmafest, Nicolas       | Fulgurite                | Hone                     |
| Chalybite              | Desnoyers, J. P. F. S.   | Fuller's Earth           | Hopkins, William         |
| Charnockite            | Desor, P. J. E.          | Fumarole                 | Hornblende               |
| Childrenite            | Devonian System          | Gabbro                   | Horner, Leonard          |
| Chlorite               | Diabase                  | Galena                   | Hornes, Moritz           |
| Chromite               | Diallage                 | Garnet                   | Hornfels                 |
| Chrysoberyl            | Diamond                  | Gaudry, Jean Albert      | Hulke, J. W.             |
| Chrysocolla            | Diaspore                 | Gault                    | Humite                   |
| Chrysolite             | Dick, Robert             | Geikie, Sir Archibald    | Hunt, Robert             |
| Chrysoprase            | Diluvium                 | Geikie, James            | Hunt, T. Sterry          |
| Cinnabar               | Diopside                 | Geinitz, H. B.           | Hutton, James            |

- Hyacinth  
 Hypersthene  
 Idrialin  
 Ijolite  
 Ilmenite  
 Iolite  
 Itacolumite  
 Jade  
 Jameson, Robert  
 Jargoon  
 Jarosite  
 Jasper  
 Jet  
 Joints  
 Jones, T. Rupert  
 Jukes, J. B.  
 Jurassic System  
 Kaolin  
 Karrer, Felix  
 Karsten, K. J. B.  
 Kayser, F. H. E.  
 Kennigott, G. A.  
 Keuper  
 Kidd, John  
 Kimeridgian  
 King, Clarence  
 Kirwan, Richard  
 Kjerulf, Theodor\*  
 Kobell, W. X. F. von  
 Koenig, K. D. E.  
 Koksharov, N. I. von  
 Koninck, L. G. de  
 Kunzite  
 Labradorite  
 Laccolite  
 Lacroix, A. F. A.  
 Lamprophyres  
 Lapilli  
 Lapis Lazuli  
 Lapparent, A. A. C. de  
 Lapworth, Charles  
 Lasaulx, A. C. P. F.  
 von  
 Laterite  
 Laumont, F. P. N. G.  
 de  
 Lava  
 Leadhillite  
 Le Conte, Joseph  
 Lehmann, J. G.  
 Lepidolite, or Lithia-  
 Mica  
 Lesley, J. Peter  
 Leucite  
 Lévy, A. M.  
 Lewis, Henry Corvill  
 Lias  
 Lignite  
 Limburgite  
 Limestone  
 Limonite  
 Lindström, Gustaf  
 Iiroconite  
 Lister, Martin  
 Llandeilo Group  
 Llandoverly Group  
 Llywd, Edward  
 Loess  
 Logan, Sir William F.  
 London Clay  
 Lonsdale, William  
 Lory, Charles  
 Ludlow Group  
 Lyell, Sir Charles  
 McCoy, Sir Frederick  
 Macculloch, John  
 Maclure, William  
 Magnesite  
 Magnetite  
 Malachite  
 Mallet, Robert  
 Manganite  
 Mantell, G. A.  
 Marble  
 Marcasite  
 Marcou, J. B.  
 Marl  
 Martin, William  
 Meek, F. B.  
 Meerschäum  
 Melaconite  
 Mesozoic  
 Metamorphism  
 Metasomatism  
 Meteorite  
 Meyer, C. E. H. von  
 Mica  
 Mica-schist  
 Microcline  
 Micropegmatite  
 Miller, Hugh  
 Miller, W. H.  
 Millerite  
 Millstone Grit  
 Mimetite  
 Mineral deposits  
 Mineralogy  
 Miocene System  
 Mispickel  
 Mocha Stone  
 Mofetta  
 Mohs, Friedrich  
 Mojsisovics von Mojs-  
 var, J. A. G. E.  
 Moldavite  
 Molybdenite  
 Monazite  
 Monzonite  
 Moonstone  
 Morris, John  
 Münster, Georg, count  
 zu  
 Murchison, Sir R. I.  
 Muschelkalk  
 Muscovite  
 Mylonite  
 Napoleonite  
 Natrolite  
 Naumann, G. A. C. F.  
 Neck  
 Neocomian  
 Nepheline  
 Nepheline-syenite  
 Nephelinites  
 Neumayr, Melchior  
 Newberry, J. S.  
 Niccolite  
 Nicholson, H. A.  
 Nicol, James  
 Nitre  
 Noeggerath, J. J.  
 Obsidian  
 Oldham, Thomas  
 Oligocene System  
 Oligoclase  
 Olivenite  
 Olivine  
 Omalius d'Halloy, J. d'  
 Onyx  
 Oolite  
 Opal  
 Oppel, C. A.  
 Orhigny, A. D. d'  
 Ordovician System  
 Orthoclase  
 Osborn, H. F.  
 Oxfordian  
 Ozokerite, or Ozocerite  
 Palaeozoic  
 Parisite  
 Parkinson, James  
 Peach, C. W.  
 Pegmatite  
 Pendleside Series  
 Pengelly, William  
 Peperino  
 Peridot  
 Peridotite  
 Perlite  
 Permian System  
 Perovskite  
 Petalite  
 Petrology  
 Pharmacosiderite  
 Phenacite  
 Phillips, John  
 Phillips, William  
 Phillipsite  
 Phlogopite  
 Phonolite  
 Phosgenite  
 Phosphates  
 Phosphorite  
 Phyllite  
 Picrite  
 Pictet, de la Rive, F. J.  
 Pitchblende, or Urani-  
 nite  
 Pitchstone  
 Plagioclase  
 Pleistocene System  
 Pliocene System  
 Plot, Robert  
 Plumbago  
 Pneumatolysis  
 Pollux, or Pollucite  
 Porphyry  
 Portlandian  
 Portlock, J. E.  
 Powell, J. W.  
 Pre-Cambrian  
 Prehnite  
 Prestwick, Sir Joseph  
 Prévost, Constant  
 Proustite  
 Psilomelane  
 Pumice  
 Purbeckian  
 Puy  
 Pyrarгыrite  
 Pyrites  
 Pyrolusite  
 Pyromorphite  
 Pyrope  
 Pyrophyllite  
 Pyroxene  
 Pyroxenite  
 Pyrrhotite  
 Quartz  
 Quartzite  
 Quartz-porphyr  
 Quaternary  
 Quenstedt, F. A. von  
 Rammelsberg, K. F. A.  
 Ramsay, Sir Andrew C.  
 Rath, Gerhard von  
 Reading Beds  
 Realgar  
 Renard, A. F.  
 Renevier, Eugène  
 Retinite  
 Reusch, Hans Henrik  
 Reuss, A. E. von  
 Rhaetic  
 Rhodochrosite  
 Rhodonite  
 Rhyolite  
 Rock  
 Rock-crystal  
 Roemer, F. A.  
 Rogers, H. D.  
 Rome de l'Isle, J. B. L.  
 Roth, J. L. A.  
 Rubellite  
 Ruby  
 Russell, Israel Cook  
 Rutile  
 Rutley, Frank  
 Salt  
 Salter, John William  
 Sand  
 Sandberger, K. L. F.  
 von  
 Sandstone  
 Sapphire  
 Sard  
 Sardonyx  
 Satin-spar  
 Savi, Paolo  
 Scapolite  
 Scheelite  
 Schists  
 Schlothelm, Baron von  
 Schorl  
 Scolecite  
 Scoria  
 Scrope, G. J. Poulett  
 Sedgwick, Adam  
 Seismometer  
 Selwyn, A. R. C.  
 Sénarmont, H. H. de  
 Serpentine

|                      |                        |                       |                              |
|----------------------|------------------------|-----------------------|------------------------------|
| Sharpe, Daniel       | Stilbite               | Topaz                 | Waltershausen                |
| Sill                 | Stoliczka, Ferdinand   | Torbernite            | Wavellite                    |
| Sillimanite          | Stone                  | Torell, Otto          | Wealden                      |
| Silurian System      | Stoppani, Antonio      | Torrionian            | Webster, Thomas              |
| Sinter               | Stratigraphy           | Tourmaline            | Wenlock Group                |
| Slate                | Strickland, Hugh E.    | Trachyte              | Werner, A. G.                |
| Smaltite             | Strontianite           | Trass                 | Whiteaves, J. F.             |
| Smith, William       | Studer, Bernhard       | Tremolite             | Whitney, J. D.               |
| Smithson, James      | Suess, Edward          | Triassic System       | Willemite                    |
| Smyth, Sir W. W.     | Sun-stone              | Tridymite             | Witherite                    |
| Sodalite             | Syenite                | Trimmer, Joshua       | Wolframite                   |
| Soffioni             | Sylvanite              | Tuff                  | Wollastonite                 |
| Solfatara            | Sylvite                | Turquoise             | Wood, S. V.                  |
| Sorby, Henry C.      | Symonds, William S.    | Vanadinite            | Woodward, John               |
| Speeton Beds         | Szabó von Szentmiklos  | Variolite             | Woodward, Samuel             |
| Sphene               | Tachylytes             | Variscite             | Woolwich-and-Reading<br>Beds |
| Spherulites          | Talc                   | Veins                 |                              |
| Spinel               | Tate, Ralph            | Verneuil, P. E. P. de | Wright, Thomas               |
| Spodumene            | Tchihatcheff, P. A. de | Vesuvianite           | Wulfenite                    |
| Spratt, Thomas A. B. | Tertiary               | Vivianite             | Yoredale Series              |
| Stalactites          | Tetradymite            | Vogt, Karl C.         | Zeolites                     |
| Stannite             | Tetrahedrite           | Volcano               | Zincite                      |
| Staurolite           | Theralite              | Waagen, W. H.         | Zircon                       |
| Steno, Nicolaus      | Thorianite             | Wachsmuth, Charles    | Zirkel, Ferdinand            |
| Stephanite           | Thorite                | Wad                   | Zittel, Karl A. von          |
| Stibnite             | Tonalite               | Walcott, Charles D.   | Zoisite                      |

## CHAPTER LVII

### BIOLOGY

#### GENERAL AND INTRODUCTORY

**T**HE Britannica tells us that Sir Thomas Browne, the famous 17th century physician and author, once ventured to doubt "whether mice may be bred by putrefaction," and Alexander Ross, the poet scientist of 200 years ago, commenting on his scepticism wrote, "So may he doubt whether in cheese and timber worms are generated; or if beetles and wasps in cows' dung; or if butterflies, locusts, grasshoppers, shell-fish, snails, eels, and such like, be procreated of putrefied matter, which is apt to receive the form of that creature to which it is by formative power disposed. To question

this is to question reason, sense and experience. If he doubts of this let him go to Egypt, and there he will find the fields swarming with mice, begot of the mud of Nylus, to the great calamity of the inhabitants" (Vol. 1, p. 64). To-day science gives no off-hand answer to the question of the origin of life. Abiogenesis, or "spontaneous generation," so-called, finds a far less simple definition and research still in vain bends its best energies to solving this problem of problems.

The subject is so vast, dealing as it does with all the phenomena manifested by living matter, that in this Guide that

branch of the subject which studies the human organism is separately dealt with in the chapter *Health and Disease*. This chapter, therefore, is confined to the still enormous subject of biology considered as dealing with the general problem of life; botany and zoology are treated in the following chapters. The student of either of the two last subjects should preface, or at least supplement, his studies, by reading the main general articles included below.

The guiding article **BIOLOGY** (Vol. 5, p. 954), which should be read first, serves as a key to the discussion of the biological sciences. It is not

### The Study of Life

long, for the main divisions of the subject are treated more conveniently and logically under their own appropriate headings. P. Chalmers Mitchell, secretary of the Zoological Society of London, who organized the whole subject for the new *Britannica*, is the contributor. Supplementing this, the article **LIFE** (Vol. 16, p. 600), also by Chalmers Mitchell, should be read, with those on **PROTOPLASM** (Vol. 22, p. 476), **SPECIES** (Vol. 25, p. 616), **ABIOTENESIS** (Vol. 1, p. 64), **BIOTENESIS** (Vol. 3, p. 952). In the two articles last named the theory of spontaneous generation is examined and found wanting, or at best unproved.

Living matter may be regarded under four aspects: structure, distribution, physiology, evolution. For the first, the article

### Structure

**MORPHOLOGY** (Vol. 18, p. 863) leads the discussion, followed by **CYTOLOGY** (Vol. 7, p. 710), and **EMBRYOLOGY** (Vol. 9, p. 314), in which the growth of cell structures is discussed. These articles are introductory to the whole subject. Supplementing them reference may be made to the Morphology sections of the articles **PLANT** (Vol. 21, p. 728) and **ZOOLOGY** (Vol. 28, p. 1022).

A most fascinating branch is that

which is concerned with the where and when of the existence of organisms. The

articles in the *Britannica* are worthy of the interest of the

subject. Under **PALAEONTOLOGY** (Vol. 20, p. 579) H. F. Osborn, Columbia University, New York, president of the American Museum of Natural History, New York, treats of the archaeology of the biological sciences, of the extinct species which once inhabited the earth; while Clement Reid, of the Geological Survey of Great Britain, A. C. Seward, professor of botany, Cambridge University, and Dr. D. H. Scott, president of the Linnean Society, perform the same service for plant life in the article **PALAEOBOTANY** (Vol. 20, p. 524). The distribution of present types is discussed under **ZOOLOGICAL DISTRIBUTION** (Vol. 28, p. 1002), **PLANTS, Distribution** (Vol. 21, p. 777), and **PLANKTON** (Vol. 21, p. 720), in which Prof. G. H. Fowler of University College, London, describes a science which is still young—that of tracing the drift and distribution of deep sea life. See also **ACCLIMATIZATION** (Vol. 1, p. 114), by Alfred Russel Wallace and Frank Finn, of the Indian Museum of Calcutta.

The properties, processes, and functions of living things fall in the province of **PHYSIOLOGY** (Vol. 21, p. 554), and kindred articles; among

### Physiology

the latter the following may profitably be consulted: **ANIMAL HEAT** (Vol. 2, p. 48), and **PLANTS, Physiology** (Vol. 21, p. 744).

The gradual development of species is considered in a number of valuable articles such as **EVOLUTION** (Vol. 10, p. 22),

**HEREDITY** (Vol. 13, p. 350), **REPRODUCTION** (Vol. 23, p. 116), **MENDELISM** (Vol. 18, p. 115), **TELEGENY** (Vol. 25, p. 509), **VARIATION AND SELECTION** (Vol. 27, p. 906).

Following is an alphabetical list of the



*general* biological articles (those not dealing directly with either Botany or Zoology), which are to be found in the Britannica:

|                 |            |              |                         |
|-----------------|------------|--------------|-------------------------|
| Abiogenesis     | Autogeny   | Fermentation | Morphology              |
| Acclimatization | Bathybius  | Habitat      | Oecology, or Ecology    |
| Acephalous      | Biogenesis | Heredity     | Osteology               |
| Acuminate       | Biology    | Hibernaculum | Parasitism              |
| Adaptation      | Bipartite  | Histology    | Protoplasm              |
| Aestivation     | Catabolism | Hybridism    | Reproduction            |
| Albino          | Chemotaxis | Life         | Rhacis, or Rachis       |
| Alveolate       | Cilia      | Longevity    | Species                 |
| Anabolism       | Cytology   | Mendelism    | Telegony                |
| Anastomosis     | Embryology | Metabolism   | Variation and Selection |
| Aporose         | Enzyme     | Microtomy    |                         |
| Auricle         | Evolution  | Monotypic    |                         |

### BIOGRAPHIES OF BIOLOGISTS

The life and work of the world's great biologists may be studied in the Britannica, and an alphabetical list of the principal articles follows.

|                                    |                           |                            |                       |
|------------------------------------|---------------------------|----------------------------|-----------------------|
| Acharius, Erik                     | Broussonet, P. M. A.      | Gegenbaur, Carl            | Malpighi, Marcello    |
| Adams, A. L.                       | Brown, Robert             | Geoffroy Saint-Hilaire, E. | Marsh, O. C.          |
| Adanson, Michel                    | Buckland, F. T.           | Geoffroy Saint-Hilaire, I. | Martius, C. F. P. von |
| Afzelius, Adam                     | Buffon, G. L. L. de       | Gerard, John               | Martyn, John          |
| Agassiz, A. E.                     | Caesalpinus, Andreas      | Gervais, Paul              | Michaux, André        |
| Agassiz, J. L. R.                  | Camerarius, Joachim       | Gesner, K. von             | Milne-Edwards, Henry  |
| Aiton, William                     | Camerarius, R. J.         | Gosse, Philip Henry        | Mivart, St. George J. |
| Albinus (Weiss), B. S.             | Camper, Peter             | Gould, A. A.               | Mohl, Hugo von        |
| Aldrovandi, Ulissi                 | Candolle, A. P. de        | Gray, Asa                  | Morgagni, G. B.       |
| Allman, George James               | Carpenter, W. B.          | Gray, John Edward          | Müller, F. von, baron |
| Alpini, Prospero                   | Cavanilles, A. J.         | Grew, Nehemiah             | Müller, J. P.         |
| Alston, Charles                    | Claparède, J. L. R. A. E. | Haeckel, E. H.             | Naegeli, K. W. van    |
| Ambrosini, Bartolomeo              | Cobbold, T. S.            | Hagenbeck, Carl            | Nees von Esenbeck     |
| Anderson, James                    | Cohn, Ferdinand Julius    | Hales, Stephen             | Newton, Alfred        |
| Arrenotokous, A.                   | Combe, George             | Hasselquist, Frederik      | North, Marianne       |
| Artedi, Peter                      | Coues, E.                 | Hofmeister, W. F. B.       | Nuttall, Thomas       |
| Audebert, J. B.                    | Cuvier, Baron             | Hooker, Sir Joseph D.      | Oken, Lorenz          |
| Audouin, Jean Victor               | Darwin, Charles R.        | Hooker, Sir William J.     | Ormerod, Eleanor A.   |
| Audubon, John James                | Darwin, Erasmus           | Huber, Francois            | Owen, Sir Richard     |
| Avebury, J. Lubbock, Baron         | Daubenton, L. J. M.       | Huxley, T. H.              | Pennant, Thomas       |
| Baer, Karl Ernst von               | De Bary, H. A.            | Hyatt, Alpheus             | Pringsheim, Nathanael |
| Baird, S. F.                       | Desfontaines, R. L.       | Jäger, Gustav              | Quatrefages de Bréau  |
| Balfour, F. M.                     | Dillen (Dillenius), J. J. | Jesse, Edward              | Ray (or Wray), John   |
| Banks, Sir Joseph                  | Donovan, Edward           | Jussieu, De (family)       | Réaumur, R. A. F. de  |
| Barton, B. S.                      | Dryander, Jonas           | Kaup, Johann Jakob         | Richardson, Sir John  |
| Bates, Henry Walter                | Duhamel du Monceau        | Kirby, William             | Romanes, G. J.        |
| Bauhin, Gaspard                    | Dutrochet, R. J. H.       | Kölliker, R. A. von        | Royle, John Forbes    |
| Belon, Pierre                      | Edwards, George           | Kühne, Willy               | Sachs, Julius von     |
| Bentham, George                    | Eschscholtz, J. F.        | Lacépède, B. G. E. de      | Saint-Hilaire, A. de  |
| Berkeley, M. J.                    | Fabricius, J. C.          | La Ville, comte de         | Saussure, N. T. de    |
| Blainville, H. M. Ducrotay de      | Falconer, Hugh            | Lamarck                    | Schleiden, M. J.      |
| Bloch, Mark Eliezer                | Flourens, M. J. P.        | Latreille, P. A.           | Schultze, M. J. S.    |
| Blumenbach, J. F.                  | Flower, Sir William H.    | Lawes, Sir John B.         | Schwann, Theodor      |
| Bonpland, A. J. A.                 | Forbes, Edward            | Leeuwenhoek, A. van        | Senebier, Jean        |
| Bory de Saint-Vincent, J. B. G. M. | Forskål, Peter            | Leidy, Joseph              | Sibthorp, John        |
| Bosc, L. A. G.                     | Fortune, Robert           | Lindley, John              | Siebold, C. T. E. von |
| Brisson, M. J.                     | Fraas, Karl Nikolas       | Linnaeus                   | Sowerby, James        |
| Broderip, W. J.                    | Fries, Elias Magnus       | Lombroso, Cesare           | Spallanzani, Lazzaro  |
| Brongniart, A. T.                  | Fuchs, Leonhard           | Ludwig, K. F. W.           | Sprengel, Kurt        |
|                                    | Gall, Franz Joseph        | Macgillivray, W. and J.    | Spurzhelm, J. C.      |
|                                    | Gaudichaud-Beaupré        |                            | Swammerdam, Jan       |
|                                    |                           |                            | Swartz, Olof          |

|                      |                      |                    |                    |
|----------------------|----------------------|--------------------|--------------------|
| Thomson, Sir C. W.   | Tournefort, J. P. de | Wallace, A. Russel | Willughby, Francis |
| Thunberg, K. P.      | Treviranus, G. R.    | Waterton, Charles  | Wilson, Alexander, |
| Thuret, G. A.        | Tylor, E. B.         | Weismann, August   | Wolff, C. F.       |
| Tiedemann, Friedrich | Virchow, Rudolf      | White, Gilbert     | Wood, John George  |
| Torrey, John         | Wagner, Rudolph      | Williamson, W. C.  | Yarrell, William   |

## CHAPTER LVIII

## BOTANY

**T**HERE are many gardeners and lovers of gardens, but comparatively few have even the most elementary knowledge of botany. How many, for instance, know or remember that in the leaves of plants are situated the kitchens in which they prepare their food, or more than vaguely recognize the presence of a nervous system in plant organisms (Vol. 21, p. 747)? The majority, indeed, ignore the fact that a little study will add a hundred-fold to their enjoyment, and that, unlike most scientific subjects, botany can be studied with a minimum of trouble or toil, and with the simplest apparatus. His own garden, the woods and fields, will give the inquirer ample subjects for his investigations, and, as in every other undertaking, the longer he pursues it the more he will see, and the more intense will be his pleasure in the contemplation of the garden of his cultivation.

Botany is, of course, one branch of an enormous subject. The student will, therefore, do well to familiarize himself with the general articles which cover the science of living matter, as outlined in the chapter on *Biology*. In that chapter references have in fact already been given to certain sections of the strictly botanical articles. The general arrangement of the subject in the *Britannica* is as follows:—(i.) articles dealing with the broad aspects of the science; (ii.) articles on "systematic" botany treating of the

various families of plants; (iii.) articles describing members of their families.

Following the most convenient and at the same time the most logical course, the article **BOTANY** (Vol. 4, p. 299) gives

### General Principles

a key to the treatment of the whole subject in the *Britannica*. This is by

A. B. Rendle, keeper of the Department of Botany, British Museum, who acted as general adviser to the editor in the arrangement of this branch of biology in the *Britannica*. The main article on the subject is under the heading **PLANTS** (Vol. 21, p. 728), by a number of eminent authorities. The article is divided as follows: *Classification*, by A. B. Rendle; *Anatomy and History and Bibliography*, by A. G. Tansley, lecturer in botany in the University of Cambridge; *Physiology*, by J. R. Green, formerly lecturer on plant physiology, University of Liverpool; *Pathology*, by H. M. Ward, formerly professor of botany, University of Cambridge; *Ecology*, which comprises the study of the relations of the individual plant, or species, or the plant community, with its habitat, by C. E. Moss, curator of the Cambridge University Herbarium; *Cytology*, which treats of the cell structure of plant organisms, by H. W. T. Wager, president of the Botanical section of the British Association, 1905; *Morphology*, by S. H. Vines, professor of botany, University of Oxford, and presi-

dent of the Linnean Society, 1900-1904; *Distribution*, by Sir W. T. Thiselton-Dyer, director of the Kew Botanical Gardens. Supplementary to the article PLANTS are the following, which should all be read carefully: ROOT (Vol. 23, p. 712), STEM (Vol. 25, p. 875), LEAF (Vol. 16, p. 322), FLOWER (Vol. 10, p. 553), FRUIT (Vol. 11, p. 254). A very important article is that on PALAEOBOTANY (Vol. 20, p. 524), which treats of the distribution, etc., of plant life in prehistoric periods. The contributor is Clement Reid of the Geological Survey of England and Wales, an original investigator in this important field. The advances in the study of minute plant organisms in the past few years have been very great and they receive treatment in the brilliant article BACTERIOLOGY (Vol. 3, p. 156), by Prof. H. M. Ward of Cambridge University, and V. H. Blackmann, professor of botany in the University of Leeds.

Other articles in the Britannica which refer to the general principles of the science will be found enumerated at the end of this chapter.

The student must, of course, make himself familiar with the primary divisions of the vegetable kingdom. These are considered in order below. By far the biggest and the most important is that of the Angiosperms. They will be treated first.

The division ANGIOSPERMS (Vol. 2, p. 9) includes all those flowering plants whose seeds are enclosed in capsules.

This division is again divided into two classes: the DICOTYLEDONS (Vol. 8, p. 185), which are distinguished by the presence of a pair of seed-leaves or cotyledons in the embryo contained in the seed; and the Monocotyledons (see Vol. 2, p. 13), which contain only one. The former embraces most of the flower-bearing plants, and includes the following

families:—BORAGINACEAE (Vol. 4, p. 242) to which order belongs such plants as forget-me-nots, borage, heliotrope, etc. CAPRIFOLIACEAE (Vol. 5, p. 290), which include elder, honeysuckle, etc. CARYOPHYLLACEAE (Vol. 5, p. 439), with the pinks, carnations, etc. COMPOSITAE (Vol. 6, p. 811), which is the largest order in this division and includes one-tenth of the whole number of flowering plants, with such varieties as lettuce, dandelion, artichoke, sunflower, chrysanthemum, etc. CONVOLVULACEAE (Vol. 7, p. 67), among which are the convolvulus, sweet potato, bindweed. CRASSULACEAE (Vol. 7, p. 380), which include a quantity of African plants. CRUCIFERAE (Vol. 7, p. 521), with the wallflower, stock, mustard, cabbage, radish, nasturtium, etc. CUCURBITACEAE (Vol. 7, p. 611), among which are the cucumber, melon, etc. CUPULIFERAE (Vol. 7, p. 635), with the hazel, oak, beech, alder. ERICACEAE (Vol. 9, p. 739), with the rhododendron, arbutus, whortleberry, heather. EUPHORBACEAE (Vol. 9, p. 892), which include the castor-oil plant, box, euphorbia, etc. GENTIANACEAE (Vol. 11, p. 601), with the gentian, yellow-wort, bog-bean, etc. GERANIACEAE (Vol. 11, p. 762), whose name is derived from the geranium. LABIATAE (Vol. 16, p. 3), with peppermint, marjoram, thyme, sage, ground-ivy. LEGUMINOSAE (Vol. 16, p. 381), which embrace gorse, furze, scarlet runner, mimosa, acacia, rest-harrow, etc. MALVACEAE (Vol. 17, p. 517), with the mallow, hibiscus, hollyhock. The MORACEAE (Vol. 18, p. 814), with the fig, mulberry, banyan, etc. ONAGRACEAE (Vol. 20, p. 104), including the evening primrose, fuschia, etc. POLYGONACEAE (Vol. 22, p. 26), with dock, rhubarb, buckwheat, etc. PRIMULACEAE (Vol. 22, p. 341), including primrose, cowslip, pimpernel. RANUNCULACEAE (Vol. 22, p. 895), with the varieties buttercup, clematis, aconite, larkspur, columbine, marsh marigold, anemone. ROSACEAE (Vol. 23, p. 722), to which the rose gives the name, and which

include strawberry, raspberry, apple, pear, plum, spiraea, blackthorn, etc. RUBIACEAE (Vol. 23, p. 808), with gardenias, chincona, coffee, madder. SAXIFRAGACEAE (Vol. 24, p. 263), saxifrage, japonica, gooseberry, hydrangea. SCROPHULARIACEAE (Vol. 24, p. 485), with veronica, foxglove, snapdragon, etc. SOLANACEAE (Vol. 25, p. 356), which embrace henbane, tobacco, deadly nightshade, cape gooseberry, capsicum. UMBELLIFERAE (Vol. 27, p. 575), to which belong ivy, carrot, hemlock, celery, caraway, parsley. URTICACEAE (Vol. 27, p. 805), which include the nettle tribes.

The Monocotyledons include the ALISMACEAE (Vol. 1, p. 671), to which belong the arrow-head, the water plantain, the

butomus (so called **Angiosperms:** because the leaves **Monocotyledons** cut the tongues of oxen feeding on them), and other water plants. AROIDEAE (Vol. 2, p. 640), so called from the Arum family. The BROMELIACEAE (Vol. 4, p. 632), including pineapple, Spanish-moss. CYPERACEAE (Vol. 7, p. 692), with bulrush, cotton grass, etc. GRASSES (Vol. 12, p. 369), a most valuable article. HYDROCHARIDEAE (Vol. 14, p. 112), which include a number of water plants. IRIDACEAE (Vol. 14, p. 793), which include besides the iris, the crocus, gladiolus, etc. The JUNCACEAE (Vol. 15, p. 555), or Rush family; and the LILIACEAE (Vol. 16, p. 683), which include asparagus, hyacinth, star of Bethlehem, fritillary, bluebell, etc.

Another big division is that of the GYMNOSPERMS (Vol. 12, p. 754). These have naked seed pods; that is to say, the

seeds are not enclosed in capsules. **Other Divisions** The best known and largest division of this class contains the conifers: pines, firs, cedars, larches, etc.

PTERIDOPHYTA (Vol. 22, p. 605), or spore-producing plants, including the fern families as the largest and most important of its members.

BRYOPHYTA (Vol. 4, p. 700), the second great sub-division of the vegetable kingdom, comprises the mosses and liverworts.

ALGAE (Vol. 1, p. 585), plants usually devoid of differentiation into roots, stem, and leaf, coming under the general class of Bryophyta, and including sea-weeds as the main group.

LICHENS (Vol. 16, p. 578), compound dual organisms, part algae and part fungus, interesting because the dual organism enables the plant to live where neither of its compounds could live alone. Iceland moss, valuable both for its nutritive and medicinal qualities, comes under this division.

FUNGI (Vol. 11, p. 333), an enormous class, comprising, according to Saccardo, 32,000 different species.

Bacteria (see BACTERIOLOGY, Vol. 3, p. 156), minute organisms, also known as microbes, bacilli, etc., technically called Schizomycetes.

INSECTIVOROUS PLANTS (Vol. 14, p. 644), more correctly termed Carnivorous, belong to a number of distinct natural orders, but agree in the extraordinary habit of adding to the supplies of nitrogenous material offered them by the soil and atmosphere by the capture and consumption of insects and other small animals.

These are the main divisions, and from the articles describing them the student will acquire a sound knowledge of the characteristics which distinguish each. As a matter of fact, interest in botany as a subject is first inspired by the particular rather than the general—that is to say, the love of individual flowers leads to the study of their habits and life history, thence to a comparison which leads to the recognition of similar characteristics in plants having apparently widely different functions, so that the following section of the subject, touching the natural history of plants, though really placed last in a logical course of reading in botany, will contain much that is al-

ready known to the student who wishes to pursue the subject systematically.

In the Britannica from the various articles concerning the natural history of individual plants it is easy to trace back

### Natural History

to what family and main division each plant belongs. To the student beginning the subject it will be most suggestive to look up the accounts of the plants which are cultivated in his garden, or which he can find near his home, and find out the family relationship between subjects which appear to differ very widely both in habits and characteristics. From the outline given above in the paragraph devoted to systematic botany an indication will be given him of the surprises which are in store for him as he pursues his investigation. He would not at first suspect, for example, that aspara-

gus and hyacinths were cousins, that roses, apples, and blackthorn are closely related, or that chrysanthemums and artichokes have any connection with one another, let alone cabbage and wall-flowers. An excellent scheme to arouse the interest of the young student would therefore be to encourage him to pick out from the list below the names of plants with which he is familiar and of which he can get specimens, and thence work backward until the meanings of the main divisions of the vegetable kingdom are clear to him.

In the natural history section of the following list will be found in alphabetical order the plants which have separate articles in the Britannica. Many plants besides these are of course described. They will be found in the Index, where the volume and page on which a description will be found are given.

## CLASSIFIED LIST OF ARTICLES IN THE BRITANNICA ON BOTANY (For biographies of botanists, see the end of the chapter on Biology)

### Botany: General

|                 |            |              |              |
|-----------------|------------|--------------|--------------|
| Acaulescent     | Caespitose | Herb         | Ruderal      |
| Acerose         | Cane       | Herbarium    | Sap          |
| Acinus          | Capsule    | Humus        | Sarcocarp    |
| Acorn           | Cataphyll  | Idioblast    | Sarmentose   |
| Albumum         | Chlorosis  | Leaf         | Scion        |
| Angulate        | Colleter   | Marcescent   | Secund       |
| Ascus           | Corn       | Meristem     | Seed         |
| Autogamy        | Cystolith  | Nut          | Stem         |
| Auxanometer     | Deciduous  | Palaeobotany | Synanthly    |
| Axile, or Axial | Fairy Ring | Pin-eyed     | Thorn        |
| Bacteriology    | Flower     | Pistil       | Thrum-eyed   |
| Botany          | Fruit      | Plants       | Tree         |
| Boll            | Galls      | Pollination  | Vegetable    |
| Bur, or Burr    | Glaucous   | Root         | Witch brooms |
| Caducous        | Graft      |              |              |

### Botany: Systematic

|                                 |                |                      |                  |
|---------------------------------|----------------|----------------------|------------------|
| Acotyledones                    | Compositae     | Gentianaceae         | Moraceae         |
| Acrogenae                       | Convolvulaceae | Geraniaceae          | Onagraceae       |
| Algae                           | Crassulaceae   | Grasses              | Polygonaceae     |
| Alismaceae                      | Cruciferae     | Gymnosperms          | Primulaceae      |
| Amentiferae, or Amen-<br>taceae | Cucurbitaceae  | Hydrocharideae       | Pteridophyta     |
| Angiosperms                     | Cupuliferae    | Insectivorous Plants | Ranunculaceae    |
| Aroideae (Arum family)          | Cyperaceae     | Iridaceae            | Rosaceae         |
| Boraginaceae                    | Diatomaceae    | Juncaceae            | Rubiaceae        |
| Bromeliaceae                    | Dicotyledons   | Labiateae            | Saxifragaceae    |
| Bryophyta                       | Dictyogens     | Leguminosae          | Scrophulariaceae |
| Caprifoliaceae                  | Ericaceae      | Lichens              | Solanaceae       |
| Caryophyllaceae                 | Euphorbiaceae  | Liliaceae            | Umbelliferae     |
|                                 | Fungl          | Malvaceae            | Urticaceae       |



Botany: Natural History

|                       |                       |                     |                        |
|-----------------------|-----------------------|---------------------|------------------------|
| Aal                   | Begonia               | Chive               | Duckweed               |
| Aaron's Rod           | Benzoin, or Gum Ben-  | Chrysanthemum       | Dulse                  |
| Abaca                 | jamin                 | Cicely              | Duramen                |
| Abutilon              | Betel Nut             | Cimicifuga          | Durian                 |
| Acacia                | Bilberry              | Cinchona            | Durra                  |
| Acanthus              | Birch                 | Cineraria           | Earth-nut              |
| Achimenes             | Bird's Eye            | Cinnamon            | Earth-star             |
| Acorus Calamus        | Blackberry            | Citron              | Ebony                  |
| Adonis                | Bladder-wort          | Cleavers            | Edelweiss              |
| African Lily          | Boletus               | Clematis            | Eglantine              |
| Agave                 | Borage                | Climbing Fern       | Elder                  |
| Agrimony              | Botrytis              | Cloudberry          | Elecampane             |
| Ailanthus             | Bottle-brush Plants   | Clover              | Elephant's Foot        |
| Alder                 | Bouvardia             | Cloves              | Elm                    |
| Aleurites             | Boxwood               | Coca, or Cuca       | Endive                 |
| Alexanders            | Bracket-fungi         | Cocculus Indicus    | Entada                 |
| Algum, or Al mug Tree | Brazil Nuts           | Cock's-comb         | Esparto, or Spanish    |
| Allamanda             | Brazil Wood           | Cocoa               | Grass                  |
| Alliaria officinalis  | Bread-fruit           | Coco de Mer         | Eucharis               |
| Allium                | Brooklime             | Coco-nut Palm       | Euonymus               |
| Almond                | Broom                 | Codiaeum            | Euphorbia              |
| Aloe                  | Broom-rape            | Coffee              | Evergreen              |
| Amadou                | Buchu, or Buka Leaves | Colchicum           | Everlasting, or Immor- |
| Amanita               | Buck-bean, or Bog-    | Coleus              | telle                  |
| Amaranth              | bean                  | Colocynth           | Fennel                 |
| Amaryllis             | Buckthorn             | Colt's-foot         | Fenugreek              |
| Ammoniacum, or Gum    | Buckwheat             | Columbine           | Fern                   |
| Ammoniac              | Bulrush               | Compass Plant       | Fig                    |
| Ampelopsis            | Burnet                | Cotton              | Filmy Ferns            |
| Anatto                | Buttercup             | Copalba, or Copaiva | Finger-and-toe         |
| Anemone               | Butter-nut            | Copal               | Fir                    |
| Angelica              | Butterwort            | Corlander           | Flax                   |
| Animé                 | Cabbage               | Cork                | Fool's Parsley         |
| Anise                 | Cactus                | Corn-salad          | Forget-me-not          |
| Apple                 | Calabash              | Correa              | Foxglove               |
| Apricot               | Calabash Tree         | Cotoneaster         | Freesia                |
| Araucaria             | Calceolaria           | Cow-tree            | Fritillary             |
| Arbor Vitae           | Camellia              | Cranberry           | Frog-bit               |
| Archil                | Campanula             | Cress               | Fuchsia                |
| Aristolochia          | Candytuft             | Crinum              | Fumitory               |
| Arrowroot             | Cannon-ball Tree      | Crocus              | Funkia                 |
| Artichoke             | Capers                | Crowberry           | Furze, Gorse, or Whin  |
| Ash                   | Caraway               | Cryptomeria         | Fustic                 |
| Asparagus             | Cardamom              | Cucumber            | Gale                   |
| Aspen                 | Cardoon               | Cumin, or Cummin    | Gardenia               |
| Asphodel              | Carnation             | Currant             | Garlic                 |
| Aspidistra            | Carrot                | Custard Apple       | Genista                |
| Aster                 | Cashew Nut            | Cyclamen            | Gentian                |
| Aubergine             | Cassava               | Cypress             | Geranium               |
| Aucuba                | Cassia                | Daffodil            | Geum                   |
| Auricula              | Casuarina             | Dahlia              | Gillyflower            |
| Avocado Pear          | Catalpa               | Daisy               | Ginger                 |
| Azalea                | Catha                 | Dame's Violet       | Gladiolus              |
| Bael Fruit            | Cayenne Pepper        | Dammar, or Dammer   | Glasswort              |
| Balm                  | Ceanothus             | Dandelion           | Gloriosa               |
| Bamboo                | Cecropia              | Daphne              | Gloxinia               |
| Banana                | Cedar                 | Darlingtonia        | Golden Rod             |
| Baneberry             | Celandine             | Date Palm           | Gooseberry             |
| Banksia               | Celery                | Dewberry            | Gourd                  |
| Baobab                | Centaurea             | Dividivi            | Grains of Paradise     |
| Barberry              | Centaury              | Dock                | Gram, or Chick-pea     |
| Barley                | Chantarelle           | Dodder              | Granadilla             |
| Bdellium              | Chenopodium           | Dogwood             | Grass of Parnassus     |
| Bean                  | Cherry                | Dracaena            | Greenheart             |
| Beech                 | Chestnut              | Dragon's Blood      | Ground Nut             |
| Beet                  | Chicory               | Dropwort            | Groundsel              |

|                          |                            |                               |                         |
|--------------------------|----------------------------|-------------------------------|-------------------------|
| Guava                    | Lentil                     | Nightshade                    | Rape                    |
| Gaulther Rose            | Lettuce                    | Nutmeg                        | Raspberry               |
| Gulfweed                 | Lilac, or Pipe Tree        | Oak                           | Reed                    |
| Gum                      | Lily                       | Oat                           | Rhododendron            |
| Gumbo, or Okra           | Lime, or Linden            | Oleander                      | Rice                    |
| Gutta Percha             | Liquidambar, or Sweet Gum  | Oleaster                      | Richardia               |
| Hackberry                | Litchi, or Lee-Chee        | Olive                         | Robinia, or Locust-tree |
| Harebell                 | Lobelia                    | Onion                         | Rocamboles              |
| Hawthorn                 | Loco-weeds, or Crazy Weeds | Orach, or Mountain Spinach    | Rose                    |
| Hazel                    | Locust-tree                | Orange                        | Rosemary                |
| Heath                    | Loosestrife                | Orchids                       | Rosewood                |
| Heliotrope, or Turnsole  | Loquat                     | Orris-Root                    | Rosin, or Colophony     |
| Hellebore                | Lotus                      | Osier                         | Royal Fern              |
| Hemlock                  | Lucerne                    | Oxalis                        | Rubber                  |
| Hemp                     | Lupine                     | Paeony                        | Rue                     |
| Henbane                  | Lycopodium                 | Palm                          | Rush                    |
| Henna                    | Madder, or Dyer's Madder   | Palmetto                      | Rye                     |
| Hickory                  | Magnolia                   | Pansy, or Heartsease          | Sabicu Wood             |
| Hippeastrum              | Mahogany                   | Papyrus                       | Safflower               |
| Holly                    | Maidenhair                 | Parsley                       | Saffron                 |
| Hollyhock                | Maise, or Indian Corn      | Parsnip                       | Sago                    |
| Honey Locust             | Mallow                     | Passionflower                 | Sainfoin                |
| Honeysuckle              | Mammee Apple               | Pea                           | St. John's Wort         |
| Hop                      | Mandrake                   | Peach                         | Salsafy, or Salsify     |
| Horehound                | Mangel-Wurzel              | Pear                          | Salvia                  |
| Hornbeam                 | Mango                      | Pellitory                     | Sapan Wood              |
| Horseradish              | Mangosteen                 | Pennyroyal                    | Sarracenia              |
| Horsetail                | Mangrove                   | Pentstemon                    | Satin Wood              |
| Houseleek                | Manilla Hemp               | Pepper                        | Saxifrage               |
| Huckleberry              | Manna                      | Peppermint                    | Scammony                |
| Huon Pine                | Maple                      | Pepper Tree                   | Scorzonera              |
| Hyacinth                 | Mare's-tail                | Persimmon                     | Screw-pine              |
| Hydrangea                | Marguerite                 | Petunia                       | Sea-kale                |
| Hyssop                   | Marigold                   | Phlox                         | Seawrack                |
| Iceland Moss             | Marjoram                   | Phormium, or New Zealand Flax | Sedum                   |
| Ice-plant                | Mastic, or Mastich         | Pimento                       | Sequoia                 |
| Impatiens                | Maté, or Paraguay Tea      | Pine                          | Service Tree            |
| Iris                     | Medlar                     | Pine-apple                    | Sesame                  |
| Irish Moss, or Carrageen | Melon                      | Pink                          | Shaddock                |
| Iron-wood                | Mesquite, or Honey Locust  | Pistachio Nut                 | Shallot                 |
| Ivy                      | Mignonette                 | Pitcher-plants                | Sisal Hemp              |
| Jarra Wood               | Mildew                     | Plane                         | Skirret                 |
| Jasmine, or Jessamine    | Milkwort                   | Plantain                      | Snake-root              |
| Jew's Ears               | Millet                     | Plum                          | Snappedragon            |
| Job's Tears              | Mimosa                     | Poinsettia                    | Snowdrop                |
| Judas Tree               | Mimulus                    | Pokeberry, or Poke-weed       | Soap-bark               |
| Jujube                   | Mint                       | Polyanthus                    | Sorghum                 |
| Juniper                  | Mistletoe                  | Polypodium                    | Sorrel                  |
| Jute                     | Moly                       | Pomegranate                   | Spanish Broom           |
| Kafir Bread              | Momordica                  | Pondweed                      | Spikenard, or Nard      |
| Kauri Pine               | Moonseed                   | Poplar                        | Spinach                 |
| Kerguelen's Land Cabbage | Moonwort, or Moonfern      | Poppy                         | Spruce                  |
| Kumquat                  | Moreton Bay Chestnut       | Potato                        | Stink-wood              |
| Labrador Tea             | Mucuna                     | Potentilla                    | Strawberry              |
| Laburnum                 | Mulberry                   | Primrose                      | Strophanthus            |
| Lac                      | Mushroom                   | Privet                        | Sudd                    |
| Lace-bark Tree           | Mustard                    | Puff-ball                     | Sumach                  |
| Lancewood                | Myrobalans                 | Pumpkin                       | Sundew                  |
| Larch                    | Myrrh                      | Purslane                      | Sunflower               |
| Larkspur                 | Myrtle                     | Pyrethrum                     | Sunn, or India Hemp     |
| Lattice Leaf Plant       | Narcissus                  | Quince                        | Sweet Potato            |
| Laurel                   | Nasturtium                 | Radish                        | Sweet-sop               |
| Laurustinus              | Nettle                     | Ramie                         | Switch Plants           |
| Lavender                 | Nettle Tree                | Ranunculus                    | Tallow Tree             |
| Leek                     |                            |                               | Tamarind                |
| Lemon                    |                            |                               | Tamarisk                |
|                          |                            |                               | Tea                     |
|                          |                            |                               | Teak                    |

|                  |                  |                       |               |
|------------------|------------------|-----------------------|---------------|
| Teazel           | Tree-fern        | Venus's Looking-glass | Willow        |
| Terebinth        | Truffle          | Veratrum              | Willow-herb   |
| Thistle          | Tuberose         | Verbena               | Wintergreen   |
| Thyme            | Tulip            | Vetch                 | Winter's-bark |
| Tiger-flower     | Tulip Tree       | Vine                  | Witch-hazel   |
| Toadstool        | Tumble-weed      | Violet                | Woad          |
| Tobacco          | Turmeric         | Walnut                | Wormwood      |
| Tomato           | Turnip           | Water-lily            | Yam           |
| Tonqua Bean      | Vanilla          | Water-thyme           | Yew           |
| Toothwort        | Vegetable Marrow | Wax-tree              | Yucca         |
| Traveller's Tree | Venus's Fly-trap | Wheat                 | Zinnia        |

## CHAPTER LIX

## ZOOLOGY

**A**T the very outset of his zoological studies the reader will find that the doctors still differ as to the best and most scientifically logical system to be employed in classification. So important is it that the connotation and denotation of every zoological designation should be definite, that Sir Edwin Ray Lankester devotes the title article ZOOLOGY (Vol. 28, p. 1022) mainly to a discussion of systems of classification, and besides there is a separate article ZOOLOGICAL NOMENCLATURE (Vol. 28, p. 1021) by P. Chalmers Mitchell, Secretary of the Zoological Society of London, university demonstrator in comparative anatomy and assistant to the Linacre Professor at Oxford, and adviser to the editor in the organization of the whole subject of zoology in the Britannica.

The Britannica articles may be classified in three divisions: dealing with (i) *General Principles*, (ii) *Systematic*, (iii) *Natural History*.

The student should read at any rate some of the general articles mentioned in the chapter on *Biology*; and these will prepare him for the difficult questions

### General Principles

involved in the articles ZOOLOGY and ZOOLOGICAL NOMENCLATURE. Supplementary to these are the following:

ANIMAL (Vol. 2, p. 48), in connection with which should be read the article PROTISTA (Vol. 22, p. 476) where the borderland between the animal and vegetable kingdoms is further discussed, and the very valuable article PROTOZOA (Vol. 22, p. 479) in which E. A. Minchin, professor of protozoology in the University of London, discusses the minute animal organisms, which in the last decade have proved immensely important in the study of parasitic diseases. In LARVAL FORMS (Vol. 16, p. 224), and METAMORPHOSIS (Vol. 18, p. 221) Prof. Adam Sedgwick, of the Imperial College of Science and Technology in London, discusses the early history of larvae and their change from larval to adult growth. The articles METAMERISM (Vol. 18, p. 215), by Sir Edwin Ray Lankester, and REGENERATION OF LOST PARTS (Vol. 23, p. 36), by P. Chalmers Mitchell, discuss the capacity for repeating parts (as in the case of the common earth worm) and for the formation of new parts to take the place of those lost by accident or injury. The article MONSTER (Vol. 18, p. 740) by Dr. Charles Creighton will be found very suggestive.

The eyes of most of us are shut to the wonders of the animal kingdom. We know by hearsay that the colouring

of an animal or insect, brilliant and startling though it often be, is designed by nature for protection by enabling it to assimilate itself to that of its surroundings. But how many of us have taken the trouble to verify this? The articles **COLOURS OF ANIMALS**, *Bionomics* (Vol. 6, p. 731), by Prof. Poulton of Oxford, and **MIMICRY** (Vol. 18, p. 495), by R. I. Pocock, superintendent of the Zoological Gardens in London, will suggest to the reader many objects for observation. Especially interesting in the former article is the section on the use of colour for warning and signaling. In connection with these articles, those on **EGG** (Vol. 9, p. 13) and **FEATHER** (Vol. 10, p. 224), by W. P. Pycraft, of the British Museum, may be read, and **NIDIFICATION** (Vol. 19, p. 666), by Prof. Alfred Newton of Cambridge University, and Hans Gadow, Strickland curator and lecturer on zoology in the University of Cambridge; especially those sections concerned with the precautions taken by the birds for protection and concealment. A very fascinating subject is discussed in the articles dealing with the distribution and movements of animal life. These are **ZOOLOGICAL DISTRIBUTION** (Vol. 28, p. 1002), by the well-known zoologist Richard Lydekker; **MIGRATION** (Vol. 18, p. 433), by Hans Gadow; and **PLANKTON** (Vol. 21, p. 720), by G. H. Fowler of University College, London. Reference to these articles has already been made in the chapter on *Biology*. Closely connected with them is the article on **PALAEONTOLOGY** (Vol. 20, p. 579), by Prof. H. F. Osborn, Columbia University and American Museum of Natural History, in which the distribution of prehistoric life is discussed; and, as will be seen from the list below, all the principal species now only found in fossil remains are described in separate articles.

The editor succeeded in getting the

psychologist, Prof. C. Lloyd Morgan, of the University of Bristol, who has made a speciality of this particular subject, to write extremely illuminating

articles on **INSTINCT** and on **INTELLIGENCE IN ANIMALS** (Vol. 14, pp. 648 and 680). Interesting as throwing a side light on either the instinct or intelligence of birds, is the section on their song in the article **SONG** (Vol. 25, p. 413). It is hardly possible to look through any of these articles, or those on mimicry and colour, above alluded to, without coming across some striking and interesting fact, as for instance, the sudden change from a divine melody to an anxious croak in the utterance of the male nightingale as soon as the brood is hatched. These articles will be read for their great interest by many who do not intend systematically to pursue the subject of Zoology.

The housing of animals in captivity is discussed in the articles **AQUARIUM** (Vol. 2, p. 237), by Professor G. H. Fowler,

University College, London; **AVIARY** (Vol. 3, p. 60), by

D. Seth-Smith, curator of birds to the Zoological Society of London; and **ZOOLOGICAL GARDENS** (Vol. 28, p. 1018), by P. Chalmers Mitchell. The first two contain some very useful hints for the care of small aquaria and aviaries; and young people who like to have aquaria at home, and are often disappointed by their failure to keep alive some of their specimens, especially larval and other surface-swimming animals, will find one of their difficulties solved. These surface-swimming animals die of exhaustion from their unaided efforts to keep off the bottom, lacking the support given in their surroundings by the natural flow of the water, native tides, and surface currents. The article describes a very simple arrangement by which this motion of the water can be simulated.

Other articles which will be found very interesting are those on HIBERNATION (Vol. 13, p. 441) and on INCUBATION AND INCUBATORS (Vol. 14, p. 359). In the latter many will be surprised to note that incubators have been in use in Egypt from time immemorial under the name *Mamal*. In one district of Egypt alone 90,000,000 eggs are annually hatched out in these old time incubators, of which the secret has been handed down, jealously guarded, from father to son. In the article TAXIDERMISTRY (Vol. 26, p. 464), Montagu Browne, a practical taxidermist, deals with the artistic as well as the technical aspects of the craft.

Turning to the articles of the chief divisions of the animal kingdom, the most useful arrangement will be to enumerate them in their order.

**Classification and Divisions** As has been already said, zoologists do not yet agree as to the best system of classification; the one which is given in the Britannica is that upon which the very eminent zoologists who have contributed the special articles, agree as being the most suitable. There are two main grades. The PROTOZOA (Vol. 22, p. 479) contain the animalcules, mainly microscopic. These are the most elementary forms of life and consist of single cells. The other and more important grade is that of the METAZOA, which are built up of many cells.

The main sub-divisions (called phyla) of the Protozoa are: phylum i. SARCODINA (Vol. 24, p. 208); phylum ii. MASTIGOPHORA (Vol. 17, p. 873); phylum iii. SPOROZOA (Vol. 25, p. 734); phylum iv. INFUSORIA (Vol. 14, 557).

Coming next, the Metazoa in their order are, as follows: phylum i. Porifera (see SPONGES, Vol. 25, p. 715); phylum ii.

**Metazoa** HYDROMEDUSAE or HYDROZOA (Vol. 14, pp. 135 and 171) which include aquatic animals of the

coral kind; phylum iii. SCYPHOMEDUSA (Vol. 24, p. 519) which include groups of shell fish; phylum iv. ANTHOZOA (Vol. 2, p. 97) with the corals; phylum v. CTENOPHORA (Vol. 7, p. 592) including the jelly fish; phylum vi. PLATYELMIA (Vol. 21, p. 826) a group of animals in which creeping first became habitual; phylum vii. Nematodea (see NEMATODA, Vol. 19, p. 359) which include certain kinds of worms; phylum viii. CHAETOGNATHA (Vol. 5, p. 789) an isolated class of transparent pelagic organisms; phylum ix. NEMERTINA (Vol. 19, p. 363) worm families; phylum x. MOL-LUSCA (Vol. 2, p. 669) shell-bearing animals.

Phylum xi. APPENDICULATA (Vol. 2, p. 220) which include the sub-phyla ROTIFERA (Vol. 23, p. 759), CHAETOPODA (Vol. 5, p. 789), and ARTHROPODA (Vol. 2, p. 673), the sub-phylum which comprises practically the whole insect family. Important articles on animals in this class are: HEXAPODA (Vol. 13, p. 418) which include the wasp, beetle, and other families; the CRUSTACEA (Vol. 7, p. 552) which cover a field wide enough to embrace species as different outwardly as lobsters, wood-lice, and minute water fleas; and ARACHNIDA (Vol. 2, p. 287) the spider family. Phylum xii. ECHINODERMA (Vol. 8, p. 871) with all the sea-urchins and star fish.

Phylum xiii. VERTEBRATA (Vol. 27, p. 1047) to which man belongs as an order of a sub-class of a class of a sub-phylum. The most important sub-phylum of the Vertebrata is the Craniata (see Vol. 27, p. 1048). The sub-phyla HEMICHORDA (Vol. 13, p. 257), Urochorda (see TUNICATA, Vol. 27, p. 379), and Cephalochorda (see AMPHIOXUS, Vol. 1, p. 886) deal with the lower orders of Vertebrata. The sub-phylum Craniata comprises the following classes: class i. Pisces, see ICHTHYOLOGY (Vol. 14, p. 243) with the fishes; class ii. BATRACHIA (Vol. 3, p. 521), with the frog tribe; class iii. Reptilia (see REPTILES, Vol. 23,



p. 136); and in close connection with this—class iv. Aves (see BIRD, Vol. 3, p. 959, and ORNITHOLOGY, Vol. 20, p. 299); class v. MAMMALIA (Vol. 17, p. 520) to which man belongs.

Phylum xiv. MESOZOA (Vol. 18, p. 187) minute parasitic animals intermediate between the Protozoa and the Metazoa. Phylum xv. POLYZOA (Vol. 22, p. 42) aquatic animals forming colonies by budding. Phylum xvi. ACANTHOCEPHALA (Vol. 1, p. 109) including the parasitic worms. Phylum xvii. PODAXONIA (Vol. 28, p. 1023), and phylum xviii. GASTROTRICHA (Vol. 11, p. 526) minute animals living at the bottom of ponds and marshes.

This is an outline of the main division of the animal kingdom in their order as now classified. The subject of zoology is so vast that the student will probably confine himself to one branch of the

subject, perhaps to one small fraction of a division, of which he proposes to investigate the complete natural history.

### Natural History

As will be seen from the list below, which is classified, the Britannica offers an immense amount of material bearing on the subject. But of course the study of any one sub-class needs a general knowledge of the foundations of zoological science, so that some acquaintance with the principles on which the animal world is classified is indispensable. As in Botany, it will be easy to see from the article on any individual animal to which family it belongs so that the young student can work back from the particular to the general and find out the whole relationship of the subject in which he is interested by reference to the "systematic" article.

## LIST OF ARTICLES IN THE ENCYCLOPAEDIA BRITANNICA ON ZOOLOGY

(For biographies of Zoologists, see the end of the chapter on Biology)

### Zoology: General

|                     |                           |               |                            |
|---------------------|---------------------------|---------------|----------------------------|
| Abomasum            | Dewlap                    | Meganucleus   | Pylome                     |
| Acetabulum          | Dorsiventral              | Membranelle   | Quill                      |
| Animal              | Dredge                    | Metamerism    | Regeneration of Lost Parts |
| Aquarium            | Egg                       | Metamorphosis | Sex                        |
| Aviary              | Feather                   | Micronucleus  | Song (of Birds)            |
| Beak                | Grub                      | Migration     | Taxidermy                  |
| Breeds and Breeding | Herd                      | Mimicry       | Vermin                     |
| Carapace            | Hibernation               | Mongrel       | Zoology                    |
| Colours of Animals  | Incubation and Incubators | Monster       | Zoological Distribution    |
| Comparative Anatomy | Instinct                  | Moult         | Zoological Gardens         |
| Conch               | Intelligence in Animals   | Nest          | Zoological Nomenclature    |
| Contractile Vacuole | Karyogamy                 | Nidification  |                            |
| Crepuscular         | Larval Forms              | Plankton      |                            |
| Dew-claw            |                           | Proboscis     |                            |

### Zoology, Systematic: Invertebrata

|                  |                 |                |                |
|------------------|-----------------|----------------|----------------|
| Acanthocephala   | Brachiopoda     | Diffugia       | Gephyrea       |
| Acineta          | Campodea        | Dinoflagellata | Globigerina    |
| Actinozoa        | Cephalopoda     | Diptera        | Gnathopoda     |
| Algae            | Chaetognatha    | Echinoderma    | Gregarines     |
| Amoeba           | Chaetopoda      | Echiuroidea    | Gymnostomaceae |
| Annelida         | Ciliata         | Ectospora      | Haemosporidia  |
| Anthozoa         | Coccidia        | Endospora      | Haplodirili    |
| Appendiculata    | Coelentera      | Entomostraca   | Heliozoa       |
| Aptera           | Coleoptera      | Epistylis      | Hemiptera      |
| Arachnida        | Crustacea       | Filosa         | Heterokaryota  |
| Arcella          | Ctenophora      | Flagellata     | Hexapoda       |
| Arthropoda       | Cystoflagellata | Foraminifera   | Hydromedusae   |
| Articulata       | Dendrocometes   | Gastropoda     | Hydrozoa       |
| Aspirotrichaceae | Desmoscolecida  | Gastrotricha   | Hymenoptera    |

|                 |                |                        |               |
|-----------------|----------------|------------------------|---------------|
| Infusoria       | Nematoda       | Platyelmia             | Rotifera      |
| Kinorhyncha     | Nematomorpha   | Polyp                  | Sarcodina     |
| Labyrinthulidea | Nemertina      | Polyzoa                | Scaphopoda    |
| Lamellibranchia | Neuroptera     | Priapulioidea          | Scyphomedusae |
| Lepidoptera     | Nummulite      | Proteomyxa             | Sipunculoidea |
| Malacostraca    | Opalina        | Protista               | Sponges       |
| Mastigophora    | Orthoptera     | Protogenes             | Sporozoa      |
| Medusa          | Paramecium     | Protomyxa              | Stentor       |
| Mesozoa         | Pedipalpi      | Protozoa               | Thyrostraca   |
| Mollusca        | Pelomyxa       | Pseudopod              | Thysanoptera  |
| Molluscoida     | Pentastomida   | Pycnogonida, or Panto- | Thysanura     |
| Mycetozoa       | Peripatus      | poda                   | Trematodes    |
| Myonemes        | Perissodactyla | Radiata                | Trypanosomes  |
| Myriapoda       | Phoronidea     | Radiolaria             | Vampyrella    |
| Myzostomida     | Planarians     | Rhizopoda              | Vorticella    |

**Zoology, Systematic: Vertebrata**

|                |                         |                       |                        |
|----------------|-------------------------|-----------------------|------------------------|
| Amphibia       | Chiroptera              | Monodelphia           | Selachians, or Elasmo- |
| Artiodactyla   | Cyclostomata, or Marsi- | Monotremata           | branchii               |
| Amphioxus      | pobranchii              | Pecora                | Suina                  |
| Balanoglossus  | Cyprinodonts            | Proboscidea           | Tardigrada             |
| Batrachia      | Edentata                | Pterobranchia         | Teleostomes            |
| Bovidae        | Equidae                 | Ratitae               | Tunicata               |
| Caecilia       | Hemichorda              | Rodentia              | Tylopoda               |
| Carnivora      | Hyracoidea              | Ruminantia            | Ungulata               |
| Cetacea        | Insectivora             | Salmon and Salmonidae | Vertebrata             |
| Chaetosomatida | Marsupialia             | Sauropsida            |                        |

**Zoology, Natural History: Mammals**

|                  |                 |                         |                |
|------------------|-----------------|-------------------------|----------------|
| Aard-vark        | Buck            | Duiker                  | Guanaco        |
| Aard-wolf        | Buffalo         | Echidna                 | Guenon         |
| Addax            | Bushbuck        | Eland                   | Guereza        |
| Agouti           | Ca'ing Whale    | Elephant                | Hamster        |
| Alpaca           | Calf            | Elk                     | Hare           |
| Ant-eater        | Camel           | Ermine                  | Hartebeest     |
| Antelope         | Capuchin Monkey | Eyra                    | Hedgehog       |
| Anthropoid Apes  | Capybara        | Fallow-deer             | Heifer         |
| Aona             | Caracal         | Ferret                  | Heron          |
| Ape              | Cat             | Field-mouse             | Hind           |
| Argali           | Catarrhine Ape  | Filander                | Hippopotamus   |
| Armadillo        | Cattle          | Flying-fox              | Horse          |
| Ass              | Cavy            | Flying Squirrel         | Hound          |
| Aurochs          | Chacma          | Foussa                  | Howler         |
| Avahi            | Chamois         | Fox                     | Humpback-whale |
| Aye-aye          | Cheeta          | Galago                  | Hunting Dog    |
| Babirusa         | Chevrotain      | Galeopithecus           | Hyena          |
| Baboon           | Chimpanzee      | Gaur                    | Ibex           |
| Badger           | Chinchilla      | Gayal                   | Ichneumon      |
| Bandicoot        | Chiru           | Gelada                  | Indri          |
| Bandicoot-rat    | Civet           | Genet                   | Jackal         |
| Bantin           | Clouded Leopard | Gerbil                  | Jaguar         |
| Barbary Ape      | Coati           | Gerenuk                 | Jaguarondi     |
| Bat              | Colugo          | Gibbon                  | Jennet         |
| Bear             | Coyote          | Giraffe                 | Jerboa         |
| Beaver           | Coypu           | Glutton, or Wolverine   | Jumping-hare   |
| Beluga           | Dasyure         | Gnu                     | Jumping-mouse  |
| Bharal           | Deer            | Goat                    | Jumping-shrew  |
| Binturong        | Diana Monkey    | Gopher                  | Kangaroo       |
| Bison            | Dingo           | Goral                   | Kangaroo-rat   |
| Black Ape        | Dog             | Gorilla                 | Kinka jou      |
| Black Buck       | Dolphin         | Green Monkey            | Kit-fox        |
| Boar             | Dormouse        | Grison                  | Klipspringer   |
| Bongo            | Douroucoull     | Grivet                  | Koala          |
| Bottlenose Whale | Dromedary       | Groove-toothed Squirrel | Kudu           |
| Bronco           | Dugong          | Ground-squirrel         | Langur         |

|                |                       |                     |                      |
|----------------|-----------------------|---------------------|----------------------|
| Lemming        | Mustang               | Primates            | Squirrel Monkey      |
| Lemur          | Nilgai                | Proboscis-monkey    | Star-nosed Mole      |
| Leopard        | Ocelot                | Prongbuck           | Suricate             |
| Linsang        | Octodon               | Puma                | Swine                |
| Lion           | Okapi                 | Quagga              | Tahr                 |
| Llama          | Opossum               | Rabbit              | Takin                |
| Loris          | Orang-utan            | Raccoon             | Tapir                |
| Lynx           | Oribi                 | Raccoon-dog         | Tarsier              |
| Macaque        | Oryx                  | Ram                 | Tenrec               |
| Macrauchenia   | Otter                 | Rat                 | Thylacine            |
| Mammalia       | Ox                    | Ratel               | Tiger                |
| Manati         | Paca                  | Reedbuck            | Tiger-cat            |
| Mandrill       | Palla                 | Reindeer            | Timber-Wolf          |
| Mangabey       | Palm-civet            | Rhinoceros          | Tree Kangaroo        |
| Manul          | Panda                 | Rhytina             | Tree-shrew           |
| Mare           | Pangolin              | River-hog           | Udad, Aoudad, or Au- |
| Markhor        | Panther               | Rocky-Mountain Goat | dad                  |
| Marmoset       | Pariah Dog            | Roe-buck            | Uakari               |
| Marmot         | Patas Monkey          | Rorqual             | Vampire              |
| Marshbuck      | Peccary               | Sable Antelope      | Vervet               |
| Marsupial Mole | Père David's Deer     | Saiga               | Vicugna              |
| Marten         | Phalanger             | Suki                | Viscacha             |
| Merino         | Pica                  | Seal                | Vole                 |
| Mink           | Pig                   | Serow               | Wallaby              |
| Mole           | Pithecanthropus Erec- | Serval              | Walrus               |
| Mole-rat       | tus                   | Sheep               | Waltzing Mouse       |
| Mole-shrew     | Platypus              | Shrew               | Wanderu              |
| Mone Monkey    | Pluto Monkey          | Sifaka              | Wart-hog             |
| Monkey         | Pocket-gopher         | Sirenia             | Waterbuck            |
| Moose          | Pocket-mouse          | Skunk               | Water-deer           |
| Mouflon        | Polecat               | Sloth               | Water-opossum        |
| Mouse          | Pony                  | Snow-leopard        | Weasel               |
| Mule           | Porcupine             | Souslik             | Whale                |
| Muntjac        | Porpoise              | Sperm-whale         | Wolf                 |
| Musk-deer      | Potoroo               | Spider-monkey       | Wombat               |
| Musk-ox        | Potto                 | Spiny Squirrel      | Yak                  |
| Musk-rat       | Pouched-mouse         | Springbuck          | Zebra                |
| Musk-shrew     | Prairie-marmot        | Squirrel            |                      |

### Zoology, Natural History: Birds

|                   |              |                        |                    |
|-------------------|--------------|------------------------|--------------------|
| Albatross         | Diver        | Greenfinch             | Jay                |
| Auk               | Dodo         | Greenshank             | Kakapo             |
| Beccafico         | Dove         | Grosbeak               | Kestrel            |
| Bird              | Duck         | Grouse                 | Killdeer           |
| Birds of Paradise | Eagle        | Guacharo               | King-bird          |
| Bittern           | Eider        | Guan                   | Kingfisher         |
| Blackbird         | Eineu        | Guillemot              | Kinglet            |
| Blackcock         | Falcon       | Guinea Fowl            | Kite               |
| Bullfinch         | Fieldfare    | Gull                   | Kiwi, or Kiwi-Kiwi |
| Bunting           | Finch        | Harpy                  | Knot               |
| Bustard           | Flamingo     | Harrier or Hen Harrier | Lammergeyer        |
| Buzzard           | Flycatcher   | Hawfinch               | Lapwing            |
| Canary            | Fowl         | Hawk                   | Lark               |
| Capercally        | Frigate-bird | Hen                    | Linnet             |
| Cassowary         | Fulmar       | Heron                  | Loom, or Loon      |
| Chaffinch         | Gadwall      | Hoactzin, or Hoatzin   | Lory               |
| Cockatoo          | Gannet       | Honey-eater            | Love-bird          |
| Cock-of-the-Rock  | Gare-fowl    | Honey-guide            | Lyre-bird          |
| Condor            | Garganey     | Hoopoe                 | Macaw              |
| Coot              | Goatsucker   | Hornbill               | Magpie             |
| Cormorant         | Godwit       | Humming-bird           | Malleduck          |
| Crane             | Golden-eye   | Ibis                   | Manakin            |
| Crossbill         | Goldfinch    | Icterus                | Manucode           |
| Crow              | Goose        | Jabiru                 | Martin             |
| Cuckoo            | Gos-hawk     | Jacamar                | Megapode           |
| Curassow          | Grackle      | Jacaná                 | Merganser          |
| Curlew            | Grebe        | Jackdaw                | Mew                |

|                 |                      |                       |                    |
|-----------------|----------------------|-----------------------|--------------------|
| Moa             | Pica                 | Screamer              | Teal               |
| Mocking-bird    | Pigeon               | Scrub-bird            | Tern               |
| Moor-hen        | Pipit                | Secretary-bird        | Thrush             |
| Morillon        | Pitta                | Seriema, or Cariama   | Tinamou            |
| Motmot          | Plover               | Shearwater            | Titmouse           |
| Mouse-bird      | Pochard, Pockard, or | Sheathbill            | Tody               |
| Nestor          | Poker                | Shield-drake          | Toucan             |
| Nightingale     | Pratincole           | Shoe-bill             | Touracou           |
| Noddy           | Ptarmigan            | Shoveler              | Tree-creeper       |
| Nonpareil       | Puff-bird            | Shrike                | Trogon             |
| Nutcracker      | Puffin               | Siskin                | Tropic-bird        |
| Nuthatch        | Quail                | Skimmer               | Trumpeter          |
| Ocydrome        | Quezal, or Quesal    | Skua                  | Turkey             |
| Oriole          | Rail                 | Snake-bird            | Turnstone          |
| Ornithology     | Raven                | Snipe                 | Vulture            |
| Orthonyx        | Razorbill            | Sparrow               | Wagtail            |
| Ortolan         | Redbreast, or Robin  | Spoonbill             | Warbler            |
| Osprey          | Redshank             | Starling              | Waxwing            |
| Ostrich         | Redstart             | Stilt, or Long-legged | Weaver-bird        |
| Ouzel, or Ouzel | Redwing              | Plover                | Wheatear           |
| Owl             | Rhea                 | Stork                 | Whitethroat        |
| Oyster-catcher  | Rifleman-bird        | Sugar-bird            | Wigeon, or Widgeon |
| Parrot          | Roller               | Sun-bird              | Woodchuck          |
| Partridge       | Rook                 | Sun-bittern           | Woodcock           |
| Peacock         | Ruff                 | Swallow               | Woodpecker         |
| Pelican         | Sand-grouse          | Swan                  | Wren               |
| Penguin         | Sandpiper            | Swift                 | Wryneck            |
| Petrel          | Scaup                | Tanager-bird          | Zosterops          |
| Pheasant        | Scoter               | Tapaculo              |                    |

Zoology, Natural History: Reptiles

|             |                |             |             |
|-------------|----------------|-------------|-------------|
| Adder       | Boa            | Gecko       | Reptiles    |
| Alligator   | Chameleon      | Iguana      | Sea-serpent |
| Alytes      | Cobra          | Lizard      | Snakes      |
| Amphisbaena | Cockatrice     | Proteus     | Sphenodon   |
| Anaconda    | Crocodile      | Python      | Tortoise    |
| Asp         | Cryptobranchus | Rattlesnake | Viper       |
| Basilisk    | Dragon         |             |             |

Zoology, Natural History: Fishes

|                       |                     |                      |                  |
|-----------------------|---------------------|----------------------|------------------|
| Anchovy               | Flying-fish         | Mackerel             | Rudd, or Red-eye |
| Angler                | Gar-fish            | Mahseer, or Mahaseer | Salmon           |
| Barbel                | Globe-fish          | Menhaden             | Sand-Eel         |
| Beluga                | Goby                | Miller's Thumb       | Sea-horse        |
| Bitterling            | Goldfish            | Minnow               | Sea-wolf         |
| Bleak                 | Goramy, or Gouramy  | Mormyr               | Shad             |
| Bream                 | Grampus             | Mullet               | Shark            |
| Brill                 | Grayling            | Muraena              | Sheepshead       |
| Burbot                | Gudgeon             | Murray Cod           | Silverfish       |
| Carp                  | Gurnard             | Narwhal              | Smelt            |
| Cat-fish              | Gwyniad             | Opah                 | Sole             |
| Char                  | Haddock             | Parr                 | Sprat            |
| Chub                  | Hag-fish            | Parrot-fishes        | Stickleback      |
| Cichlid               | Hair-tail           | Perch                | Sturgeon         |
| Coal-fish             | Hake                | Pike                 | Sun-fish         |
| Cod                   | Halibut             | Pike-perch           | Sword-fish       |
| Dace, Dare, or Dart   | Hammer-Kop, or Ham- | Pilchard             | Tench            |
| Dog-fish              | merhead             | Pilot-fish           | Trout            |
| Dory, or John Dory    | Herring             | Pipe-fishes          | Tunny            |
| Eel                   | Horse Mackerel      | Plaice               | Turbot           |
| Electric Eel          | Ichthyology         | Pollack              | Vendace          |
| File-fish and Trigger | Kipper              | Pollan               | Weever           |
| Fish                  | Lamprey             | Pout                 | Whitebait        |
| Flat-fish             | Ling                | Ray                  | Whitefish        |
| Flounder              | Loach               | Ribbon-fishes        | Whiting          |
| Fluke                 | Lump-sucker         | Roach                | Wrasse           |

**Zoology, Natural History: Batrachians**

|           |            |              |           |
|-----------|------------|--------------|-----------|
| Axolotl   | Newt       | Surinam Toad | Toad      |
| Batrachia | Salamander | Tadpole      | Tree Frog |
| Frog      | Siren      |              |           |

**Zoology, Natural History: Insects**

|                        |              |                    |                |
|------------------------|--------------|--------------------|----------------|
| Acarus                 | Cricket      | Ichneumon-fly      | Saw-fly        |
| Alder-fly              | Cuckoo-spit  | Insect             | Scale-insect   |
| Ant                    | Death-watch  | Katydid            | Scorpion-fly   |
| Ant Lion               | Dragon-fly   | Lacewing-fly       | Snake-fly      |
| Aphides                | Earwig       | Lantern-fly        | Springtail     |
| Bee                    | Entomology   | Leaf-insect        | Stick-insect   |
| Beetle                 | Fire Brat    | Locust             | Stone-fly      |
| Bird-louse             | Fire-fly     | Louse              | Tarantula      |
| Bug                    | Flea         | Mantis             | Termite        |
| Butterfly and Moth     | Fly          | Mantis-fly         | Ticks          |
| Caddis-fly and Caddis- | Glow-worm    | May-fly, or Ephem- | Tsetse-fly     |
| worm                   | Gnat         | idae               | Wasp           |
| Caterpillar            | Grasshopper  | Mosquito           | Water-boatman  |
| Chafer                 | Ground-pearl | Moth               | Water-scorpion |
| Cicada                 | Harvest-bug  | Palmer             | Weevil         |
| Cochineal              | Harvester    | Phylloxera         | Wireworm       |
| Cockroach              | Hemimerus    |                    |                |

**Zoology, Natural History: Other Invertebrata**

|                       |             |            |            |
|-----------------------|-------------|------------|------------|
| Abalone               | Cowry       | Mite       | Snail      |
| Asterid               | Crab        | Mussel     | Spider     |
| Barnacle              | Crayfish    | Nautilus   | Starfish   |
| Bêche-de-Mer, or Tre- | Cuttle Fish | Octopus    | Tapeworms  |
| pang                  | Earthworm   | Oyster     | Teredo     |
| Book-scorpion         | King-crab   | Prawn      | Water-flea |
| Centipede             | Leech       | Scorpion   | Wood-louse |
| Chiton                | Lobster     | Sea-urchin | Worm       |
| Cockle                | Millipede   | Shrimp     |            |

**Zoology, Palaeontology**

|                |               |                         |                 |
|----------------|---------------|-------------------------|-----------------|
| Amblypoda      | Glyptodon     | Multituberculata        | Phenacodus      |
| Anclypoda      | Graptolites   | Myledon                 | Phororhacos     |
| Anthracotheium | Ichthyosaurus | Odontornithes           | Plesiosaurus    |
| Archaeopteryx  | Iguanodon     | Oreodon                 | Pterodactyles   |
| Arsinoitherium | Litopterna    | Ostracoderms, or Ostra- | Sparasodonta    |
| Creodonta      | Machaerodus   | cophores                | Tillodontia     |
| Dinothereium   | Mammoth       | Palaeontology           | Titanotheriidae |
| Diplodocus     | Mastodon      | Palaeospondylus         | Toxodontia      |
| Dryopithecus   | Megatherium   | Palaeotherium           | Trilobites      |
| Ganodonta      |               |                         |                 |



## CHAPTER LX

### PHILOSOPHY AND PSYCHOLOGY

**P**HILOSOPHERS, says Plato, are "those who are able to grasp the eternal and immutable"; their pursuit is wisdom. The history of philosophy is, therefore, the history of the ideas which have animated successive generations of man; so that in the wide sense the investigation includes all knowledge; the

#### Definitions

natural as well as the moral sciences; and the Greeks, to whom the western world owes the direction of its thought, so understood it. The several divisions of PHILOSOPHY (Vol. 21, p. 440), as we reckon them, were all fused by Plato in a semi-religious synthesis, with resulting confusion. Aristotle, the encyclopaedist of the ancient world, saw that the several issues should be regarded as separate disciplines, and became the founder of the sciences of logic, psychology, ethics, and aesthetics. His "first philosophy," or, as we should say, "first principles," which stood as introductions to his separate special inquiries, gradually acquired the name metaphysics. In more recent times the natural sciences: biology, physics, chemistry, medicine, etc., have been regarded as outside the strict boundaries of the philosophic schools; and theology, is excluded on the ground that its subject matter is so extensive that it may be looked upon as a separate science. The main divisions of philosophy are: EPISTEMOLOGY (Vol. 9, p. 701), which is concerned with the nature and origin of knowledge, i. e., the possibility of knowledge in the abstract; METAPHYSICS (Vol. 18, p. 224), the science of

being, often called ONTOLOGY (Vol. 20, p. 118), dealing, that is to say, with being as being; and PSYCHOLOGY (Vol. 22, p. 547), the science of mind, an analysis of what "mind" means.

It will be of interest to the reader if, at this point, we enumerate some of the more important articles in the Britan-

nica covering this field with the names of their authors. Andrew Seth Pringle-

Pattison, professor of logic and metaphysics in the University of Edinburgh, wrote the general article PHILOSOPHY, which is a key to the whole subject, as well as the articles MYSTICISM (Vol. 19, p. 123), SCEPTICISM (Vol. 24, p. 306), SCHOLASTICISM (Vol. 24, p. 346), SPINOZA (Vol. 25, p. 687), and others. Of fundamental importance is the article LOGIC (Vol. 16, p. 879), which would occupy 124 pages of this Guide. It is divided into two parts: the first, by Thomas Case, president of Corpus Christi College, Oxford, formerly professor of moral and metaphysical philosophy in that university, treats of the science generally, and examines in detail the processes of inference. The second, by H.

W. Blunt, of Christ Church, Oxford, and formerly fellow of All

Soul's, gives a brilliant account of the *history* of logic, that is, the history of the ideas which have been the basis of all attempts to regulate these processes of inference. This account is unique in that it is the first

critical review of the types of logical theory that has been attempted. A lucid discussion of a most difficult subject is that given under METAPHYSICS (Vol. 18, p. 224); equivalent to 100 pages in this Guide by Professor Case, to whom, as one of the most distinguished of modern Aristotelians, the article ARISTOTLE (Vol. 2, p. 501) was also assigned. The life and work of PLATO are examined in a valuable article (Vol. 21, p. 808), the equivalent in length to 54 pages of this Guide, by the late Professor Lewis Campbell, of St. Andrews, one of the best known Platonists of the time.

Henry Sturt, author of *Personal Idealism* and many other books, is responsible for brilliant discussions of UTILITARIANISM (Vol. 27, p. 820), NOMINALISM (Vol. 19, p. 735), METEMPSYCHOSIS (Vol. 18, p. 259), SPACE AND TIME (Vol. 25, p. 525), etc. And F. C. S. Schiller, of Corpus Christi College, Oxford, who, under the wider, and historically more significant title "Humanism," has further developed the pragmatic philosophy of William James, contributed the articles on PRAGMATISM, HERBERT SPENCER, and NIETZSCHE.

The very important article on PSYCHOLOGY (Vol. 22, p. 54), equal to nearly 200 pages of this Guide was contributed by James Ward,

### Psychology

professor of mental philosophy, Cambridge, who has devoted his whole life to psychological research. In addition to PSYCHOLOGY he also contributed the articles HERBERT (Vol. 13, p. 335), and NATURALISM (Vol. 19, p. 274). James Sully, the well-known psychologist, former professor of the philosophy of the mind and logic, at University College, London, contributes the article AESTHETICS (Vol. 1, p. 277). The article ETHICS (Vol. 8, p. 808), equivalent to about 100 pages of this Guide, and WILL (Vol. 28, p. 648), both of primary importance, were the work of the Rev. H.

H. Williams, lecturer in philosophy, Hertford College, Oxford.

Very interesting articles are ASSOCIATION OF IDEAS (Vol. 2, p. 784), DREAM (Vol. 8, p. 588), INSTINCT (Vol. 14, p. 648) and, very important, WEBER'S LAW (Vol. 28, p. 458), which expresses the relation between sensation and the stimulus which induces it.

Of recent years the psychology of crowds has received a good deal of attention; in fact, the need of an understanding of the phenomena attending it is of increasing importance in this age of universal suffrage. Interesting light is thrown upon the subject in the articles SUGGESTION (Vol. 26, p. 48), by W. M. McDougall, Wilde reader in mental philosophy at Oxford; IMITATION (Vol. 14, p. 332); and RELIGION (Vol. 23, p. 66). A line of inquiry of vital importance to the social body is examined in the articles CRIMINOLOGY (Vol. 7, p. 464), by Major Griffith, for many years H. M. Inspector of Prisons, in which Lombroso's theory of the possession by criminals of special anatomical and physiological characteristics is criticized, and the problem is shown to be one of abnormal psychology; see also CESARE LOMBROSO (Vol. 16, p. 936). For discussions of other forms of abnormal psychology, see the chapter *For Physicians and Surgeons* in this Guide, and in particular the article INSANITY (Vol. 14, p. 597).

Perhaps more popular, certainly more sensational, than the more legitimate branches of psychology, is that classed under PSYCHICAL

### Psychical Research

RESEARCH (Vol. 22, p. 544). The title article was written by Andrew Lang, who wrote POLTERGEIST (Vol. 22, p. 14), as well as articles on SECOND SIGHT (Vol. 24, p. 570), APPARITIONS (Vol. 2, p. 209), etc. The article DIVINATION (Vol. 8, p. 332) was written by Northcote Thomas, government anthropologist to Southern Nigeria, and author of *Thought Transference* and

other books; and Mrs. Henry Sidgwick, formerly principal of Newnham College, Cambridge, and secretary to the Society for Psychical Research, was responsible for the article **SPIRITUALISM** (Vol. 25, p. 705). Among the biographical articles in this section, interest will be felt in the biography of Daniel Dunglas HOME, the original of Robert Browning's poem, "Sludge the Medium."

We now may classify the principal subjects belonging to the main divisions of philosophy, the sciences of epistemology, metaphysics, and

**Classification** psychology. The wider phases of thought roughly belonging to the division of metaphysics are, in their historical order: **Platonism** (see **PLATO**, Vol. 21, p. 808), and **Aristotelianism** (see **ARISTOTLE**, Vol. 2, p. 501), the two great Greek systems of the classical period; **NEOPLATONISM** (Vol. 19, p. 372), the last school of pagan philosophy, which grew up mainly among the Greeks of Alexandria from the 3rd century A.D. onwards; **SCHOLASTICISM** (Vol. 24, p. 346), which gave expression to the most typical products of medieval thought; **IDEALISM** (Vol. 14, p. 281), the philosophy of the "absolute," which, though it has given a tinge to philosophic thought from the days of Socrates to the present time, is in its self-conscious form a modern doctrine; **MATERIALISM** (Vol. 17, p. 878), which regards all the facts of the universe as explainable in terms of matter and motion; **REALISM** (Vol. 22, p. 941), which is a sort of half-way house between Idealism and Materialism; **PRAGMATISM** (Vol. 22, p. 246), the philosophy of the "real," which expresses the reaction against the intellectualistic speculation that has characterized most of modern metaphysics. **LOGIC** (Vol. 16, p. 879), the art of reasoning, or, as Ueberweg expresses it, "the science of the regulative laws of thought," clearly belongs to the division of epistemology. Aspects of psychology, since they depend essentially upon perceptions of the human mind in

relation to itself or its environment, are **ETHICS** (Vol. 9, p. 808), or moral philosophy, the investigation of theories of good and evil; and **AESTHETICS** (Vol. 1, p. 277), the philosophy or science of the beautiful, of taste, or of the fine arts.

The articles enumerated will give the reader a clear idea of the drift of thought currents throughout the course of his-

tory, and they will introduce him to the detailed discussions of the various systems which have been propounded by the little band of men who have contributed something vital to the treasury of thought. Each has been in and out of fashion at different times. In the Britannica the contributions to philosophic thought by the great philosophers are discussed in biographical articles, to which we now turn.

The father of Greek philosophy and indeed of European thought was **THALES** of Miletus (Vol. 26, p. 720), who founded

**Breaking the** the **IONIAN SCHOOL** (Vol. 14, p. 731) at the end of the 7th century B.C. He

first, as far as we know, sought to go behind the infinite multiplicity of phenomena in the hope of finding an all embracing infinite unity. This unity he decided was water. **HERACLITUS** (Vol. 18, p. 309), the "dark philosopher," nicknamed from his aristocratic prejudices "he who rails at the people," later selected fire. The never ending fight between advocates of the "One" and the "Many" had therefore begun. **Sophistry** (see **SOPHISTS**, Vol. 25, p. 418) has now an unpleasant connotation, inherited from the undisciplined reasonings of the schools of which **PROTAGORAS** (Vol. 22, p. 464), **GORGAS** (Vol. 12, p. 257), **PARMENIDES** of Elea (Vol. 20, p. 851), and **ZENO**, also of Elea (Vol. 28, p. 970), were leaders. The "science of the regulative laws of thought" had not yet been developed and fallacies were the rule rather than the

exception. Protagoras, the first of the Sophists, in his celebrated essay on Truth, said that "Man is the measure of all things, of what is, that it is, and what is not, that it is not." In other words, there is no such thing as objective truth. After nineteen-hundred years we are still seeking the answer to Pilate's question, "What is truth?" Gorgias, in his equally famous work on Nature or on the Nonent (not-being) maintained that "(a) nothing is, (b) that, if anything is, it cannot be known, (c) that, if anything is and can be known, it cannot be expressed in speech." The paradoxes with which Zeno, the pupil and friend of Parmenides, adorned his arguments are proverbial. Who has not heard of Achilles and the tortoise? And it is a little curious that in quite modern times his sophisms have, after centuries of scornful neglect, been reinstated and made the basis of a mathematical renaissance by the German professor Weierstrass, who shows that we live in an unchanging world, and that the arrow, as Zeno paradoxically contended, is truly at rest at every moment of its flight (Vol. 28, p. 971).

The teaching of SOCRATES (Vol. 25, p. 331) was oral, and his philosophy is handed down to us in the refined and elaborated system

**The Socratic Schools** which PLATO (Vol. 21, p. 808) developed

in his dialogues. The "One" and the "Many" were united in the philosophy of Plato. To him we owe a debt which is simply incalculable, for, as is shown in the Britannica, "to whatever system of modern thought the student is inclined he will find his account in returning to this well-spring of European thought, in which all previous movements are absorbed, and from which all subsequent lines of reflection may be said to diverge." The germs of all ideas, even of most Christian ones, are, as Jowett remarked, to be found in Plato. The teaching of Socrates bore fruit in strangely divers forms. Plato,

his legitimate successor, and the expounder of his philosophy, has been referred to, but there were other very different developments. The CYNICS (Vol. 7, p. 691), of whom DIOGENES (Vol. 8, p. 281) is the notorious prototype, uncouthly preached the asceticism which was to become so fashionable in a later era; but, their central doctrine, "let man gain wisdom—or buy a rope," contains more than a germ of truth. The CYRENAICS (Vol. 7, p. 703), under ARISTIPPUS (Vol. 2, p. 497), starting from the two Socratic principles of virtue and happiness, differed from the Cynics in emphasizing the second. The MEGARIANS (Vol. 18, p. 77), the "friends of ideas," as Plato called them, united the Socratic principles of virtue (as the source of knowledge) with the Eleatic doctrine (Vol. 9, p. 168) of the "One" as opposed to the "Many." Their strength lay in the intellectual pre-eminence of their members, not so much in the doctrine, or combination of doctrines, which they inculcated.

Plato had done much, he had laid the foundation of modern thought; it remained to classify it and to systematize it. This task was

**Aristotle**

reserved for ARISTOTLE (Vol. 2, p. 501),

one of the greatest geniuses of any age. He invented the sciences of logic, ethics, aesthetics, and psychology, as separate sciences. He was at once a student, a reader, a lecturer, a writer, and a book collector. He was the first man whom we know to have collected books, and he was employed at one time by the kings of Egypt as consulting librarian. His system of aesthetics still remains the best foundation of the critic's training. The fundamental difference between Aristotle and Plato is that Platonism is a philosophy of universal forms, and Aristotelianism one of individual substances. As Professor Case puts it in the Britannica: "Plato makes us think first of the supernatural and the kingdom



of heaven, Aristotle of the natural and the whole world." His inquiries, therefore, preeminently implied that "transvaluation of all values," of which Nietzsche was to boast more than two thousand years later. A contemporary of Aristotle, whose philosophy occupies a somewhat independent position, is EPICURUS (Vol. 9, p. 683). His advice to a young disciple was to "steer clear of culture." His system, in fact, led him to go back from words to realities in order to find in nature a more enduring and a wider foundation for ethical doctrine; "to give up reasonings, and get at feelings, to test conceptions and arguments by a final reference to the only touchstone of truth—the senses." A famous Roman who subscribed to the doctrines of Epicurus was the poet-philosopher-scientist, LUCRETIVS (Vol. 17, p. 107), whose theories in his poem *De Rerum Natura* so curiously anticipated much of modern physics and psychology.

Two schools remain to be considered before the Greek philosophy can be dismissed: the STOICS (Vol. 25, p. 942) and the Neoplatonists (see NEOPLATONISM, Vol. 19, p. 372). The Stoics caught the practical spirit of the age which had been evoked by Aristotle and provided a popular philosophy to meet individual needs. They showed kinship with the Cynics, but under the inspiration of their founder, Zeno of Citium, they avoided the excesses of that school, and formulated a system which fired the imagination of the time and finally bequeathed to Rome the guiding principles which were to raise her to greatness. Zeno is regarded as the best exponent of anarchistic philosophy in ancient Greece, and he and his philosophers opposed the conception of a free community without government to the state-Utopia of Plato; see ANARCHISM (Vol. 1, p. 915). Of Neoplatonism Adolph Harnack says in the *Britannica* (Vol. 19, p. 372):

Judged from the standpoint of empirical science, philosophy passed its meridian in Plato and Aristotle, declined in the post-Aristotelian systems, and set in the darkness of Neoplatonism. But, from the religious and moral point of view, it must be admitted that the ethical "mood" which Neoplatonism endeavored to create and maintain is the highest and purest ever reached by antiquity.

The most famous exponents of this system were PLOTINUS (Vol. 21, p. 849), an introspective mystic, and PORPHYRY (Vol. 22, p. 103), who edited Plotinus's works and wrote his biography. Neoplatonism, coming as it did early in our era, formed a link between the pagan philosophy of ancient Greece and Christianity.

With the death of BOETIUS (Vol. 4, p. 116), in 524 A.D., and with the closing of the philosophical schools in Athens five years later, intellectual darkness settled over Europe and hung there for centuries. When in the Middle Ages, the speculative sciences once again attracted men's minds, Christianity had already impressed its mark. SCHOLASTICISM (Vol. 24, p. 346) as a system began with the teaching of SCOTUS ERIGENA (Vol. 9, p. 742) at the end of the 9th century, and culminated three centuries later with ALBERTUS MAGNUS (Vol. 1, p. 504), with his greater disciple THOMAS AQUINAS (Vol. 2, p. 250), whose ideas have animated orthodox philosophic thought in the Catholic Church to this day, and with MEISTER ECKHART (Vol. 8, p. 886), the first of the great speculative mystics (see MYSTICISM, Vol. 19, p. 123).

With the Reformation an assertion of independence made itself heard. Man's relation to man assumed an importance comparable to that of his relation to God; and the first steps on the path which was to lead to the rationalism of the French Encyclopaedists and of the English Utilitarians were taken by Albericus GENTILIS (Vol. 11, p. 603), and Hugo GROTIUS (Vol. 12, p. 621).



In England, FRANCIS BACON (Vol. 3, p. 135) was independently working out the same problems. In philosophy his position was that of a humanist. The remarkable success of Grotius's treatise *De Jure Belli et Pacis* brought his views of natural right into great prominence, and suggested such questions as: "What is man's ultimate reason for obeying laws? Wherein exactly does their agreement with his rational and social nature exist? How far and in what sense is his nature really social?" The answers which HOBBS (Vol. 13, p. 545), who was considerably influenced by Bacon, gave to these fundamental questions in his *Leviathan* marked the starting point of independent ethical inquiry in England.

From this time on the drift of thought in England, though of course often profoundly affected by the speculations of continental philosophers, mainly ran in utilitarian channels; and the succession of ideas may be traced through LOCKE (Vol. 16, p. 844), whose influence on the French Encyclopaedists was far reaching, HUME (Vol. 13, p. 876), Jeremy BENTHAM (Vol. 3, p. 747) with his famous principle of the "greatest happiness for the greatest number," J. S. MILL (Vol. 18, p. 454), and Herbert SPENCER (Vol. 24, p. 634), with his philosophy of the "unknowable."

Meanwhile, on the continent of Europe, DESCARTES (Vol. 7, p. 79), in the *Discourse of Method*, had stated his famous proposition "*Cogito, ergo sum*," and had laid down those fundamental dogmas of logic, metaphysics, and physics, from which started the subsequent inquiries of LOCKE, LEIBNITZ (Vol. 16, p. 385), and NEWTON (Vol. 19, p. 583). But CARTESIANISM (Vol. 5, p. 414), as Dr. Caird points out in the Britannica, includes not only the work of Descartes, but also that of MALEBRANCHE (Vol. 17, p. 486) and of SPINOZA (Vol. 25, p. 687), who, from very different points of view, de-

veloped the Cartesian theories, the former saturated with the study of Augustine, the latter with that of Jewish philosophy.

There follows a group of men whose speculations left a deep mark on the course of events in Europe and America:

**The Rights of Man** VOLTAIRE (Vol. 28, p. 199), MONTESQUIEU (Vol. 18, p. 775), Jean Jacques

ROUSSEAU (Vol. 23, p. 775), and Denis DIDEROT (Vol. 8, p. 204). The anti-ecclesiastical animus which informed the writings of the first, the *Esprit des Lois* of the second, the *Contrat Social* of the third, and the famous encyclopaedia of the last, had political results, but their influence on metaphysical inquiry was practically nil.

Outstanding, of course, in the 18th century was the influence of Immanuel KANT (Vol. 15, p. 662), who summed up the teachings of Leibnitz and Hume, carried them to their logical issues, and

immensely extended them. In fact, Kant and his disciple FICHTE (Vol. 10, p. 313), as Prof. Case shows in the article METAPHYSICS (Vol. 18, p. 231), "became the most potent philosophic influences on European thought in the 19th century, because their emphasis was on man. They made man believe in himself and in his mission. They fostered liberty and reform, and even radicalism. They almost avenged man on the astronomers, who had shown that the world is not made for earth, and therefore not for man. Kant half asserted, and Fichte wholly, that Nature is man's own construction. The *Kritik* and the *Wissenschaftslehre* belonged to the revolutionary epoch of the "Rights of Man," and produced as great a revolution in thought as the French Revolution did in fact. Instead of the old belief that God made the world for man, philosophers began to fall into the pleasing dream "I am everything, and everything is I"—and even

"I am God." The term **TRANSCENDENTALISM** (Vol. 27, p. 172) has been specially applied to the philosophy of Kant and his successors, which is based on the view that true knowledge is intuitive, or supernatural. The famous Transcendental Club founded, 1836, by **EMERSON** (Vol. 9, p. 332) and others in New England, was not "transcendental" in the Kantian sense; its main theme was regeneration, a revolt from theological formalism, and a wider literary outlook; see also **BROOK FARM** (Vol. 4, p. 645), **THOREAU** (Vol. 26, p. 877), **A. BRONSON ALCOTT** (Vol. 1, p. 528), and **MARGARET FULLER** (Vol. 11, p. 295).

**SCHELLING's** position (Vol. 24, p. 316), like that of his disciple **HEGEL** (Vol. 13, p. 200), differed from the transcendentalism of Kant and

### Idealism

**Fichte** in regarding all noumena, or things comprehended (Vol. 19, p. 828), as knowable products of universal reason—the Absolute Ego, and, the absolute being God, nature as a product of universal reason, "a direct manifestation not of man but of God." This was the starting point of noumenal idealism in Germany, and showed a reversion to the wider opinions of Aristotle. Hegelianism in which this idealism is carried to its limit is professedly one of the most difficult of philosophies. Hegel said "One man has understood me and even he has not." His obscurity lies in the manner in which, as William Wallace shows in his article on the philosopher (Vol. 13, p. 204), he "abruptly hurls us into worlds where old habits of thought fail us." The influence of Hegel on English thought has been wide and lasting.

**SCHOPENHAUER** (Vol. 24, p. 372) was essentially a realist. He led the inevitable reaction against the absorption of everything in reason which

### Realism

is the keynote of the Kantian system. In the very title of his chief work, *The World as*

*Will and Idea*, he emphasizes his position in giving "will" equal weight with "mind" or "idea" (*Vorstellung*). His "Will to Live" embodies a wholesome practical idea. **Eduard von HARTMANN** (Vol. 13, p. 36) in his sensational *Philosophy of the Unconscious* established the thesis: "When the greater part of the Will in existence is so far enlightened by reason as to perceive the inevitable misery of existence, a collective effort to will non-existence will be made, and the world will relapse into nothingness, the Unconscious into quiescence." He thus goes a step further in pessimism than did Schopenhauer, and the essence of his doctrine is the will to non-existence—not to live, instead of a will to live. German realism is, however, so strongly coloured by the idealistic cast of the national thought that we have to go to France and England for the most thorough-going statement of the realist position. In France the eclecticism of **V. COUSIN** (Vol. 7, p. 330) marked a doctrine of comprehension and toleration, opposed to the arrogance of absolutism and to the dogmatism of sensationalism which were the tendencies of his day. In England a reversion to Baconian ideas produced the natural or intuitive realism of **REID** (Vol. 23, p. 51), **DUGALD STEWART** (Vol. 25, p. 913), **SIR WILLIAM HAMILTON** (Vol. 12, p. 888) and their followers, and led to the synthetic philosophy of **HERBERT SPENCER** (Vol. 25, p. 634).

The materialists go a step further than the realists. In its modern sense materialism is the view that all we know is

**Materialism** body (or matter), of which the mind is an attribute or function. This attitude was induced by the rapid advances of the natural sciences, and by the unifying doctrine of gradual evolution in nature. It was also heralded by a remarkable growth in commerce, manufactures, and industrialism. The leaders of the movement

were BÜCHNER (Vol. 4, p. 719) whose *Kraft und Stoff* became a text book of materialism, and HÆCKEL (Vol. 12, p. 803) who in his *Riddle of the Universe* asserts that, sensations being an inherent property of all substance, neither mind nor soul can have an origin.

In the inquiries of LOTZE (Vol. 17, p. 23), and FECHNER (Vol. 10, p. 231), the latter an experimental psychologist, lies the

### The 19th Century and Beyond

germ of much of the speculative thought of the present day. Lotze, as the well-known psychologist Henry Sturt says in his article in the *Britannica* (Vol. 17, p. 25), "brought philosophy out of the lecture room into the market place of life." He saw that metaphysics must be the foundation of psychology, and that the current idealist theories of the origin of knowledge were unsound; and he concluded that the union of the regions of facts, of laws, and of standards of values, can only become intelligible through the idea of a personal deity. Like a brilliant meteor NIETZSCHE (Vol. 19, p. 672) flashed across the philosophic sky. His theories of the super-man are known to everyone. His brilliant essays are all in the nature of prolegomena to a philosophy which, embodied in a master work, the "Will to Power," was to contain a transvaluation of all existing ethical values. Unfortunately he did not live to complete the work, which remains a fragment; but the drift of his thought is clearly indicated. One other system should be mentioned, that of POSITIVISM (Vol. 22, p. 172), which its founder, AUGUSTE COMTE (Vol. 6, p. 814) hoped would

supersede every other system. Comte's philosophy confines itself to the data of experience and declines to recognise a priori or metaphysical speculations. The system of morality which he built up on it, and in which God is replaced by Humanity, has largely failed, in spite of the brilliant ideas which animate it, because it is in many of its aspects retrograde. A most interesting review of present day tendencies in the regions of Metaphysics will be found at the end of that article, with special reference to the brilliant work of WUNDT (see also Vol. 28, p. 855), who constructing his system on the Kantian order—sense, understanding, reason, exhibits most clearly the necessary consequence from psychological to metaphysical idealism. His philosophy is the best exposition of modern idealism—that we perceive the mental and, therefore, all we know and conceive is mental.

This sketch of the course of events in philosophical speculation will at least enable the reader to follow the historical clue to the evolution

### The Historical Clue

of ideas. Every student must, in order to attain a true perspective, know the *genealogy* of the ideas he is studying. It will therefore be best that he first read the general articles referred to in the beginning of this chapter, supplementing them by the accounts given of the separate systems under the headings of their authors.

A list of the philosophical and psychological articles (more than 500 in number) in the *Britannica* will be found in the Index (Vol. 29, p. 939) and it is not repeated here.

# **PART III**

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**DEVOTED TO THE INTERESTS OF  
CHILDREN**





## CHAPTER LXI FOR PARENTS

**T**HE new Encyclopaedia Britannica is full of encouragement for parents who are tempted to feel that the proper care and training of a child require almost superhuman skill and energy. Many of the fears and doubts by which they are beset rest upon vague traditions, handed down from a day when a child's health was threatened by more dangers and greater

dangers than now, and when much less **The Science of Rearing Children** was known than is known to-day about the training of a child. Statistics are dull things, as a rule, but it would be difficult to find pleasanter reading than the statistical tables which show how much the modern progress of science has done for children. And these figures, in many Britannica articles on various diseases and localities, by showing how much safer children's lives are than they used to be, also indicate a *decrease of children's suffering* and an *increase of children's happiness* which cannot be expressed in numbers. Sheer ignorance caused much of the pain that children used to suffer and also much of the neglect that led to bodily and mental deficiency in later life. There is still room for improvement; but it is no exaggeration to say that the child of the average American mechanic is more intelligently cared for than was, a hundred years ago, the heir to a European kingdom.

Every branch of science has contributed to these improved conditions. Medical and surgical research have no doubt been the great factors, as disease and deformity were the worst evils; but the child's mind has been as carefully studied as its body. Here, again, figures cannot

tell the whole story. They can show the universal benefits of our public school system, but they cannot show how greatly the children of well-read and thoughtful parents benefit by home influences intelligently exerted. That element of education begins as soon as a child is born, and it is based upon such observation of its individual needs as only a parent's affection and sympathy can achieve. And in this part of the parent's task, as in the case of the child's health, it is essential to be guided by specialists of the highest authority, such as those who wrote for the Britannica the articles of which a brief account is given in this chapter.

The child's individuality, physical and mental, is largely inherited.

The vast subject of heredity has indeed not yet been reduced to an exact science, but the newest theories advanced by Weismann, Hertwig, and others, with such confirmation as has already been obtained, are clearly set forth in Dr. P. Chalmers Mitchell's article HEREDITY (Vol. 13, p. 350). As for our knowledge of the physiological process of heredity, the foundation may be said to have been laid by the labours of the Austrian monk Mendel, and biologists are rapidly extending his work in various directions. What has been done in the past thirteen years since scientists rediscovered Mendel's work is described in MENDELISM (Vol. 18, p. 115), by R. C. Punnett, professor of biology, Cambridge University. There is no subject of greater interest or fascination before the world to-day, and there is no better or simpler introduction to it than Pro-

### What is Known about Heredity

fessor Punnett's able article. As he says, "Increased knowledge of our heredity means increased power of control over the living thing." We know very little as yet, but that little "offers the hope of a great extension at no very distant time. If this hope is borne out, if it is shown that the qualities of man, his body and his intellect, his immunities and his diseases, even his very virtues and vices, are dependent upon the ascertainable presence or absence of definite unit-characters whose mode of transmission follows fixed laws, and if also man decides that his life shall be ordered in the light of this knowledge, it is obvious that the social system will have to undergo considerable changes."

The relations between parent and offspring are also dealt with in REPRODUCTION (Vol. 23, p. 116), by Dr. Mitchell; and those who wish to study the development of the organism will find such information in EMBRYOLOGY (Vol. 9, p. 314), by Adam Sedgwick, who is professor of zoology at the Imperial College of Science and Technology, London. This masterly account is supplemented by a section (p. 329) on the *Physiology of Development* by Dr. Hans A. E. Driesch, of Heidelberg University.

The article INFANCY (Vol. 14, p. 513), by Dr. Harriet Hennessy, is devoted to the care of the child during its first year. The first bath, care of the eyes, clothing, increase of weight, etc., are thoroughly discussed, and the directions for artificial feeding contain tables of milk-dilution and of the amounts to be given. In CHILD (Vol. 6, p. 136) will be found a valuable table of average heights and weights of children from the ages of one to fifteen, and a full bibliography of works relating to child-study.

The main points to be considered for each sex in the difficult period between childhood and maturity are concisely set forth in ADOLESCENCE (Vol. 1, p. 210).

An ideal system of child raising is outlined, dealing with hygiene, clothing, and moral and physical training. See also GYMNASTICS AND GYMNASIUM (Vol. 12, p. 752), by R. J. McNeill.

Parents must have a thorough and clear understanding of the question of bodily nourishment. This is most imperative. It means sound bodies for the children, their good health in after years, their efficiency and success in life. On this point the new Britannica provides information of a character that for authoritativeness and completeness can nowhere else be matched.

The important matter of feeding a family is treated at great length in DIETETICS (Vol. 8, p. 214), by the late Prof. W. O. Atwater of Wesleyan University, known the world over as an authority on this subject, and R. D. Milner, formerly assistant in the U. S. Department of Agriculture. The article gives information as to the composition and nutritive values of foods and their adaptation to the use of people in health. There are tables of food composition, of the digestibility of nutrients, of the quantities of available nutrients, etc. The hygienic and pecuniary economy of food are discussed in such a way as to be of real service. For those who desire further information on the subject of food assimilation reference may be made to NUTRITION (Vol. 19, p. 920), by Dr. D. Noel Paton, professor of physiology, University of Glasgow, and Dr. E. P. Cathcart, lecturer in chemical physiology in the same institution.

In regard to the maintenance of general health of children without reference to specific ailments there is a vast fund of information to be extracted by consulting the new Britannica. The titles of a few of the articles will sufficiently indicate information to which every parent

### The Vital Question of Food

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should have constant access: ANTISEPTICS (Vol. 2, p. 146); DISINFECTANTS (Vol. 8, p. 312); CARBOLIC ACID, *Pharmacology and Therapeutics*, (Vol. 5, p. 305); SALICYLIC ACID, *Medicine and Therapeutics* (Vol. 24, p. 70); EMETICS (Vol. 9, p. 336); ACONITE, *Therapeutics* (Vol. 1, p. 152); COLCHICUM, *Pharmacology* (Vol. 6, p. 662); PHENACETIN (Vol. 21, p. 363); PEPSIN (Vol. 21, p. 130); RHUBARB (Vol. 23, p. 273); SENNA (Vol. 24, p. 646); POISON, with list of poisons and antidotes (Vol. 21, p. 893); HAEMORRHAGE, how to tell the different kinds (Vol. 12, p. 805); WOUND, nature of bruises and treatment (Vol. 28, p. 837); BURNS AND SCALDS (Vol. 4, p. 860); SUNSTROKE, nature of heat prostration (Vol. 26, p. 110); nature and treatment of frost-bite, MORTIFICATION (Vol. 18, p. 878); ULCER (Vol. 27, p. 565); CHILBLAINS (Vol. 6, p. 134); ECZEMA (Vol. 8 p. 920); relief from choking, OESOPHAGUS (Vol. 20, p. 14); BONE, *Fractures*, special fractures in the young (Vol. 4, p. 201); DROWNING AND LIFE SAVING (Vol. 8, p. 592); SLEEP, amount of sleep necessary at different ages (Vol. 25, p. 238); DISEASES OF VISION (Vol. 28, p. 142); with its special section (p. 144) on the care of the eyesight of children; BLINDNESS, *Causes and Prevention* (Vol. 4, p. 60), by Sir F. J. Campbell, principal, Royal Normal College for the Blind, London; SHOCK, injuries and accidents (Vol. 24, p. 991). There is a section on *Action of Baths on the Human System*, in BATHS AND BATHING (Vol. 3, p. 518), telling of the effects of cold, tepid, warm, hot, and very hot baths.

Parents will be most grateful to the Britannica for the complete descriptions of infantile diseases, dealing with symptoms and principles of cure and treatment.

*The British Medical Journal* commenting on the nature of the medical section of the new Britannica has said that it is "an admirable example of the kind of exposition which will enable the

head of a family, without embarrassing him with technical details, to deal with a situation with which he may be confronted at any moment." Realizing the great necessity for a popular yet authentic discussion of diseases, the editors have produced a work which has received the highest approval of the medical world for its quality of practical usefulness.

In the first place, parents should devote much study to Sir T. Lauder Brunton's most clear and able discussion of THERAPEUTICS (Vol. 26, p. 793), dealing in a general manner with the means employed to treat disease. Here we learn about the action of microbes, the nature of inflammation and fever (which are protective processes calculated to defend the organism against the attacks of microbes but which often become injurious), about defensive measures and principles of cure, proper nutrition and elimination, flatulence, constipation, etc. It is also important to know something about the action of drugs, and this is fully explained in PHARMACOLOGY (Vol. 21, p. 350), by Dr. Ralph Stockman, of Glasgow University, while Dr. H. L. Hennessy in the same article (p. 352) explains the terms used in the classification of drugs.

Before describing the material devoted to the special diseases of children, it is well to remind parents of a valuable illustrated article on PARASITIC DISEASES (Vol. 20, p. 770), by Dr. G. Sims Woodhead, professor of pathology in Cambridge University. It is about the length of 52 pages in this Guide. The information as to the origin of various diseases, of those which are due to vegetable and those due to animal parasites, of the infective diseases in which no organism yet discovered has surely been connected with the malady (as is the case with scarlet fever), and of infective diseases, such as measles, mumps, and whooping-cough, not yet traced to micro-

organisms, will prove of the highest interest because the facts related have a most important influence upon present methods of treatment.

CROUP (Vol. 7, p. 511) is a concise account of spasmodic croup—so terrifying to all parents. The treatment is carefully

**Diseases most  
Common to  
Childhood**

described. The same is true of TONSILLITIS (Vol. 27, p. 11). For other common throat diseases see

BRONCHITIS (Vol. 4, p. 634); RESPIRATORY SYSTEM, *Pathology of* (Vol. 23, p. 195) by Dr. Thomas Harris, a noted authority, and Dr. Harriet Hennessy, and LARYNGITIS (Vol. 16, p. 228), which fully describes the paroxysmal laryngitis so peculiarly fatal to infants. In all these articles reference is made to adenoids as a contributing cause of the maladies described. There is a separate account of these recently discovered troublesome growths, ADENOIDS (Vol. 1, p. 191), and of the comparatively simple operation for their removal, by Dr. Edmund Owen, consulting surgeon to the Children's Hospital, London.

The great attention which, in recent years, has been paid to DIPHTHERIA (Vol. 8, p. 290) has produced most striking results. We know its cause and nature, we understand the conditions which influence its prevalence; and a "specific" cure in an antitoxin has been found. Specialists now trace to diphtheria many of the serious cases which would formerly have been thought due to other diseases, and especially to croup.

WHOOPIING COUGH (Vol. 28, p. 616) is one of the most common diseases of infancy, but, except in the most extreme cases, does not require the regular attendance of a physician. The malady has three recognized stages, in the second of which complications are apt to arise which may become a source of danger greater than the malady itself. Parents should also understand the curious structural changes in the lungs which some-

times remain after the disease has run its course.

Of all the diseases of earlier childhood, MEASLES (Vol. 17, p. 947) is the most prevalent, and its spread is largely due to the fact that its initial symptoms are slight and not easily recognizable. The proper understanding of these is, therefore, most necessary, as well as a thorough appreciation of possible complications and their consequences. The best mode of treatment is also indicated in this article. There are several well-marked varieties of SCARLET FEVER (Vol. 24, p. 303) of which the chief are simple scarlatina, septic scarlatina, and malignant scarlatina; and the complications and effects of the disease are among the most important features which should be understood. The list of infantile diseases is too long for specific description, but parents can appreciate the value and significance of this valuable department of the work by referring to such articles as MUMPS (Vol. 18, p. 968); DYSENTERY (Vol. 8, p. 785); CHOLERA (Vol. 6, p. 262), with a special section on children's simple cholera; see also DIGESTIVE ORGANS, *General and Local Diseases* (Vol. 8, p. 262) by Dr. A. L. Gillespie, lecturer on modern gastric methods, Edinburgh Post-Graduate School, and MENINGITIS, *Cerebro-Spinal* (Vol. 18, p. 130), with an account of the new and successful serum treatment.

In planning the groundwork of education, parents should have a clear idea of the principles of modern in-

**Mental  
Training**

struction. Here the Britannica again comes to their assistance. The biographies of PESTALOZZI (Vol. 21, p. 284) and of FROEBEL (Vol. 11, p. 238) describe the insistence of these leaders on the need of educating a child through his own activity, and the results they obtained by this method. Further elaboration of the subject is given in EDUCATION, *Theory* (Vol. 8, p. 951), by James



Welton, professor of education in the University of Leeds, to which article there are added detailed accounts of national systems of education. An interesting supplementary article is **SCHOOLS** (Vol. 24, p. 359), by A. F. Leach, describing the stages of experiment by which our modern idea of a school has been developed. There is an admirably instructive article, **TECHNICAL EDUCATION** (Vol. 26, p. 487), by Sir Philip Magnus, formerly member of the Royal Commission of Technical Instruction.

The new Britannica performs a service of the greatest importance in responding to the opening mind of the child. Children are the greatest

#### Assistance at Home in School Education

of question askers, and the Britannica is the best question answerer ever devised. They want to know about the races of men, the different animals and plants they see; in fact, almost every object that comes under their observation. The inestimable advantage of answering an inquiry fully and correctly and not in an offhand manner is too obvious to need mention. *Let your young children see you go to your Britannica for information and as soon as they are old enough they will naturally do the same, and then the volumes will be performing their most efficient work in the household.*

For helping children with their school "themes" and "compositions," for elucidation or amplification of any topic that comes up in the course of their studies, there is no medium so useful as the new Britannica—the most exhaustive compendium of knowledge which has ever been devised, with its elaborate index of 500,000 alphabetical references, giving instant access to every fact in the whole work. Of equal assistance will be its employment in connection with Sunday School lessons; for the accounts of the Bible and its separate books, giving the latest results of Biblical crit-

icism, are the product of the highest learning of the age.

For the instruction of children about the history of mankind, the nature of the universe, the animal, plant, and mineral world, the new Britannica offers a complete fund of necessary knowledge.

There are 277 astronomical articles, including biographies; 889 zoological articles; 675 on plants; 380 on minerals and rocks. The classified subject-list in the Index Volume places the whole of this material immediately before the eye.

The articles **ANTHROPOLOGY** (Vol. 2, p. 108), by Dr. Edward B. Tylor of Oxford University, dean of living anthropologists, and **ETHNOLOGY AND ETHNOGRAPHY** (Vol. 9, p. 849) describe the races of mankind, man's place in nature, the origin of man, and his antiquity. The main article **ZOOLOGY** (Vol. 28, p. 1022), by Sir Edwin Ray Lankester, of London University, is an introduction to knowledge of the whole of the animal world, which is amplified, with minute details, in separate accounts of all members of the animal kingdom. **ZOOLOGICAL DISTRIBUTION** (Vol. 28, p. 1002), by the noted naturalist, Richard Lydekker, is a mine of information about the distribution of living animals and their forerunners on the surface of the globe. Articles of great importance are **BOTANY** (Vol. 4, p. 299), by Dr. A. B. Rendle of the British Museum, and the great article **PLANTS** (Vol. 21, p. 723), in the various sections of which the whole story of the vegetable world is told by eight famous specialists. There are, of course, separate articles on all plants. We also recommend to parents a careful study of the section (Vol. 23, p. 120) of **REPRODUCTION, Reproduction of Plants**, by Dr. S. H. Vines, and **POLLINATION** (Vol. 22, p. 2), from which they can give their children much necessary instruction. Such a course is now strongly advised by educators and authorities in child-study as the best



method of preparing the mind for a healthy, sane knowledge of sex matters in later years.

All the facts about the earth's surface will be found in *GEOGRAPHY*, in the section *Principles of Geography* (Vol. 11, p. 630), by Dr. H. R.

**What Happens on the Earth and in the Air** Mill, formerly president of the Royal Meteorological Society; and see also

*OCEAN AND OCEANOGRAPHY* (Vol. 19, p. 967), by Dr. Otto Krümmel, professor of geography, University of Kiel, and Dr. H. R. Mill. Everything about the weather, storms, etc., may be learned from *METEOROLOGY* (Vol. 18, p. 264), by Dr. Cleveland Abbe, professor of meteorology in the U. S. Weather Bureau; and from *ATMOSPHERIC ELECTRICITY* (Vol. 2, p. 860), by Dr. Charles Chree of the National Physical Laboratory, England.

Clouds always appeal strongly to a child's imagination. The article *CLOUD* (Vol. 6, p. 557), by A. W. Clayden, author of *Cloud Studies*, has beautiful illustrations of cloud forms, with explanations.

Lord Rayleigh, a winner of the Nobel prize and one of the most distinguished of living scientists, in the article *SKY* (Vol. 25, p. 202) explains why the blue of the sky varies as it does.

Parents will find a great deal to tell their children about phenomena of nature in such articles as *EARTHQUAKE* (Vol. 8, p. 817), by F. W. Rudler, formerly president of the Geologists' Association, England, and Dr. John Milne, author of *Earthquakes*; and *VOLCANO* (Vol. 28, p. 178), by F. W. Rudler. Glaciers and their effects are described in *GLACIER* (Vol. 12, p. 60), by E. C. Spicer.

In teaching rudimentary things about the heavens, it is well to note that *CONSTELLATION* (Vol. 7, p. 11), by Charles Everitt, contains star-maps by which the positions may easily be recognized. After reading *STAR* (Vol. 25, p. 784), by A. S. Eddington, of the Royal Observatory,

Greenwich, many wonders of the heavens about the number of the stars, their distances, the variable and double stars, etc., may be told the child. The same is true of the articles *PLANET* (Vol. 21, p. 714), by Dr. Simon Newcomb, director of the American Nautical Almanac and professor of mathematics in the Navy, and of the separate accounts of all the different planets; *COMET* (Vol. 6, p. 759), by Dr. Newcomb; and *NEBULA* (Vol. 19, p. 332), by A. S. Eddington, etc. These are all very fully illustrated. Ideas as to the structure of the universe, the origin of the solar system, etc., will be found in *NEBULAR THEORY* (Vol. 19, p. 333), by Sir Robert S. Ball, professor of astronomy, Cambridge University.

A great many children show a liking for the mechanical arts and are curious about processes of manufacture. Parents

will find in the new **The Training of the Hand** Britannica complete information about

the marvelous things ingenious machines do and how they do them; for example, *SPINNING* (Vol. 25, p. 685), by T. W. Fox, professor of textiles in the University of Manchester; *COTTON-SPINNING MACHINERY* (Vol. 7, p. 301), also by Professor Fox; *WEAVING* (Vol. 28, p. 440), by Professor Fox, with illustrations; *HOSIERY* (Vol. 13, p. 788), by Thomas Brown, of the Incorporated Weaving, Dyeing and Printing College, Glasgow; *CARPET* (Vol. 5, p. 392), by A. S. Cole, assistant secretary for art, Board of Education, England; *SILK* (Vol. 25, p. 96), by Frank Warner, president of the Silk Association of Great Britain and Ireland; Richard Snow, examiner in silk throwing and spinning for the City and Guilds of London Institute, and Arthur Mellor; *FLOUR AND FLOUR MANUFACTURE* (Vol. 10, p. 548), by G. F. Zimmer, author of *Mechanical Handling of Material*; *ROPE AND ROPE MAKING* (Vol. 23, p. 713), by Thomas Woodhouse, head of the weaving and textile department, Technical College, Dundee; *SUGAR*,

*Sugar Manufacture* (Vol. 26, p. 35), by A. Chapman, designer and constructor of sugar machinery, and Valentine W. Chapman.

An important service to education is rendered by the Britannica in the way that it supplements and extends education received in

**The Foundation of Good Taste** the school. There, far too often children learn little or nothing of the world of art, of the beautiful creations of the human intellect by means of which, even before the dawn of history, men attempted to express in concrete form their sense of beauty. It is surely most desirable for children to have an idea, at least, of principles and styles of architecture; of ancient and modern painting and sculpture—to know the chief characteristics of schools of art; to have a little knowledge of musical forms, of what a symphony, a concerto, a sonata, an opera, are; to be able to recognize a piece of Dresden, Sèvres, Italian faience, Copenhagen, or Wedgwood ware when they see it; to know the different periods and styles of furniture; to tell Bohemian from Venetian glass; to be familiar with lovely textiles and fabrics and to appreciate their true value. Such knowledge is the foundation of good taste. It serves to arouse appreciation of, and respect for, the objects with which a child is surrounded, and leads to delightful interests, recreations and occupations in later years. There are few better and more constant uses to which the Britannica can be put than the systematic education of children in matters of general culture and refined taste.

A list of articles to serve this purpose would be too long to give here. They are easily found by means of other chapters in this Guide. But

**Knowledge of the Fine Arts** special mention may be made of ARCHITECTURE (Vol. 2, p. 369), by R. Phené Spiers, master of the

architectural school, Royal Academy, London, by John Bilson, of the University of Manchester, and others; PAINTING (Vol. 20, p. 459), by Prof. G. B. Brown of Edinburgh University; L. Bénédite, keeper of the Luxembourg Gallery, Paris; Richard Muther, professor of modern art, Breslau University; and John C. Van Dyke, professor of history of art, Rutgers College; SCULPTURE (Vol. 24 p. 488), by Marion H. Spielmann, formerly editor, *Magazine of Art*, P. G. Konody, art critic of the *Observer*, L. Bénédite, and Dr. J. H. Middleton, Slade professor of fine art, Cambridge University; CERAMICS (Vol. 5, p. 703), by Hon. William Burton, chairman, Joint Committee of Pottery Manufacturers of Great Britain, R. L. Hobson of the British Museum, and other authorities; GLASS (Vol. 12, p. 86), by Alexander Nesbitt, H. J. Powell, author of *Glass Making*, and Dr. W. Rosenhain of the National Physical Laboratory, England; LACE (Vol. 16, p. 37), by A. S. Cole, author of *Embroidery and Lace*; FURNITURE (Vol. 11, p. 363), by J. Penderel-Brodhurst. All of these articles are superbly illustrated, and this feature alone would give them a direct educational value for young people.

In fact, the new Britannica may be said to be the greatest and most varied picture book in existence. There are

**The Best Picture-Book in the World** 7,000 text illustrations and 450 full-page plates. This suggests at once a special use for the work in making children familiar, by purely pictorial means, with objects they should learn to recognize. When a child asks for a description of some object whose name has aroused his curiosity, it is safe to say that an accurate picture of it will be found in the new Britannica. Suppose that he has heard of a dirigible balloon and wants to know how it differs from the ordinary balloon which he has seen. The index will guide his instructor to the article AERONAUTICS (Vol. 1, p.

260), with two full-page plates of dirigible balloons. A child can learn to distinguish the breeds of domestic animals from the illustrations alone. Thirst for mechanical knowledge may be satisfied by such articles as STEAM ENGINE (Vol. 25, p. 818), with about 70 illustrations, by Prof. J. A. Ewing, of Cambridge University; WATCH (Vol. 28, p. 362), by Lord Grimthorpe and Sir H. H. Cunyng-hame; LIGHTHOUSE (Vol. 16, p. 627), by W. T. Douglass and N. G. Gedye; TELEPHONE (Vol. 26, p. 547), by Emile Garcke; and LOCK (Vol. 16, p. 841), by A. B. Chatwood—all fully illustrated.

The new Britannica is an exhaustive and practical compendium of sports, games, and recreations of all kinds. Part 6 of this Guide contains a survey of this department in the book. There are

over 260 articles on sports and games alone, and they describe clearly how each is played, and also give expert advice. There is also much that is extremely interesting in the historical development of pastimes, a knowledge of which heightens the interest and pleasure of those who participate in them; and parents can be of real assistance to their children in instructing them about their sports, and by acquiring this information themselves can give sympathetic appreciation to the children's amusements. Among the noteworthy contributions on sports and games there are CHILDREN'S GAMES (Vol. 6, p. 141), an article for parents by Alice B. Gomme, an expert on this subject; GAMES, CLASSICAL (Vol. 11, p. 443), an account which every boy will read with pleasure, by Francis Storr, editor of the *Journal of Education*, London; ATHLETIC SPORTS (Vol. 2, p. 846); BASEBALL (Vol. 3, p. 458), by Edward Breck; BASKET-BALL (Vol. 3, p. 483), FOOTBALL (Vol. 10, p. 617), of which the American section is written by Walter Camp, the football expert; KITE-FLYING (Vol. 15, p. 839), by Major-Gen. Baden Powell;

MARBLES (Vol. 17, p. 679), by W. E. Garrett Fisher; LAWN TENNIS (Vol. 16, p. 300), by R. J. McNeill; SWIMMING (Vol. 26, p. 231), by William Henry, founder and chief secretary of the Royal Life Saving Society; SKATING (Vol. 25, p. 166), and COASTING (Vol. 6, p. 603).

Recreation in the form of diverting occupations is sometimes more attractive to children, especially to those of a practical turn of mind, than sports and games. It is often difficult for parents to encourage these inclinations, since they themselves may not be familiar with the subjects for which their children show a special aptitude, and a real talent may thus fail to be cultivated. As soon as any particular bent in the child is discovered, a parent ought to consider it a duty to learn to help the boy or girl.

The new Encyclopaedia Britannica will, on all subjects of diverting occupations, prove of immense practical assistance to parents. They will find all that they need to know to help their children under such headings as PHOTOGRAPHY (Vol. 21, p. 485), by Sir William de Wiveleslie Abney, formerly president of the Royal Photographic Society, James Waterhouse also a former president of the same society, who writes on photographic apparatus, and A. H. Hinton, author of *Practical Pictorial Photography*, etc.; BEE, *Bee Keeping* (Vol. 3, p. 628), by W. B. Carr, formerly editor of the *Bee-Keeper's Record*; the article AVIARY, on the keeping of birds (Vol. 3, p. 60), by David Seth-Smith, formerly president of the Avicultural Society; POULTRY AND POULTRY FARMING (Vol. 22, p. 213), by Lewis Wright, author of *The Practical Poultry-Keeper*; BASKET, *Basket Making* (Vol. 3, p. 481); HORTICULTURE (Vol. 13, p. 741), by M. T. Masters, late editor of *The Gardener's Chronicle*, W. R. W. Williams, superintendent of London County Council Botany Centre, John Weathers, author of *Practical Guide to Garden Plants*,

Prof. Liberty Hyde Bailey, director of the College of Agriculture, Cornell University, and Peter Henderson; *CARPENTRY* (Vol. 5, p. 386), by James Bart-

lett, lecturer on construction, at Kings College, London; *CONJURING* (Vol. 6, p. 943), by John Algernon Clarke, G. Faur, and John Nevil Maskelyne.

## CHAPTER LXII

### FOR SCHOOL-CHILDREN

**W**HEN a stick of hot glass is drawn out, no matter how far it is stretched, the slender stick retains the original shape of the piece—square, round or oval. In the same way, a child's mind retains in after life the shaping originally given to it. Everyone

#### Importance of Correct First Impressions

knows from personal experience how difficult it is to rid the mind of a wrong impression received in childhood. The editors of the new Britannica feel that they have solved a great problem in making a work of the most accurate and authoritative character interesting to children, for they have received much valuable testimony that this end has been attained. Dr Charles W. Eliot, president-emeritus of Harvard University, was an early subscriber for two sets for the use of his grandchildren. He said that he found the work "altogether admirable; and my grandchildren, who are at the most inquisitive ages, are of the same opinion." Professor W. G. Hale, of the University of Chicago, wrote, "My children feel the same fascination in it that I do." Judge J. P. Gorter, of the Baltimore Supreme Court, has expressed his opinion that "every family with growing children seeking information should have this invaluable work in the library." The owner of the new Britannica should constantly

encourage his children to go to the volumes for further information on topics included in the course of the day's studies at school. It will not take long to make them realize that the volumes open an inexhaustible mine of knowledge, and answer any question as to which curiosity has been aroused. With a little help from you, at the beginning, they will soon learn to use the Britannica for themselves.

The love of reading is quickly developed in children. Some are attracted to history, to the lives of great men, to exploration and to

#### The Britannica Interesting to Children

adventure; others become more interested in the world of nature; still others have a natural bent toward science and the mechanical arts. Whatever the inclination may be, the Britannica stands at the child's service, giving to him the true facts in such a way that he can easily understand them.

The following suggestions will help children to pursue their favourite lines of reading. They may like to begin with the heroes of myth and history. Andrew Lang contributes a most comprehensive article on *MYTHOLOGY* (Vol. 19, p. 128). The classified subject-list in Vol. 29 (Index) indicates nearly 500 separate articles on the gods and mythological beings of ancient Greece and Rome, Asia,



Egypt, Europe and America. The central hero of medieval romance, ARTHUR (Vol. 2, p. 681), is described by Miss Jessie L. Weston, author of *Arthurian Romances*. The famous deeds of the CID (Vol. 6, p. 361), the foremost man of Spain's heroic period, are related by H. E. Watts, the well-known translator of *Don Quixote*. ROLAND, LEGEND OF (Vol. 23, p. 464), tells another stirring story.

Of peculiar interest to children are such articles as CYRUS (THE GREAT), (Vol. 7, p. 706), by Dr. Eduard Meyer,

**Heroes and Heroines of History, Romance and Adventure**

professor of ancient history, University of Berlin, author of the world-famous *History of Antiquity*; ALEXANDER III (THE GREAT), (Vol. 1, p. 545), by the noted Hellenist, Edwyn R. Bevan; CAESAR, JULIUS (Vol. 4, p. 938), by Henry Stuart Jones, of Oxford University; HANNIBAL (Vol. 12, p. 920), by M. O. B. Caspari, of London University; THEODORIC (Vol. 26, p. 768), the great ruler of the Gothic nation, by Theodore Hodgkin, author of *Italy and her Invaders*; CHARLEMAGNE, founder of the Holy Roman Empire (Vol. 5, p. 891), by Arthur W. Holland; CHARLES MARTEL (Vol. 5, p.

**The Romance of the Middle Ages**

942), a great type of courage and activity, by Christian Pfister, professor at the Sorbonne, Paris; ALFRED THE GREAT (Vol. 1, p. 582), by Rev. Charles Plummer, author of *The Life and Times of Alfred the Great*; CRUSADES (Vol. 7, p. 524), by Ernest Barker, of Oxford University, a narrative with all the action and interest of the best tales for children; TEMPLARS (Vol. 26, p. 591), by W. Alison Phillips, author of *Modern Europe*, etc.; LOUIS IX (Saint) (Vol. 17, p. 37), by Prof. James T. Shotwell, of Columbia University; CONRADIN (Vol. 6, p. 968), the pathetic life of this marvelous boy who perished at the age of seventeen; HUNDRED YEARS'

WAR (Vol. 13, p. 893), by Jules Viard, archivist of the National Archives, Paris; FROISSART, JEAN (Vol. 11, p. 242), a notable biography, by Sir Walter Besant; CHARLES V (Vol. 5, p. 899), by Edward Armstrong, author of *The Emperor Charles V*, etc.; CROMWELL, OLIVER (Vol. 7, p. 487), by Philip Chesney Yorke,

of Oxford, Capt. C. F. Atkinson, and R. J. McNeill; GUS-

TAVUS ADOLPHUS (Vol. 12, p. 735), by R. Nisbet Bain,

author of *Scandinavia*, etc.; MARLBOROUGH (Vol. 17, p. 737), by Dr. W. P. Courtney; FREDERICK II (THE GREAT) (Vol. 11, p. 52), by James Sime, author of *History of Germany*, and W. Alison Phillips; NAPOLEON I (Vol. 19, p. 190), by J. Holland Rose; NELSON (Vol. 19, p. 352), by David Hannay, author of *Short History of the Royal Navy*; WELLINGTON (Vol. 28, p. 507); WASHINGTON, GEORGE (Vol. 28, p. 344), by Dr. William Macdonald, professor of American History in Brown University; LINCOLN, ABRAHAM (Vol. 16, p. 703), by John G. Nicolay, private secretary to President Lincoln, and Charles C. Whinery, assistant editor of the Encyclopaedia Britannica; GRANT, ULYSSES S. (Vol. 12, p. 355), by Capt. C. F. Atkinson, and John Fiske, author of *The American Revolution*; LEE, ROBERT E. (Vol. 16, p. 362); BOADICEA (Vol. 4, p. 94), by Dr. F. J. Haverfield, professor of ancient history, Oxford University; MATILDA

**Famous Women of History**

(THE GREAT COUNTESS) (Vol. 17, p. 888), by Prof. Carlton H. Hayes, of Columbia University; JOAN OF ARC (Vol. 15, p. 420), by Prof. J. T. Shotwell, of Columbia University; ISABELLA (Vol. 14, p. 859); ELIZABETH, QUEEN OF ENGLAND (Vol. 9, p. 282), by A. F. Pollard, professor of English history, London University; MARY, QUEEN OF SCOTS (Vol. 17, p. 817), by Algernon C. Swinburne, the great poet, author of *Mary Stuart*, etc.; CATHERINE DE' MEDICI (Vol. 5, p. 528);



VICTORIA, QUEEN (Vol. 28, p. 28), by Hugh Chisholm, editor, Encyclopaedia Britannica.

The biographies are not dry outlines of the subjects' lives, but narratives of a thoroughly interesting and often most entertaining nature. There has been a generous amount of space allotted the biographical articles in the Encyclopaedia Britannica. The article on Napoleon I is equivalent to 60 pages of this Guide; that of George Washington to 13 pages; of Abraham Lincoln to 23 pages; of Queen Victoria 23 pages. Such length provides space for the picturesque details which make the articles especially appropriate for children, and will establish a taste for this kind of reading in later years.

Many children show a bent for knowledge of the world of nature, and to them the new Britannica will prove a

faithful, constant  
**Readings in** companion. Their  
**Natural** pleasure in going to  
**History** the encyclopaedia  
 will be heightened by

the many beautiful pictures they will find in it. The articles on the domestic animals not only relate in simple, readable fashion the very interesting facts about their history and development, but are splendidly illustrated with pictures of the different breeds so that by this means alone anyone may learn to distinguish them. CAT (Vol. 5, p. 487), is by Richard Lydekker, the noted naturalist; CATTLE (Vol. 5, p. 539) is by Dr. William Fream, author of *Handbook of Agriculture*, and Robert Wallace, professor of agriculture, Edinburgh University; DOG (Vol. 8, p. 374) is by Walter Baxendale, kennel editor of *The Field*, and Dr. F. Chalmers Mitchell; HORSE (Vol. 13, p. 712) is by Sir William Henry Flower, the noted biologist, author of *The Horse, a Study in Natural History*, Richard Lydekker, E. D. Brickwood, Dr. William Fream and Robert Wallace; PIG (Vol. 21, p. 594) is by Robert Wallace, and SHEEP (Vol. 24, p. 817)

is by Dr. Fream and Professor Wallace.

In too many books for children about the habits of wild animals, the facts of nature are grossly distorted with the idea of impressing the imagination. We are all familiar with the recent spirited controversy over "nature fakers" and the reaction to more sober statement which it brought about. It is the truth about the animal world that is wanted; for it is quite wonderful and fascinating enough as it is. And the new Britannica supplies this need in a most satisfactory and thorough manner. Children never tire of natural history, and parents may be assured that the information in the entertaining articles by noted naturalists, in the pages of the Britannica, is of the most reliable and accurate character.

Nothing, for instance, could be more absorbing to the average school-child than the article ANT (Vol. 2, p. 85), by

Prof. George H. Carpenter of the Royal College of Science, Dublin, who wrote the well-known book

*Insects; their Structure and Life*. Here he tells how colonies of ants are founded, and how they live, and how they receive other insects as guests in order to obtain the food they desire, and how some species make slaves of other species. Numerous examples of their sense and intelligence are given, and the question as to whether their actions are rational or instinctive is discussed in the light of the most recent knowledge. The story of the BEE (Vol. 3, p. 625), also by Professor Carpenter, is equally wonderful, for we learn all about the solitary and social bees, the social organization of the hive, and how the worker bees are victimized. Both of these articles are fully illustrated. SPIDERS (Vol. 25, p. 663), by R. I. Pocock, superintendent of the Zoological Gardens, London, is another example of the adaptability of the Britannica to children's reading. The accounts of their webs, nests and

modes of catching prey hold the attention throughout.

A great deal of the most curious and recent knowledge of the animal kingdom is related in supplementary articles such as COLOURS OF ANIMALS (Vol. 6, p. 731), by Dr. E. B. Poulton, Hope professor of zoology at Oxford, author of *The Colours of Animals*, and MIMICRY (Vol. 18, p. 495), by R. I. Pocock. The latter tells how animals protect themselves from their enemies by resemblance to other animals or objects.

Space will not permit further specific mention. The life-story of the entire animal kingdom, detailed information

### Knowledge about Plants and Animals

about plants and flowers are to be found in the pages of the new Britannica. The accurate and beautiful illustrations and the text, written in every case by naturalists of acknowledged reputation, and written always in the clearest language, help to give the work its unique position as the greatest source of authoritative and easily comprehended knowledge.

Children delight in machinery and what it accomplishes, and the Britannica tells about this with great thoroughness

### Marvelous Machines

in its complete section dealing with processes of manufacture. A number of the articles on this subject have been suggested in the last chapter as suitable for parents who wish to interest their children in the industrial world, and the list may be further extended for the benefit of older children by including such articles as TEXTILE PRINTING (Vol. 26, p. 694), by Dr. Edmund Knecht, of Manchester University; FINISHING (Vol. 10, p. 378) also by Professor Knecht; WOOL, WORSTED AND WOOLLEN MANUFACTURES (Vol. 28, p. 805), by Aldred F. Barker, professor of textile industries, Bradford Technical College; TYPOGRAPHY, *Modern Practical Typography* (Vol. 27, p.

542), by John Southward, author of *Practical Printing*, and H. M. Ross; PRINTING (Vol. 22, p. 350), by C. T. Jacobi, managing director of the Chiswick Press, London; DREDGE AND DREDGING (Vol. 8, p. 562), by Walter Hunter, a noted consulting engineer; REAPING (Vol. 22, p. 944), by Primrose McConnell, author of *Diary of a Working Farmer*, etc.

Boys with a practical, mechanical turn of mind will delight in such articles as BRIDGES (Vol. 4, p. 533), by Prof. W. C. Unwin, with many illustrations; MOTOR VEHICLES (Vol. 18, p. 914), by the late C. S. Rolls, a pioneer of motoring, and Edward S. Smith; FLIGHT AND FLYING, *Artificial Flight* (Vol. 10, p. 510), which describes, with many pictures, flying machines from the earliest types to the latest, and CYCLING (Vol. 7, p. 682), an historical and pictorial account of the velocipede and bicycle. Nothing could be more interesting and instructive than SHIP (Vol. 24, p. 860), of which the historical part is by Rev. Edmond Warre, formerly head master of Eton College, and the account of modern ships by Sir Philip Watts, who designed the "Dreadnought" and the "Mauretania." It is a real story, equivalent in length to 190 pages of this Guide, with nearly 130 illustrations of all sorts of craft including modern warships, ocean liners and vessels for inland navigation. Under RAILWAYS (Vol. 22, p. 819) there is an equally good history of the railway by H. M. Ross, editor of *The Times Engineering Supplement*, and others.

The remarkable attraction possessed by electrical apparatus for many boys will doubtless send them to such articles

### Electrical Apparatus

as DYNAMO (Vol. 8, p. 764), by C. C. Hawkins, author of *The Dynamo*; TELEPHONE (Vol. 26, p. 547), by Harry R. Kempe, electrician to the General Post Office, London; TELEGRAPH (Vol. 26, p. 510), also by H. R. Kempe, and the chapter on *Wireless Telegraphy* (p. 529),

by J. A. Fleming, professor of electrical engineering in the University of London. These accounts are full of the most practical information, and will be of inestimable help to any boy who wishes to experiment for himself.

Many industrial processes, while not employing complicated machinery, nevertheless possess much interest, both from an historical

### Industrial Processes

and a technical point of view, and on these the new Britannica is

as complete and authentic as in all other departments. Especially useful and entertaining to children will be found the material relating to the manufacture of the common objects by which they are surrounded. Such, for instance, are CERAMICS (Vol. 5, p. 703), by William Burton and several other experts, with beautiful illustrations; GLASS (Vol. 12, p. 86), by Harry James Powell, author of *Glass Making*, etc., Alexander Nesbitt, and William Rosenhain of the National Physical Laboratory, England; and PROCESS (Vol. 22, p. 408), an illustrated account, by Edwin Bale, of the photo-mechanical processes by which illustrations are reproduced in printing.

These and hundreds of similar articles will prove most helpful and suggestive to school-children who are constantly called on to prepare "themes" and write compositions. As soon as a child makes acquaintance with the new Britannica he will quickly realize its inexhaustible resources, and the aid it lends him in his studies will be continued throughout the course of his life, in his business and in his general reading.

Children love to read adventures of explorers in forcing their way to unknown lands. The impression they make is

### Explorers' Voyages and Journeys

much clearer when the child has learned to distinguish the different motives which have led to

discovery and to exploration—commer-

cial expansion, fresh conquests, religious zeal, flight from persecution, or the advancement of knowledge for its own sake. With such information he will read in a new light the stirring history of a venture, the great story of hardship and endurance.

The Britannica presents all this on a definite, scientific plan. The inquirer starts on his trip through any field of learning with guide-posts clearly marked, and successive ones in sight one from the other; so that there is no going astray, no uncertain wandering. A reader—young or old—with taste for exploration and adventure may turn first to GEOGRAPHY, *Progress of Geographical Discovery* (Vol. 11, p. 623), by Dr. H. R. Mill, editor of *The International Geography*. This article outlines geographical discovery in chronological order from the days of the Phoenicians. The reader will doubtless make excursions into other parts of the books for more detailed accounts, but he has always this main article to guide him. He will go to the article on HERODOTUS (Vol. 13, p. 381), the traveler, by Canon George Rawlinson, the great Oriental archaeologist, and the Rev. E. M. Walker of Oxford University; and to the story of PYTHEAS (Vol. 22, p. 703), the Greek navigator who brought the first definite news of northwestern Europe to the Mediterranean world, by Sir Edward H. Bunbury, author of *A History of Ancient Geography*, and Dr. C. R. Beazley of the University of Birmingham. Other stories of exploration and adventure are: VIKING (Vol. 28, p. 62), by Charles F. Keary, author of *The Vikings in Western Christendom*; LEIF ERICSSON (Vol. 16, p. 396), the first European to set foot on the American continent, by Prof. C. R. Beazley; VINLAND (Vol. 28, p. 98), with all the latest known facts of Leif's discovery, by Prof. J. E. Olson of the University of Wisconsin; the marvelous career of the great Venetian discoverer, POLO, MARCO (Vol. 22, p. 7), boldest of medieval travelers, by Sir Henry Yule, author

of *The Book of Ser Marco Polo*, and Prof. C. R. Beazley; HENRY OF PORTUGAL (the Navigator) (Vol. 13, p. 296); DIAZ DE NOVAES (Vol. 8, p. 172); COLUMBUS, CHRISTOPHER (Vol. 6, p. 741)—all of these by Professor Beazley; GAMA, VASCO

DA (Vol. 11, p. 433), who discovered the Cape route to India; PINZON (Vol. 21, p. 631); VESPUCCI, AMERIGO (Vol. 27, p. 1053), by Professor Beazley; BALBOA, VASCO NUÑEZ DE (Vol. 3, p. 241), discoverer of the Pacific Ocean; CABOT (Vol. 4, p. 921), by H. P. Biggar, author of *The Voyages of the Cabots to Greenland*; MAGELLAN, FERDINAND (Vol. 17, p. 302), the first circumnavigator of the globe, by Professor Beazley; SOTO, FERDINANDO DE (Vol. 25, p. 435), wrongly called the discoverer of the Mississippi; PERU, *History* (Vol. 21, p. 274), by Sir Clements R. Markham, author of *Travels in Peru and India*, a full account of Pizarro's conquest; CORTES, HERNAN (Vol. 7, p. 205), a concise and able description of the conquest of Mexico; CARTIER, JACQUES (Vol. 5, p. 433), which tells of the discovery of the St. Lawrence; HUDSON, HENRY (Vol. 13, p. 849); BAFFIN, WILLIAM (Vol. 3, p. 192); LA SALLE (Vol. 16, p. 230), by C. C. Whinery, assistant editor of the *Encyclopaedia Britannica*; CHAMPLAIN, SAMUEL DE (Vol. 5, p. 830), by Dr. N. E.

**Great Voyages** *Life of Samuel Champlain, etc.*; DRAKE, SIR FRANCIS (Vol. 8, p. 473); BUCCANEERS (Vol. 4, p. 709), by David Hannay, a stirring account of the piratical adventurers of different nationalities who united against Spain in the 17th century, and COOK, JAMES (Vol. 7, p. 71), by Professor Beazley.

The story of geographical discovery and exploration is continued in such articles as AMERICA, *General Historical Sketch* (Vol. 1, p. 806), by David Hannay; AFRICA, *History: Exploration and Survey*

*since 1875* (Vol. 1, pp. 331 and 352), by F. R. Cana, author of *South Africa from the Great Trek to the Union*; ASIA, *Exploration* (Vol. 2, p. 738), by Col. Sir Thomas H. Holdich, formerly superintendent of the Frontier Surveys of India; AUSTRALIA, *Discovery and Exploration* (Vol. 2, p. 958); and POLAR REGIONS (Vol. 21, p. 938), by Dr. Fridtjof Nansen, the Arctic explorer, and Dr. H. R. Mill, which gives a brilliant survey of all the attempts to conquer the frozen world. In connection with these articles should be read the full and interesting biographies of the great modern explorers such as BAKER, SIR SAMUEL WHITE (Vol. 3, p. 227); BURTON, SIR RICHARD F. (Vol. 4, p. 864), by Dr. Stanley Lane-Poole; LIVINGSTONE, DAVID (Vol. 16, p. 813), by John Scott Keltie, secretary of the Royal Geographical Society; STANLEY, SIR HENRY MORTON

**Modern Exploration** (Vol. 25, p. 779), by F. R. Cana; EMIN PASHA (Vol. 9, p. 340); SPEKE, JOHN H. (Vol. 25, p. 633); PARRY, SIR WILLIAM EDWARD (Vol. 20, p. 865); FRANKLIN, SIR JOHN (Vol. 11, p. 30); KANE, ELISHA KENT (Vol. 15, p. 650); NORDENSKIÖLD, NILS ADOLF ERIK (Vol. 19, p. 740); NANSEN, FRIDTJOF (Vol. 19, p. 162); PEARY, ROBERT EDWIN (Vol. 21, p. 30). See the chapter on *Geography* in this Guide.

A strong taste for history is often found in children, and the new Britannica is, among other things, a complete history of the world, by the greatest historians of the present day. In respect to the treatment and arrange-

**A Complete History of the World** ment of the historical section there are many things that make it especially adapted for young people's reading. In the first place the great episodes of history, such as FRENCH REVOLUTION, RENAISSANCE, REFORMATION, MIDDLE AGES, and CRUSADES, are discussed in separate articles. Also every battle, siege, campaign, or war of importance



has its article, apart from its treatment in the histories of countries. The historical articles in the new Britannica will send those a little older to other articles dealing with government, and thus help them to cope intelligently with the social and civic problems of the age—in other words, enable them to become the best kind of citizens. The chapter in this Guide headed *Questions of the Day* covers this ground; and see the chapters on *History*.

A child is naturally curious to know about mountains, rivers, caverns, the causes of rain, dew and wind. Just as this encyclopaedia shows itself the best of instructors in regard to the plant and animal world, so with natural phenomena it serves to bring the child into close, sympathetic touch with the truths of science.

The principles of physical geography are clearly explained in *GEOGRAPHY, Principles of* (Vol. 11, p. 630), by Dr. H.

**Physical Geography made Interesting** these are learned young people will turn with eager interest to such articles as *ALPS* (Vol. 1, p. 737), partly by W. A. B. Coolidge, author of *The Alps in Nature and in History*; *ANDES* (Vol. 1, p. 960); *APPALACHIAN MOUNTAINS* (Vol. 2, p. 207), by Dr. Arthur C. Spencer, geologist to the Geological Survey of the United States; *HIMALAYA* (Vol. 13, p. 470); *VOLCANO* (Vol. 28, p. 178), by F. W. Rudler, of the Museum of Practical Geology, London; *VESUVIUS* (Vol. 27, p. 1063), by Sir Archibald Geikie and Dr. Thomas Ashby; *EARTHQUAKE* (Vol. 8, p. 817), by F. W. Rudler and Dr. John Milne, author of *Earthquakes, etc.*; *GEYSER* (Vol. 11, p. 913); *CAVE* (Vol. 5, p. 573), by Dr. William Boyd Dawkins, author of *Cave Hunting, etc.*; *MAMMOTH CAVE* (Vol. 17, p. 531), by Rev. Horace C. Hovey, author of *Celebrated American Caverns, etc.*; *LURAY CAVERN* (Vol. 17, p. 127), also by Dr. Hovey; *GRAND CAN-*

*YON* (Vol. 12, p. 347), by R. S. Tarr, late professor of physical geography, Cornell University; *GREAT SALT LAKE* (Vol. 12, p. 421); *YOSEMITE* (Vol. 28, p. 937), by Dr. John Muir, president of the American Alpine Club, and author of *The Mountains of California*; *YELLOWSTONE NATIONAL PARK* (Vol. 28, p. 912); *GLACIER* (Vol. 12, p. 60), by Rev. E. C. Spicer, of Oxford University; *NIAGARA* (Vol. 19, p. 634), by Dr. G. K. Gilbert, author of *Niagara Falls and their History*; *MISSISSIPPI RIVER* (Vol. 18, p. 604); *AMAZON* (Vol. 1, p. 783), by Col. George E. Church, the famous American explorer of the Amazon; *ORINOCO* (Vol. 20, p. 275), also by Colonel Church; *RHINE* (Vol. 23, p. 240), by Dr. J. F. Muirhead, editor of many of Baedeker's Guide Books, and Philip A. Ashworth; *NILE* (Vol. 19, p. 692), by F. R. Cana and Sir W. E. Garstin, governing director, Suez Canal Co.; *NIGER* (Vol. 19, p. 674) and *CONGO* (Vol. 6, p. 914), by F. R. Cana; *YANGTZE-KIANG* (Vol. 28, p. 903), by George Jamieson, formerly British consul-general at Shanghai; *DESERT* (Vol. 8, p. 92), by Dr. H. N. Dickson, professor of geography, University College, Reading; *SAHARA* (Vol. 23, p. 1004), by Edward Heawood, librarian of the Royal Geographical Society, London, and F. R. Cana. There are also separate articles on the oceans and large lakes.

Astronomy is a science which is peculiarly attractive to children, since it arouses the imagination and makes a strong appeal to their delight in all that is marvelous. There are 277 astronomical articles in the new Encyclopaedia Britannica to which the classified list in the Index Volume (Vol. 29, p. 888) is the key.

In the preceding chapter are mentioned a few articles which will serve for the beginning of an acquaintance with astronomy. When a child has learned to know the zodiacal constella-

**Readings in Astronomy**

for the beginning of an acquaintance with astronomy.



tions he will certainly want to read **ZODIAC** (Vol. 28, p. 993), by Agnes M. Clerke, author of *A History of Astronomy in the 19th Century*, for the story of the signs and what they meant to the nations of past ages. There are separate articles on the principal constellations and stars. **ASTROLOGY** (Vol. 2, p. 795), by Prof. Morris Jastrow of the University of Pennsylvania, will prove both entertaining and instructive.

Those who wish to know about methods of observation will find the complete story in **TELESCOPE** (Vol. 26, p. 557), a beautifully illustrated article by H. Dennis Taylor, author of *A System of Applied Optics*, and Sir David Gill, formerly astronomer royal at the Cape of Good Hope.

In the preceding chapter a few articles on games were mentioned as being useful to parents helping very young children to amuse themselves. A little later, the child will be delighted to choose for himself among the 260 articles on sports and pastimes; and the analysis of this department of the Britannica, in Part 6 of this Guide, will then be of service. We may mention here the articles **GOLF** (Vol. 12, p. 219), by H. G. Hutchinson, golf champion and author of *Hints on Golf*; **LACROSSE** (Vol. 16, p. 54); **BOWLING** (Vol. 4, p. 344); **ROWING** (Vol. 23, p. 783), by C. M. Pitman, formerly stroke of the Oxford University Eight; **MODEL-YACHTING** (Vol. 18, p. 640); **ANGLING, Methods and Practice** (Vol. 2, p. 24); **CRICKET** (Vol. 7, p. 435); **ARCHERY, Pastime of** (Vol. 2, p. 364), by the late W. J. Ford. A long list of indoor and outdoor games will be found in the classified subject-list (Vol. 29, p. 946).

The aptitude of children for diverting and often profitable occupations is admirably fostered by the new Britannica through many of its very practical arti-

cles. This matter has been discussed in the last chapter.

**Diverting and Profitable Occupations** In addition it is worthy of note that an ingenious boy could learn to make and set up a sun-dial with the help of **DIAL AND DIALLING** (Vol. 8, p. 149), by Hugh Godfray; and could experiment and amuse himself with a **CAMERA LUCIDA** or a **CAMERA OBSCURA** (Vol. 5, p. 104), from the articles written by Charles J. Joly, late Astronomer Royal of Ireland; while even a younger child could quickly learn to tie any kind of a knot from **KNOT** (Vol. 15, p. 871), with 54 illustrations, by P. G. Tait, the famous British physicist. All the crafts that produce objects of household utility are practically taught in articles by experts, so that the Britannica is a complete guide to the use of every kind of tool.

In the field of girls' occupations there is in the Britannica much material that serves to give knowledge of the best methods of home making.

**Reading for Girls** *A great number of articles for girls' reading will be found among those named in the chapter For Women.*

In these days parents, and especially mothers, are devoting more and more time to the study of child development. The importance and value of intelligent sympathetic guidance in everything a child does—and every active child strives to do something—has been fully realized. The chief problem before the parent is, therefore, to have at hand some ready means of meeting every expression of a child's interests, every indication of budding talents. A short experience with the new Britannica will show this to be one of its many valuable functions. Children do not need to be driven to the volumes. They need only to be made acquainted with them.

## CHAPTER LXIII

SOME QUESTIONS CHILDREN SOMETIMES ASK, AND  
SOME QUESTIONS TO ASK CHILDREN

**A** CHILD gains a great part of its knowledge by asking questions, and he should be encouraged to ask them. But parents often find the child's questions, even those about the objects he sees every day, so difficult to answer, that he is told "not to bother." With the new Encyclopædia Britannica at hand, there is hardly any intelligent question that cannot be answered after a glance at the Index and at the page to which it refers the reader. Again, there is no better way at once of amusing and instructing the child than to ask him questions and help him find his way to the answers. Here are a few questions: some of the kind that a child might ask, and some that may be put to a child. The Britannica supplies interesting answers to all of them, and some of these answers are given here.

*What makes people snore?*

The answer, found at once by referring to "snoring" in the Index, is that the cause is breathing through the mouth, which makes the soft palate vibrate. When the child is told this, it should also be told what the Britannica says about mouth-breathing being a dangerous habit for children to form, as it often leads to sore throats.

*How does one ant tell another to go to work?*

By patting it with its feelers. The article ANT, by Professor Carpenter, will supply you with stories to tell children as fascinating as any fairy tale.

*What makes the colours of sunset?*

Dust. If it were not for the dust floating in the air, we should lose not only the brilliant sunsets but the glori-

ous cloud scenery as well, and there would be no twilight. Furthermore, all the moisture in the air, which now condenses on the particles of floating dust, would settle on our clothes and on the walls of our rooms. You will find many other curious facts in the article DUST, by John Aitken, who invented the machine for counting the particles of dust in the atmosphere.

*How does the brightness of moonlight compare with that of sunlight?*

Most people would guess that sunlight is twenty, or, at most, fifty times as strong; yet it is really half a million times stronger. The article MOON, by Dr. Simon Newcomb, is full of such curious information and of delightful pictures.

*Why did the Israelites in bondage need straw to put in their bricks, although we do not use it in ours?*

The article BRICK tells you that their bricks were made of Nile mud, which would not bind without something to hold it together.

*When sea-water freezes, does the salt go into the ice?*

Only one-fifth of it, the article ICE says.

*Are you sure you like the taste of vanilla?*

This is an excellent puzzle to put to a bright child. The curious answer, found in the article TASTE, is that vanilla, like onions and some other substances which we think have strong flavors, really has no taste at all. We smell them as we eat them, and therefore we imagine we taste them. This you can prove to a child by blindfolding it, while its nose is firmly closed, holding a slice of onion

and a slice of apple near its open mouth, and touching its tongue first with one and then with the other.

*What is a beaver's favourite food?*

Of all unlikely things—water-lilies! This, and other things that will delight children, you will find in the article **BEAVER**, by Richard Lydekker, the famous naturalist.

*Why is it harder to guess the width of a river than to guess the width of a field as wide?*

The article **VISION** will tell you.

*Why are new-born babies' eyes often slate-blue, for a time?*

The article **EYE** will tell you.

*Why is not spiders' silk manufactured?*

Unfortunately, although the silk is of the finest quality, quite equal to the silkworm's, the spiders are such fierce cannibals that each one would have to be kept in a separate box, and this would make the silk too costly. The article **SPIDERS**, by R. I. Pocock, superintendent of the London Zoological Gardens, also tells you how spiders make their way through the air to islands in the sea; how the wolf-spider builds a nest with a hinged door, and how the common pond-spider builds his thimble-shaped house under water and fills it with air by swimming down to it, time after time, on each trip taking down a tiny bubble of air.

*Why do not animals that sleep all through the winter starve to death?*

Because they live on the fat they have put on during the summer, as the article **HIBERNATION** explains.

*Why could not the Norsemen who visited America in the 11th century found permanent settlements?*

The natives were hostile and the Norsemen had no firearms. The wonderful story of the first voyages to America is told in the article **VINLAND**.

*How can you tell how far away a flash of lightning is?*

Sound travels so much more slowly than light does, that if the flash is a mile

away you see it five seconds before you hear the report; so by counting the seconds you can measure the distance. The Index, under "Lightning: distance" refers you to the article **SOUND**, by Professor Poynting.

*Why does your hair stand on end when you are frightened?*

The article **SKIN**, by Professor Parsons, will tell you about this curious action of the muscles.

*Why do we count by tens?*

Because people began by counting on their fingers and thumbs, and when they got to ten they had to begin again. Some tribes used to make twenty their basis for counting, adding in their toes. The article **ARITHMETIC** tells you this; and a newspaper critic said of this article that he was amazed to find it one of the most readable things in the Britannica. The truth is that there are no subjects that are dull in themselves. There is a dull way of treating them, and there is also the Britannica way, which is to show you *how things came to be as they are*. That is why children are delighted when "Britannica time" comes, the hour when the parent sits down by the bookcase and tells them true stories out of the volumes and shows them the exquisite pictures.

*Are men or women oftener stammerers?*

The article **STAMMERING**, which tells you that men are much oftener afflicted than women, is one that all parents should read. If a child's speech is carefully watched, the first trouble of this kind may sometimes be checked before it becomes a habit.

*Why does a room look smaller with red than with violet wall-paper?*

Read the article **VISION** and you will understand this and many other curious facts about the way our eyes do their work. Furthermore, you will be reminded that slight defects in a child's sight should be noticed and treated by an oculist before permanent harm has been done.

*Why is winter colder than summer?*

Simply because the sun's rays, coming aslant instead of from overhead, travel through more miles of air and are thus robbed of much of their heat before they reach us. The polar regions actually get more hours of sunlight in a year than we get in the United States, more even than there are at the equator, but the sun is never high above the horizon at the poles.

*Can a snake cross a frozen pond?*

No, nor move on any other smooth surface, as the article SNAKES shows.

*How long was Abraham Lincoln at school?*

Less than a year in all, as shown by the article LINCOLN, ABRAHAM, by J. G. Nicolay (Lincoln's private secretary) and C. C. Whinery. But although he could not get much teaching, he read over and over again every book he could get hold of.

Here are a few questions without the answers; but the numbers after each question show the volume and page of the Britannica where each answer can be found:

*What makes blood clot?* (Vol. 4, p. 81.)

*Are there any red-haired human races?* (Vol. 12, p. 823.)

*Why does a cut apple turn brown?* (Vol. 21, p. 756.)

*What makes negroes black?* (Vol. 25, p. 190.)

*Are men or women oftener colour-blind?* (Vol. 28, p. 139.)

*Why do stars twinkle?* (Vol. 23, p. 29.)

*What happens in your throat when you sob?* (Vol. 23, p. 195.)

*What change in water, as it freezes, makes ice float?* (Vol. 14, p. 227).

*Why is the shadow cast by an electric light sharper-edged than the shadow cast by the sun?* (Vol. 24, p. 758).

*Why does fright make people faint?* (Vol. 27, p. 942).

*What makes the beautiful "ice-flowers" on a frosted window-pane?* (Vol. 14, p. 226).

*How do trappers prepare valuable furskins so as to preserve them until they get to market?*

The skins are simply dried in the air, as stated in the article FUR, which was written by the head of a great wholesale fur business.

*How does the amount of air in a room spoiled by an ordinary gas-burner, or a small reading-lamp, compare with the amount spoiled by a man's breathing?*

The gas burner or the lamp spoils four times as much air, as shown in the article VENTILATION.

*What part of your weight is blood?*

One-twentieth. (Vol. 27, p. 939).

*What domestic animal is oftener born with only one eye?*

The pig. (Vol. 18, p. 743).

*Which covers the more space, the United States (without Alaska) or Europe?*

Europe. (Vol. 27, p. 612, and Vol. 9, p. 907.)

*If you looked at the moon all night every night, how soon would you have seen all its surface?*

Never. Four-tenths of it can never be seen from the earth. (Vol. 18, p. 803.)

*What was the great difference between the destruction of Pompeii and that of Herculaneum?*

Pompeii was covered by ashes and Herculaneum by mud. (Vol. 22, p. 50, and Vol. 13, p. 342.)

*Why do not high mountains, where more snow falls than melts, keep growing higher?*

Because pressure forces the snow, changed into ice, to descend in the form of glaciers, as explained in the article GLACIER.

*Who wrote to George Washington, on behalf of a number of officers in the United States army, asking him to make himself king of the United States?*

Col. Lewis Nicola. The article WASHINGTON, GEORGE, by Professor MacDonald of Brown University, gives you the words of Washington's indignant reply.

*How deep has anyone ever dived in diver's dress?*

The article **DIVERS** tells you: 210 feet.

*In baseball, how is a fielding-record calculated?*

To get the fielder's average, you divide the number of chances he has made the most of by the total number of chances he has had. (Vol. 3, p. 461.)

*How tall must a giant be?*

Seven feet, to be properly called a giant. (Vol. 18, p. 741).

*Where were the first lighthouses built?*

In lower Egypt, as stated in the article **LIGHTHOUSE**, which describes all the great lighthouses and gives pictures of the towers and of the wonderful lamps.

*When ships are going through the Panama Canal, from the Atlantic to the Pacific, will they be heading to the eastward or to the westward?*

Oddly enough, to the eastward; for the Isthmus curves so, just where the canal line lies, that the Pacific end is much to the eastward of the Atlantic end. You can see this plainly on the detailed map in the article **PANAMA CANAL**.

*Why does a tame rabbit die if it is held erect for half an hour?*

Because the muscles of its abdomen are so weak that they cannot act as a belt, as our muscles do, and all the rabbit's blood settles below the heart. (Vol. 27, p. 942.)

*For what price was Manhattan Island bought from the Indians in 1626?*

For \$24 worth of goods, as shown in the article **NEW YORK**.

*Why do people, when they are in the polar regions, seldom catch cold?*

Because colds are caused by microbes and there are very few microbes in places so far from any masses of people, as you can see from the article **CLIMATE**.

*If North America were spread out on the surface of the moon, what share of the moon's surface would it cover?*

About four-sevenths. (Vol. 18, p. 805, and Vol. 19, p. 764.)

*Which is the greater: the highest mountain's height or the deepest sea's depth?*

The sea's depth, which is 31,614 feet; while Mt. Everest is 29,002 feet high. (Vol. 19, p. 973, and Vol. 10, p. 7.)

*Of what use are the hairs on a caterpillar?*

Like the bristles on a dog-collar, they keep an enemy from biting him. (Vol. 6, p. 733.)

*Why do you twist yourself into an uncomfortable position when you have a pain?*

Because instinct teaches you that discomfort will help you by partially taking your attention away from the pain. (Vol. 22, p. 587.)

*What warm-blooded creature has the longest average life?*

Man, except possibly the whale; but not the elephant, as is generally believed. The article **LONGEVITY** tells how long all kinds of animals live.

*What mistake about American history is caused in our minds by the celebration of the Fourth of July?*

The belief that the Declaration of Independence was signed on the 4th of July. Congress did not order it to be engrossed for signature until July 19th. The article **INDEPENDENCE, DECLARATION OF**, also shows that the most important day was July 2nd, when Congress adopted the Resolution of Independence.

If you look up the answers to these questions, in the Britannica, you will incidentally learn, from the articles to which you turn, a great many things that will be of practical use to you in everyday life. For whether you turn to the volumes because you want only a single fact, or because you want to learn all about some important subject—or even because you merely want to pass a pleasant hour—you always get from them far more than you had hoped to find.



# PART IV

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READINGS ON QUESTIONS OF THE DAY  
WHICH RELATE TO THE DUTIES  
OF AMERICAN CITIZENSHIP  
AND TO CURRENT  
POLITICS



## CHAPTER LXIV

### QUESTIONS OF THE DAY

**T**HE old idea of an encyclopaedia as a remote book, distant from every-day needs and the real public questions of the day, and to be consulted only for information

#### An Intimate Book

about ancient history and medieval philosophy, was a wrong one.

It was wrong *in theory*, if an encyclopaedia is to be a live and valuable book. And it was wrong *in practice*. It is not the case with the new Britannica. For the Britannica is full of information about current public questions; and even its treatment of the past, remote or near, is from a fresh and modern view-point, and is of the utmost value as throwing the light of history on the problems of modern politics and every-day life. The spirit of today is an intensely wide-awake and inquisitive one, and people are no longer willing to believe that "whatever is, is right"—much less that a thing is right because it *has been*, no matter how long. Indeed the very phrase "has been" as now used in the vernacular implies the outworn, the discarded. The Britannica, a book for intimate use on the questions of the day, is a record of *what is*, as well as of what has been, and of the great changes, the constant flux, of the past and of the present.

One of our symptoms of health is the development of a social sense, or, better, a social conscience. This is due in no small degree to the work

#### Sociology

of Herbert Spencer in founding a new science,

called by him Sociology. For an inspiring and stimulating starting-point for the study in the Britannica of the great social and political questions of the day let the reader study the article SOCIOLOGY (Vol.

25, p. 322), by Benjamin Kidd, who wrote *Social Evolution*, and *Principles of Western Civilization*.

Evolution, sociology, Spencerian psychology and the closer relation of the state to the individual are all important

factors in the educational changes of the last few years; and their

study is indispensable to a clear understanding of the great questions of education. A more concrete study may be based on the article EDUCATION (Vol. 8, p. 951) and particularly the part on education in the United States by Nicholas Murray Butler, president of Columbia University. An elaborate course of reading on education is given in another chapter of this Guide *For Teachers*. But it may be well to call attention here to the fact that there are in the articles on individual states sections on the educational system of each state; and in the separate articles on each city similar descriptions of schools in those cities; and also that either in the article on the city or town in which it is situated, or in a separate article there is an estimate, a description, and a historical sketch of each of the great universities and colleges of the country. This information is not merely of value if one wishes to understand in a general way the trend of education, but of particular interest to one who is choosing the school best adapted to a special need. In the same way there are articles on other great educational institutions—for example a general article on MUSEUMS OF SCIENCE (Vol. 19, p. 64) and one on LIBRARIES (Vol. 16, p. 545), as well as articles on such special institutions as the Smithsonian, or treatment of them in the article on the places where the institu-

tion is—as in the article on Washington for the Library of Congress, the article on New York City for the Metropolitan Museum, etc.

But government, particularly in America, besides taking a direct interest and responsibility in the education of its

### Defectives and Their Training

youth, has begun within the last few years to assume the task of uplifting those of its citizens who are below the normal. Modern methods of dealing with criminals and of caring for defectives and the insane are based on a principle entirely different from that which obtained 50, or even 20, years ago. The whole article *INSANITY* (Vol. 14, p. 597) might well be read as a preliminary to a study of this topic, since it treats of idiocy and imbecility as well as of the more violent forms of mental disorder, and since it treats them all as forms of disease—the basis of the modern method of treatment which has substituted the hospital and the school for the mere place of detention. In particular, however, the last part of this article dealing with *Hospital Treatment* should be studied. It is by Dr. Frederick Peterson, the American specialist, and it describes the improved conditions of modern asylums. "Physical restraint is no longer practised. . . . The general progress of medical science in all directions has been manifested in the department of psychiatry by improved methods of treatment, in the way of sleep-producing and alleviating drugs, dietetics, physical culture, hydrotherapy and the like. There are few asylums now without pathological and clinical laboratories. . . . The colony scheme has been successfully adopted by the state of New York at the Craig Colony for Epileptics at Sonyea and elsewhere. . . . Many asylums have, as it were, thrown off detached cottages for the better care of certain patients. . . . But the ideal system is that of the psychopathic hospital and the colony for the insane." It is with the

"colony" plan that Dr. Peterson's name is intimately connected, especially in New York state. In the Britannica article on New York state there is a full treatment (Vol. 19, p. 601) of the state's charitable institutions, including its hospitals for the insane, the Craig Colony already mentioned, the Letchworth Village custodial asylum for epileptics and feeble-minded, and other institutions of the same kind. And in the same way the system in each state is described in the separate article on that state with special attention to the peculiar features in its administration of its hospitals and schools for insane and imbeciles.

There has been a similar change in the education of the blind and the deaf—or rather education is now provided for these

### The Blind

classes, whereas they formerly received none at all. And this education is coming under state control and, once under governmental supervision, is being transferred from departments in charge of penal or charitable institutions to the department of public schools. For the most striking instances of what has been accomplished by improved systems of training under private supervision see the articles on SAMUEL GRIDLEY HOWE (Vol. 13, p. 837), the great teacher of the blind at the Perkins Institution for the Blind in Boston; on his blind and deaf pupil, LAURA BRIDGMAN (Vol. 4, p. 559), and on HELEN ADAMS KELLER (Vol. 15, p. 718), another and even more remarkable blind and deaf student, whose education, coming as a product of a new sociology, has made her a most efficient social helper and social worker.

From these articles the student should go to *BLINDNESS* (Vol. 4, p. 59), by Sir Francis J. Campbell, principal of the Royal Normal College for the Blind, Norwood, London; an article equivalent in length to 40 pages of this Guide. Its author, the founder of the college, is himself a blind man, who, born in Tennessee, in 1832, and educated at the Nashville

school, and afterwards in music at Leipzig and Berlin, had from 1858 to 1869 been associated with Dr. Howe at the Perkins Institution, Boston, and was knighted in 1909 for his services to the education of the blind. The part of his article dealing with the education of the blind is, therefore, doubly valuable and interesting. The main topics with which it deals are: early training—other senses of the blind not *naturally* sharper than those of the seeing, but developed by cultivation of hearing and touch from early childhood; physical training to increase the average of vitality; mental training; early manual training; choice of occupation; piano-forte tuning; musical training; deaf-mutes should not be educated with the blind as their needs are so different; blind boys and blind girls should not be taught together, as co-education promotes intermarriage, which is a calamity. The remainder of the article deals with types and books for the blind, appliances for educational work, employment, and biographical matter, with a list of prominent blind people. See also, for literary men who were blind, the articles on JOHN MILTON, WILLIAM H. PRESCOTT, and PHILIP BOURKE MARSTON.

DEAF AND DUMB (Vol. 7, p. 880) is by the Rev. Arnold Hill Payne, chaplain to the Oxford Diocesan Mission to the deaf and dumb, late normal

**The Deaf** fellow of the National Deaf Mute College, Washington, D. C., and author of many books on the subject. He points out the mistaken use of the word "dumb"—"In the case of the deaf and dumb, as these words are generally understood, dumbness is merely the result of ignorance in the use of the voice, this ignorance being due to deafness." After discussing causes of deafness, the condition of the deaf in childhood, their natural language, which the contributor thinks is "sign" rather than purely oral, and their social status, he deals with education of the deaf, giving an elaborate historical account including the "oral"

revival in Germany and the work in the United States of Dr. Thomas Hopkins Gallaudet—see also the separate article on him and his two sons (Vol. 11, p. 416)—and of the National Deaf-Mute College at Washington, D. C. (on which see also the article WASHINGTON, D. C.). This interesting article closes with a section on the blind-deaf, telling the story of several remarkable cases in England less well-known and more recent than Laura Bridgman or Helen Keller.

This chapter began with a reference to the article on SOCIOLOGY with the recommendation that it be used as a basis for

**Psychology** the study of present-day problems. The reader will often have heard vague allusions to sociology, and his reading this article in the Britannica will certainly sharpen and define his own idea of the meaning and the value of the science. Has he not heard much oftener of psychology, and heard it mentioned as if it were some sort of magic spell to charm away many of the difficulties of our modern complex world? But has he a full comprehension of the meaning of psychology and of the knowledge newly gained in regard to the "psychology of the senses"? The corrective for any vagueness of ideas about psychology is best found in the article PSYCHOLOGY (Vol. 22, p. 547) by Professor James Ward, whose articles for the Britannica have been reprinted and used as textbooks in schools and colleges all over the country. Put in a few words, the lesson of psychology is that the senses, sensations, thoughts and feelings, which, even when they are our own, we too often speak of as if they were things apart and independent, are subject to certain natural laws in much the same way as are the forces treated by the science of physics. The reader who would study the subject of psychology in the Britannica should make use of the analysis of many articles in the chapter in this Guide *For Teachers*.



As with general education, special education of defectives, state training of feeble-minded, and restraint of the insane, so with the state's attitude toward the criminal there has been in recent years a great change which is still working toward full fruition, so that prison administration, children's courts, delinquency, probation, etc., are live topics of interest.

### Crime

Just as the whole new science of sociology was based by Spencer on biology and on the Darwinian theory of evolution, so in this field of delinquency a "science" has been devised called criminology by its "inventor" Cesare Lombroso. The article **LOMBROSO** (Vol. 16, p. 936) in the Britannica criticizes his theories as showing "an exaggerated tendency to refer all mental facts to biological causes." His theory of a criminal type points to a "practical reform . . . a classification of offenders, so that the born criminal may receive a different kind of punishment from the offender who is tempted into crime." The article **CRIMINOLOGY** (Vol. 7, p. 464), by Major Arthur Griffiths, Inspector of Prisons, should be read carefully. It lists the supposed criminal traits as follows:

Various brain and cerebral anomalies; receding foreheads; massive jaws, prognathous chins; skulls without symmetry; ears long, large and projecting; noses rectilinear, wrinkles strongly marked, even in the young and in both sexes, hair abundant on the head, scanty on the cheeks and chin; eyes feline, fixed, cold, glassy, ferocious; bad repellent faces. . . . Other peculiarities are:—great width of the extended arms, extraordinary ape-like agility; left-handedness as well as ambi-dexterity; obtuse sense of smell, taste and sometimes of hearing, although the eyesight is superior to that of normal people. . . . So much for the anatomical and physiological peculiarities of the criminal. There remain the psychological or mental characteristics, so far as they have been observed. Moral insensibility is attributed to him, a dull conscience that never pricks and a general freedom from remorse. He is said to be generally lacking in intelligence, hence his stupidity, the want of proper precautions, both before and after an offence, which leads so

often to his detection and capture. His vanity is strongly marked and shown in the pride taken in infamous achievements rather than personal appearance.

Although Major Griffiths thinks that criminality is oftener due to environment than to congenital defects, he closes his article with this estimate of what has been accomplished by Lombroso and his followers:

The criminologists have strengthened the hands of administrators, have emphasized the paramount importance of child-rescue and judicious direction of adults, have held the balance between penal methods, advocating the moralizing effect of open-air labour as opposed to prolonged isolation, and have insisted upon the desirability of indefinite detention for all who have obstinately determined to wage perpetual war against society by the persistent perpetration of crime.

The article **CRIME** (Vol. 7, p. 447) is full of interesting statistics and facts. It tells us that "the growth of criminals is greatly stimulated where people are badly fed, morally and physically unhealthy, infected with any forms of disease and vice," and after proving by the records of various countries that men everywhere are more addicted to crime than are women, ends with this statement: "It has been well said that women are less criminal according to the figures, because when a woman wants a crime committed she can generally find a man to do it for her."

Other important articles on the subject are **DEPORTATION** (Vol. 8, p. 56) and **PRISON** (Vol. 22, p. 361). For English prison reforms, see also the article on **JOHN HOWARD** and that on **ELIZABETH FRY**, with an outline of the growth in Pennsylvania and New York (Auburn and Sing Sing), of the method of solitary confinement and of its adoption in England, and of the development in New York (see also the article on **ELMIRA** for the work of Zebulon R. Brockway), and in Massachusetts (Concord), of distinct and different treatment for first offenders.

**JUVENILE OFFENDERS** (Vol. 15, p. 613) describes the work of Charles Dickens

and others in England, the reform in Europe and in the United States; the philanthropic criminal code proposed

**Children's Courts** by EDWARD LIVINGSTON (see the biographical article, Vol. 16, p. 811); the Randall's Island House of Refuge, the Elmira (N. Y.) Reformatory, the reformatory for women at Sherborn, Massachusetts, and the George Junior Republic at Freeville, New York, and its offshoots—see also the separate article GEORGE JUNIOR REPUBLIC (Vol. 11, p. 749); and the Borstal scheme, a modification of the American state reformatory system adopted in England in 1902.

CHILDREN'S COURTS (Vol. 6, p. 140) calls attention to the origin of these tribunals in the United States, in Massachusetts and Illinois, and their success in Chicago, Indianapolis, Denver and Washington, leading to their adoption in England; see also the article PROBATION (Vol. 22, p. 404) in general and, for particular and local methods, the articles on BIRMINGHAM (Vol. 3, p. 985), BOSTON (Vol. 4, p. 294), CHICAGO (Vol. 6, p. 124), COLORADO (Vol. 6, p. 722), EGYPT (Vol. 9, p. 29), ILLINOIS (Vol. 14, p. 308), and UTAH (Vol. 27, p. 818). The articles on individual states also contain detailed information about local penal institutions of all kinds.

The reader should also study the articles POLICE (Vol. 21, p. 978), FINGER PRINTS (Vol. 10, p. 376), IDENTIFICATION (Vol. 14, p. 287), PUNISHMENT (Vol. 22, p. 653), CAPITAL PUNISHMENT (Vol. 5, p. 279), GUILLOTINE (Vol. 12, p. 694), HANGING (Vol. 12, p. 917), and ELECTROCUTION (Vol. 9, p. 210), the last by Professor Edward Anthony Spitzka, the American authority on the subject. In the article on Utah, already mentioned, the reader will find that "a person sentenced to death may choose one of two methods of execution—hanging or shooting."

If a respectable citizen of a century ago

could return to earth he could not fail to be greatly surprised at dinner, whether in a private home or in a hotel, to see how much less alcoholic beverages are used,

**Alcohol** how much lighter they are, and how much more common are other drinks. If he "returned" to certain parts of the United States he would find that he could get no alcohol except on a doctor's prescription stating the reason why the patient needed it, and he would learn that such a prescription could be filled only once, and then only by a registered pharmacist of good character. No matter to what place he came back, he would find a constant interference with or supervision of the manufacture, sale and consumption of alcoholic liquors on the part of the government. He would probably wonder why the state should interfere with private and personal liberty in such matters. We have already pointed out that the state now *does* interfere, and that this is one of the distinguishing marks of the government of the day. For information on this particular form of interference, its prevalence, its necessity, and its advisability, the student may confidently turn to the Britannica. The hygienic side of the question is outlined in the chapter of this Guide on *Health and Disease*. The social or sociological side claims our attention here. Read the article DRUNKENNESS (Vol. 8, p. 601), and for the relation between alcohol and mental disease, the section *Toxic Insanity* (Vol. 14, p. 609) in the article on INSANITY already mentioned, and also NEUROPATHOLOGY (Vol. 19, p. 429); then the article INEBRIETY, LAW OF (Vol. 14, p. 409); that on LIQUOR LAWS (Vol. 16, p. 759), with a special section referring to the United States, which deals with local prohibition, state prohibition, public dispensaries, and taxation; and for a general and elaborate summary of the whole question the article TEMPERANCE (Vol. 26, p. 578) equivalent to about 50 pages of this Guide, by Dr. Arthur Shadwell, author of

*Drink, Temperance and Legislation.* In the section on the *Use and Abuse of Alcohol* Dr. Shadwell summarizes the results of modern scientific investigation of the abuse in its bearings upon crime, poverty, insanity, mortality, longevity, and heredity.

In such articles as those on THEOBALD MATHEW ("Father Mathew") (Vol. 17, p. 886), NEAL DOW (Vol. 8, p. 456), JOHN B. GOUGH (Vol. 12, p. 282), and FRANCES E. WILLARD (Vol. 28, p. 658) the reader will find biographies relating to the temperance movement; and in the separate articles on states there is information about state prohibition, local option, and the state dispensary system.

Dr. Shadwell's remarks on the relation of alcoholism to heredity may remind us that the very word "heredity" would seem strange to the typical man of a century ago, whose return to life we have imagined. We should be no more shocked by the occasional crudeness of his intimate and excited phraseology than he would be at our frankness in discussing even in mixed company such subjects as birth, reproduction, sexual morality, the social evil and the white slave trade. The growth of interest in these topics may be traced in part to Darwin, Huxley and Mendel, to what they did to make biology a science. Read in the Britannica the interesting story, in the article MENDELISM (Vol. 18, p. 115), of the investigations of Gregor Mendel, Abbot of Brnn, in his cloister garden, in crossing peas and classifying the inheritance of peculiarities. Then read the articles

**Heredity  
and  
Eugenics**

HEREDITY (Vol. 13, p. 530), by Prof. Chalmers Mitchell, and HYBRIDISM (Vol. 14, p. 26), by the same contributor, and turn to the articles EUGENICS (Vol. 9, p. 855) and SIR FRANCIS GALTON (Vol. 11, p. 427), for an account of the attempt to found a practical science to improve the breed of men.

Especially within the last few years

has the public conscience been aroused on the white slave traffic and prostitution, both in Great Britain and the United States, and particularly in the great cities, where this form of vice, if left under the jurisdiction of the police, gives rise to a singularly dangerous form of corruption and to the general disrepute of the defenders of public safety. The many important aspects of the subject, which need not be rehearsed here, are to be found in Dr. Shadwell's article PROSTITUTION (Vol. 22, p. 457) and Dr. Edmund Owen's article VENEREAL DISEASES (Vol. 27, p. 983).

One of the remedies most commonly suggested for the evils of prostitution in general and of the white slave trade in particular is a minimum wage. Dr. Shadwell's article on prostitution gives "excessively laborious and ill-paid work" as only one of many secondary causes for women's taking to a life of evil repute. Indolence, love of excitement, dislike of restraint, and abnormal sexual appetite, he counts as primary causes; and among secondary causes he names the difficulty of finding employment; harsh treatment at home, promiscuous living among the overcrowded poor; overcrowding in factories; the example of luxury, self-indulgence and loose manners set by the wealthy; demoralizing literature and amusements; and the arts of profligate men. But the subject of wages is an important one in itself, and as an introduction to the study of the labour question, it may well be taken up here, even if the efficacy of minimum-wage laws, or of any legislation, in producing a higher sexual morality has been exaggerated.

Read the article WAGES (Vol. 28, p. 229, equivalent to 20 pages of this Guide), by Joseph Shield Nicholson, professor of political economy at Edinburgh University. The difficulty of an exact definition, and, specifically, of one that distinguishes between "wages" and "profits,"

leads the author to adopt as the best the definition of Gen. Francis A. Walker, the American economist, "the reward of those who are employed in production with a view to the profit of their employers and are paid at stipulated rates." The distinction between a nominal and real wage is based on the difference between the money value and the purchasing value of the wage as affected by variation in the cost of living. Irregularity of employment and other elements of uncertainty, such as liability to accident or to occupational diseases, are factors to be considered in estimating real wages. Professor Nicholson discusses the wage-fund theory, corrects it by Adam Smith's observation that wages are paid from the product of labour; and treats "relative" wages, the state-regulation of wages (which he does not consider feasible); poor relief in aid of wages; factory legislation; trade unions; the effects of machinery on wages; and the progress of the working-classes.

The subject of factory legislation brings us back to the general topic of "state interference with private matters" as the old school of political scientists would have called it. Two treatises in the Britannica are important for the study of this

**Labour  
Legislation**

subject—the general article **LABOUR LEGISLATION** (Vol. 16, p. 7), equivalent

to 70 pages of this Guide, by Adelaide Mary Anderson, principal lady inspector of factories to the British Home Office, and Carroll D. Wright, late U. S. Commissioner of Labor; and the article **EMPLOYERS' LIABILITY AND WORKMEN'S COMPENSATION** (Vol. 9, p. 356), which is of peculiar interest now that in the United States recent laws in regard to employers' liability and workmen's compensation have shown a change in legislative theory and practice. Statutes of this kind have been passed by the legislatures of several states where nothing of the sort would have been attempted a genera-

tion ago, although legislatures have always been readier than courts to approve radical laws, and have been far more readily influenced by popular sentiment. After their passage they have in some states been held unconstitutional, and in other states the highest court has recognized them as valid; the decisions perhaps depending to some extent on the attitude of the court toward the opposed claims of capital and labour. Here as elsewhere the student should remember that much information of a local character is to be found in the articles on different states of the Union. The article **LABOR DAY** (Vol. 16, p. 6) describes an official recognition of the claims of labour in the United States.

On labour organizations and their work see the articles: **TRADE UNIONS** (Vol. 27, p. 140), and particularly the

**Organized  
Labour**

section *Economic Effects of Trade Unionism*, and the section on trade

unions in the United States, by Carroll D. Wright, late U. S. Commissioner of Labor, who deals with such topics as railway brotherhoods, national unions, the "International," Knights of Labor, American Railway Union, federations of labour, especially the American Federation of Labor, and estimated strength of trade unions. For the earlier history of trade unions or similar organizations see **TRADE ORGANIZATION** (Vol. 27, p. 135), **GILDS** (Vol. 12, p. 14), **LIVERY COMPANIES** (Vol. 16, p. 809), and **APPRENTICESHIP** (Vol. 2, p. 228).

**STRIKES AND LOCK OUTS**, particularly the sections *Economic Effects* (Vol. 25, p. 1028), *Important British Strikes and Lock Outs* (p. 1029), and on strikes in the United States (p. 1033),—the last by Dr. Carroll D. Wright, who describes, among others, the Homestead strike of 1892, the Pullman strike of 1894, the steel strike of 1901, and the coal strike of 1902. For these and other strikes see the local articles on such storm-centres as



Homestead, Pullman, Leadville, Cripple Creek, Chicago.

See also **BOYCOTT** (Vol. 4, p. 353); and **INJUNCTION** (Vol. 14, p. 570), and, for a "classic" use of the injunction against boycott, the article on **WILLIAM HOWARD TAFT** (Vol. 26, p. 354);

**ARBITRATION AND CONCILIATION** (Vol. 2, p. 331) for attempts by the state to regulate the relations of capital and labour at variance.

Related topics which have not been analyzed here will be found in the articles **UNEMPLOYMENT** (Vol. 27, p. 578), **LABOUR EXCHANGE** (Vol. 16, p. 7), and **VAGRANCY** (Vol. 27, p. 837).

Closely connected with the American labour problems, since growing American industries demand a supply of workmen

that cannot be filled by natural increase in the population, is the question of immigration. The article **MIGRATION** (Vol. 18, p. 427) is divided into two parts, the second dealing with migration in zoology. The first section, dealing with emigration and immigration and internal migration of populations, is for the most part by Richmond Mayo-Smith, late professor of political economy and social science in Columbia University, New York City. It is appropriate that the subject should be treated by an American and with special attention to the United States, since this country owes its origin to an immigration three centuries ago; as the presence of many recent immigrants puts a strain on our powers of assimilation and gives rise to other serious problems; and as internal migrations are markedly affecting social conditions. In a preliminary historical sketch the author deals with: prehistoric migrations in search of booty, through the desire of the stronger to take possession of the lands of the weaker, or by pressure of population on the food supply; Greek and Roman colonization; the German conquest; minor migratory movements such as the introduction of Flemish

weavers to England and the forced migration of the Huguenots from France; the great colonization period after the discovery of America; and modern migration—characterized by its magnitude, by the change of the emigrant's political allegiance, and by the circumstance that it is a movement of "individuals seeking their own good without state direction or aid." In a statistical discussion of immigration to the United States (Vol. 18, p. 430) there is much valuable information. "At first the Irish and Germans were most prominent. Of later years, the Italians, Czechs, Hungarians and Russians were numerous represented." Immigration to other countries, especially Canada and South America; the balance of migration and temporary emigration; and the effects of migration on the country "from which" and the country "to which"—are topics considered in the article, which also discusses the restriction of immigration. As to Asiatic immigration see **CALIFORNIA** (especially p. 20, Vol. 5), **SAN FRANCISCO** (p. 148, Vol. 24), and **COOLIE** (Vol. 7, p. 77). See also the article **UNITED STATES**, section *Population and Social Conditions* (p. 634, Vol. 27), and, in separate articles on states and larger cities of the United States, the analysis of foreign-born population, that of foreign parentage, etc. For instance, in the article **MASSACHUSETTS** (Vol. 17, p. 854), there is a most interesting account of the varying sources of immigration and of the replacing of Irish labour by Canadians and Italians. Boston is the second immigrant port of the country. A large part of the transatlantic immigrants pass speedily to permanent homes in the West, but by far the greater part of the Canadian influx remains there.

The article on **NEW YORK CITY** (p. 617 of Vol. 19) remarks that

there are in New York City more Germans than in any city of Germany, save Berlin, and more Irish than in Dublin. There are many well-defined foreign communities in the city, such as "Little Italy" about Mulberry Street, "Chinatown" on Mott, Pell



and Doyers Streets, the Hebrew quarter on the upper Bowery and east of it, a "German Colony" east of Second Avenue below Fourteenth Street, French quarters south of Washington Square about Bleecker Street and on the West Side between Twentieth and Thirty-fourth Streets; a Russian quarter near East Broadway, a "Greek Colony" about Sixth Avenue in the 40's, and negro quarters on Thompson Street and on the West Side in the 50's, and there are equally well-defined Armenian and Arab quarters.

Chicago, as the article on that city shows, is the second largest Bohemian city in the world, the third Swedish, the fourth Norwegian, the fifth Polish and the fifth German.

The Southern states of the Union, though they have much less immigration than the North or West, have a population problem that is even more difficult

**Negro Problem**

in some respects—that of the negro. Many immigrant elements are readily "amalgamated" or assimilated into the native local population—by marriage, by trade, and indeed even by physical environment. It seems certain, for instance, that the physical type of the children of Italian or Hebrew immigrants in New York City is different from that of their parents and more like a local type, even in such respects as the shape and contour of the head and its ratio of length to breadth. But the negro does not assimilate physically or, to any considerable degree, mentally; and the communities in America in which he is most plentiful are so far from eager to assimilate him that they socially and politically isolate him. The reader should go to the article **NEGRO** (Vol. 19, p. 344), in which there is a general study of the race by T. Athol Joyce, assistant in the Department of Ethnography, British Museum, and a section on *Negroes in the United States* by Dr. Walter Francis Willcox, late chief statistician U. S. Census Bureau and professor of social science and statistics, Cornell University. The magnitude of the negro problem may be deduced from Professor

Willcox's remark that the present number of negroes in the United States "is greater than the total population of the United States was in 1820, and nearly as great as the population of Norway, Sweden and Denmark." Birth and mortality statistics in regard to negroes show that they are increasing much less rapidly than whites; but it must be remembered that there is an absolute increase, that there is no prospect of the negro problem being solved by the dying out of the race, and that even the fact that negroes constitute a smaller proportion of the population than formerly does not greatly affect the problem. There is also much relevant information of value in the articles on the Southern states, particularly in the sections on population, education and government; and as to education see the articles **TUSKEGEE** (Vol. 27, p. 487), **BOOKER T. WASHINGTON** (Vol. 28, p. 344) and **S. C. ARMSTRONG** (Vol. 2, p. 591). See also the article **LYNCH LAW** (Vol. 17, p. 169) by Prof. W. L. Fleming of the Louisiana State University.

There is a very close relation between the economic problems connected with labour and those which have to do with capital and especially with capital in its organized and monopolistic forms. A monopoly of the supply, sale, or manufacture of any class of goods was, especially in England under the Tudors and Stuarts, a crown grant; and the theory of patent and copyright law is based on such grants, as is shown in the articles **MONOPOLY** (Vol. 18, p. 733), **LETTERS PATENT** (Vol. 16, p. 501), and **PATENTS** (Vol. 20, p. 903). On the modern monopoly which, far from being cherished by government, is constantly being regulated, checked or "crushed," see the article **TRUSTS** (Vol. 22, p. 334) by Prof. J. W. Jenks, formerly of Cornell and now of New York University, whose treatment is from the American point of view—the problem is peculiarly an American one—but with sections on European experience,

including paragraphs on Great Britain, Germany, France and Austria.

Among the questions answered by this article—questions that are continually presenting themselves to the mind of every intelligent citizen, but that are seldom lucidly answered even by the most intelligent—are:

What are trusts? Why are they formed?

Why were they not formed before the latter years of the 19th century?

Why can combination be successfully applied in some industries and not in others? Why do some industries thrive better under competition than under combination? Why are some combinations bound to fail?

In what respect has the trust advantages over the individual competitor?

How do trusts benefit by protective tariffs and by discrimination in rates of transportation?

What has been the history of trusts in Europe?

The question of most interest to the ordinary person is: Do trusts raise prices? To this the Encyclopaedia Britannica answers: "Experience seems to show, beyond question, that whenever the combinations are powerful enough to secure a monopolistic control it has usually been the policy to increase the prices above those which obtained during the period of competition preceding the formation of the combination." Besides this increased price, the evils of combinations are: loss to investors through promotion and speculation by directors; loss to wage-earners, corruption of legislatures, and the suppression of independent activity.

The most obvious remedies are "more rigid laws with reference to the methods of incorporation and to the responsibility of directors to stockholders and to the public," greater publicity and closer government inspection, and the abolition of special favours granted by government and shipping companies.

For American legislation in regard to trusts see the article INTERSTATE COMMERCE (Vol. 14, p. 711), equivalent to 10

### Government Control

pages of this Guide, by Prof. Frank A. Fetter, formerly of Cornell and now of Princeton University. This article shows the constitutional basis for action by the Federal government and the power given

to Congress to regulate commerce among the several states; and it describes the Interstate Commerce Act of 1887, amended in 1903 by the Elkins Act, and the Sherman Anti-Trust Act of 1890. See also in the article UNITED STATES, the section *History*, §§ 353, 357, 396 (pp. 725, 726, 733 of Vol. 27).

But although there have been great changes in the relation of government to the individual in his private and business life, the extent of practical government control is still much less than many theorists would like to see. It is true that in many countries of Europe railways are owned and operated by the state—see p. 826 of Vol. 22, in the article RAILWAYS. See also the article NEW ZEALAND and the summary of conditions there (p. 307, Vol. 25), in part as follows:

The government owns not only the railways, but two-thirds of the whole land, letting it on long leases. It sets a limit to large estates. It levies a progressive income-tax and land tax. It has a labour department, strict factory acts and a law of compulsory arbitration in labour disputes (1895). There are old-age pensions (1898), government insurance of life (1871) and against fire (1905). Women have the suffrage, and, partly in consequence, the restriction of the liquor traffic is severe. There is a protective tariff, and Oriental labour is excluded. The success of the experiment is not yet beyond doubt; compulsory arbitration, for example, did not work with perfect smoothness, and was amended in 1908. . . . It is fair to add that the experiment is probably on too small a scale to show what might happen in larger countries. New Zealand has only 100,000 sq. m. of territory and about one million of inhabitants, mainly rural and of picked quality. The conditions of combined isolation and security are not easily obtained elsewhere. The action of the state has been in the great majority of instances rather regulative than constructive.

But in general governments have extended their control more or less along the conventional lines of law and legislative theory, and have not undertaken ownership and operation—even in New Zealand, as we have just seen, public ac-

tion being "rather regulative than constructive." See the general article **SOCIALISM** (Vol. 25, p. 310) and biographies of those connected with the Socialist movement, such as Marx, Lassalle, Robert Owen, Rodbertus, Bebel, Liebknecht, Jaures, Ballance, William Morris, Edward Bellamy, and Henry George. On communism, see the article on that subject, the biographies of Owen, Saint-Simon, Fourier, Cabet, etc., and descriptions of the more important American communistic experiments in the articles on Brook Farm, Shakers, Amana, Nauvoo, Harmony, Oneida Community, Hopedale, etc. For communism merely as a business scheme see the article **COOPERATION** (Vol. 7, p. 82) and the biographies of Raiffeisen and Schulze-De-litzsch.

We have now run through the more strikingly novel public questions of the day, and we come next to questions which have been long discussed

**Finance** and longer recognized as being within the sphere of government. The one of these that is most intimately connected with the economic problems we have just been discussing is the subject of public finance and revenue. On this read the articles **FINANCE** (Vol. 10, p. 374), **TAXATION** (Vol. 26, p. 458), and **NATIONAL DEBT** (Vol. 19, p. 266); and, on American public finance, see Vol. 27, p. 654; on Congressional legislation and finance, p. 661 of the same volume; for a general and statistical treatment of American finance, the sections headed *Finance* in each article dealing with a state of the Union, the articles **GOLD** (Vol. 12, p. 192), **SILVER** (Vol. 25, p. 112), and **BIMETALLISM** (Vol. 3, p. 946), and the biographies of **ROBERT MORRIS** (Vol. 18, p. 871), **ALEXANDER HAMILTON** (Vol. 12, p. 880), and **JAY COOKE** (Vol. 7, p. 73).

Of perennial interest in the field of public finance is the question of tariff reform. This is true both in the United States

and in the United Kingdom, but strangely enough "tariff reform" is

**Tariff** used with absolutely opposite meanings in the two countries. Tariff reform in England is linked with Imperialism and means the introduction of higher tariffs for protection of colonial as well as British industries. In the United States the typical tariff reformer is usually an opponent of Imperialism (which, of course, does not mean the same thing in the two countries), and tariff reform here involves lowering duties, doing away with protection, and, in short, adopting approximately the very system now in vogue in the United Kingdom, and the very system that the followers of Joseph Chamberlain wish to replace with something not entirely unlike the American protective system as it has been since the Civil War. On this subject see the article **TARIFF** (Vol. 26, p. 422), by the American economist, F. W. Taussig, professor at Harvard, the articles **PROTECTION** (Vol. 22, p. 464), by E. J. James, president of the University of Illinois, and author of the *History of American Tariff Legislation*, and **FREE TRADE** (Vol. 11, p. 88), by the Venerable Dr. William Cunningham, Archdeacon of Ely, and author of *The Growth of English Industry and Commerce*; the biographies of **ALEXANDER HAMILTON** (Vol. 12, p. 880), and **HENRY CLAY** (Vol. 6, p. 470), for the foundation of American protection; and the articles on **H. C. CAREY** (Vol. 5, p. 329), **FRIEDRICH LIST** (Vol. 16, p. 776), and **WILLIAM MCKINLEY** (Vol. 17, p. 256) for the principal exponents, theoretical and practical, outside of Great Britain, of protection; the lives of **RICHARD COBDEN** (Vol. 6, p. 607) and **JOHN BRIGHT** (Vol. 4, p. 567) and the article **CORN-LAWS** (Vol. 7, p. 174) for the genesis of free trade in Great Britain; and the article on **JOSEPH CHAMBERLAIN** (in particular pp. 816-817 of Vol. 5) for English tariff reform in politics.

Another topic in public finance of great

interest at the present moment is the banking laws,—the interference of government with banking and similar business. Local regulations in regard to banking will be found in sections on legislation and finance in articles on each of the states of the Union. The article OKLAHOMA (Vol. 20, p. 57), for example, contains the following summary of the first radical state enactment—constitutional in this case,—providing bank guarantees:

### Banking Laws

The unique feature of the banking system (with amendments adopted by the second legislature becoming effective on the 11th of June, 1909) is a fund for the guaranty of deposits. The state banking board levies against the capital stock of each state bank and trust company, organized or existing, under the laws of the state to create a fund equal to 5% of average daily deposits other than the deposits of state funds properly secured. One-fifth of this fund is payable the first year and one-twentieth each year thereafter; 1% of the increase in average deposits is collected each year. Emergency assessments, not to exceed 2%, may be made whenever necessary to pay in full the depositors in an insolvent bank; if the guaranty fund is impaired to such a degree that it is not made up by the 2% emergency assessment, the state banking board issues certificates of indebtedness which draw 6% interest and which are paid out of the assessment. Any national bank may secure its depositors in this manner if it so desires. The bank guaranty law was held to be valid by the United States Supreme Court in 1908, after the attorney-general of the United States had decided that it was illegal.

More general treatment is to be found in the articles BANKS AND BANKING (Vol. 3, p. 334), SAVINGS BANKS (Vol. 24, p. 243) and TRUST COMPANY (Vol. 27, p. 329); and see further the articles listed in the chapter in this Guide *For Bankers and Financiers*.

Another sphere of private finance over which government restriction and regulation has been greatly extended during the last few years, is insurance. The entire subject of insurance is, moreover, of interest not merely to the citizen as a member of the body politic but to the individual as the head of a family and as an investor for his own protection in old age. To every one, therefore, the article INSURANCE (Vol. 14, p. 656) will be of the utmost value, by reason of its rare combination of interest and authority. For a full analysis of this article and of related topics see the chapter in this Guide *For the Insurance Man*.

Much of the earlier part of the present chapter has been devoted to the rapid extension of governmental control, regulation and supervision through legislation. Interesting and novel though this is, it is far less important for an intelligent comprehension of government than is a careful study of the foundations and principles of legislation. Only the specialist will wish to pursue a complete course in political science, but every well-informed citizen of the United States should study the general powers and functions of national and state legislatures and courts. This material is given briefly, lucidly and critically by the Hon. James Bryce, late British Ambassador to the United States, former President of the British Board of Trade, and author of *The American Commonwealth*, in the section *Constitution and Government*, article UNITED STATES (Vol. 27, pp. 646-658). Part of this section deals with the governments of the states, as to which there is also special information in the section on government of the article on each state. Regarding city governments similar sections will be found in the articles on the larger cities. For a full analysis and a list of articles see the chapter *For Lawyers* in this Guide. Constitutional restrictions of all delegated powers must be continually kept in mind in the study of the action of legislatures and courts, and of the questions that arise in regard to legislation or to court decisions. Although the legislature represents the people more or less directly—

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the lower house being commonly called the House of Representatives—and so has delegated to it from the people the power of making laws, still, in the Federal and state constitutions (except those of a very recent date) there is a system of checks on every delegated power. The result is that an act passed by Congress does not become law without the approval of the president, nor, in most states, a local statute without that of the governor, and—more important—is not a valid law if the highest Federal Court (or, if it be a state enactment, the highest state court) holds it contrary to the terms of the constitution. For a summary of the historical arguments for this system of checks see the section on the Constitution (Vol. 27, p. 686), in the article UNITED STATES and such biographical articles as JAMES MADISON (Vol. 17, p. 284); ALEXANDER HAMILTON (Vol. 12, p. 880), and GOUVERNEUR MORRIS (Vol. 18, p. 869). The working of this system in nation and state has been greatly affected by the distinction between the legislators' mandate and that of the judge. Legislators have shorter terms of service than judges, and especially judges of the higher courts, and so may be said to be in much closer and more constant contact with the people; and the legislator is bound by what he thinks the people need and want,—something that is continually changing. On the other hand, the judge is bound by the written law, unchanged and unchangeable except by constitutional amendments or slightly varying interpretation of the constitution. The result has been dissatisfaction with the courts and with legislatures. The definite expression of this dissatisfaction is in constitutional amendments or in new constitutions, adopted in order that future action of the courts may more nearly accord with the present sentiment of the people. The story of the constitution of each state in the Union is told, with a

**The System of Checks**

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summary of important constitutional changes, in the section on government of each article on a separate state. In his analysis of the state constitutions, Mr. Bryce says (Vol. 27, p. 647):

Comparing the old constitutions with the new ones, it may be said that the note of those enacted in the first thirty or forty years of the republic was their jealousy of executive power and their careful safeguarding of the rights of the citizen; that of the second period, from 1820 to the Civil War (1861-65), the democratization of the suffrage of institutions generally; that of the third period (since the war to the present day), a disposition to limit the powers and check the action of the legislature, and to commit power to the hands of the whole people voting at the polls.

**Initiative, Referendum and Recall**

And at the close of his treatment of local government in the United States, the same authority writes (Vol. 27, p. 651):

Several state constitutions now contain provisions enabling a prescribed number (or proportion) of the voters in a state or city to submit a proposition to all the registered voters of the state (or city) for their approval. If carried, it takes effect as a law. This is the Initiative. These constitutions also allow a prescribed number of voters to demand that a law passed by the state legislature, or an ordinance passed by the municipal authority, be submitted to all the voters for their approval. If rejected by them, it falls to the ground. This is the Referendum. Some cities also provide in their charters that an official, including the mayor or a member of the council, may be displaced from office if, at a special election held on the demand of a prescribed number of the city voters, he does not receive the largest number of votes cast. This is the Recall. All these three institutions are in operation in some Western states and are spreading to some of the Eastern cities. Their working is observed with lively interest, for they carry the principle of direct popular sovereignty to lengths unprecedented except in Switzerland. But it is not merely the faith of the Western Americans in the people that their introduction is due. Quite as much must be ascribed to the want of faith in the legislature of states and cities, which are deemed too liable to be influenced by selfish corporations.

In connection with the above reference to the referendum and initiative in



Switzerland, see the description of the Swiss system of continuous control by the electors (Vol. 26, p. 243).

On previous experience, outside the United States, with the referendum and the initiative, see the article REFERENDUM (Vol. 23, p. 1), by the Rev. Dr. W. A. B. Coolidge, an American whose life has been chiefly spent in, and devoted to the study of, Switzerland, where the system was evolved. In the United States the system was first tried in Oregon, and the student should read the description in the article OREGON of the legislative department (Vol. 20, p. 246), which also deals with the recall of officers. See also under OKLAHOMA (Vol. 20, p. 59), and the articles on SOUTH DAKOTA and LOS ANGELES.

On suffrage in the United States see p. 647 of Vol. 27, describing the requirements in different states and pointing out that "by the Federal Constitution state suffrage is also the suffrage for Federal elections, viz. elections of representatives in Congress and of presidential electors." On representation see the passage on p. 653 of Vol. 27, a portion of which has been quoted above; and on representation in state legislatures see p. 647 of Vol. 27 and consult the articles on the separate states, where in the sections headed *Government* there is also supplementary information about election and ballot laws. It is interesting to note, in the articles on Mississippi, Virginia, North Carolina, South Carolina, Georgia, Alabama, Louisiana and Oklahoma, that these states have practically disfranchised the negro. For a concrete instance of the awkward working of the electoral college, in the choice of the president in 1876, see the article ELECTORAL COMMISSION (Vol. 9, p. 172). On the position of aliens see the articles ALLEGIANCE (Vol. 1, p. 689) and NATURALIZATION (Vol. 19, p. 275); and articles on various states. In the article OREGON, for instance (Vol. 20, p. 245), the reader will find that "the

constitution provides that no Chinaman, not a resident of the state at the time of the adoption of the constitution, shall ever hold any real estate or mining claim, or work any mining claim in the state."

See also, on the whole subject, the articles BALLOT (Vol. 3, p. 279); VOTE (Vol. 28, p. 216); VOTING MACHINES (Vol. 28, p. 217); ELECTION (Vol. 9, p. 169); REPRESENTATION (Vol. 23, especially pp. 112-116, for proportional voting, second choice voting, etc.), and WOMEN (Vol. 28, p. 782) for the history of the woman's suffrage movement. In that connection it is curious to note in this article (p. 787) that, owing to an oversight in the wording of the first constitution of New Jersey, women could vote in that state from 1776 to 1807. For any thorough knowledge of practical, as contrasted with theoretical representative government in the United States, the student should read what Mr. Bryce has to say about *Party Government* (Vol. 27, p. 658-660); a large part of the article on the history of the United States after the adoption of the Constitution (Vol. 27, pp. 688-735); articles on the great parties, FEDERALIST (Vol. 10, p. 235), DEMOCRATIC (Vol. 8, p. 2), and REPUBLICAN (Vol. 23, p. 177); and the lives of the great party leaders from Hamilton and Jefferson to McKinley, Roosevelt, Bryan and Woodrow Wilson. A fuller outline for the study of United States history will be found in another chapter of this Guide, on *History of the United States*.

But the Federal government and even the state governments do not touch any one of us so closely as does the local government of our city and township; and Mr. Bryce gives (Vol. 27, p. 650) a valuable criticism of the American system of local government,—which, in some cities, indeed, seems a lack of system in the business sense of that word, and a control of the government by political parties prone to corruption, bribery and the granting of

### Municipal Government

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special privilege. Mr. Bryce dwells on the over-developed power of the state in legislating for the cities or other minor governmental units, and the consequent activity of local city interests in state and national politics, but he also points to the growing tendency of the states to permit cities to enact their own charters. The movement to take the city government out of politics has reached its greatest force—and its greatest success—in government by commission.

In 1902 the city of Galveston, in Texas, adopted a new form of municipal government by vesting all powers in a commission of five persons, elected by the citizens on a "general ticket," one of whom is mayor and head of the commission, while each of the others has charge of a department of municipal administration. A similar plan, differing in some details, was subsequently introduced in the city of Des Moines, in Iowa; and the success which has attended this new departure in both cities has led to its adoption in many others, especially, but not exclusively, in the Western states.

For a fuller account see the articles on GALVESTON and DES MOINES, where, as in other articles on towns and cities, there is a summary of their government and particularly of the distinctive features of local administration.

What we have said, up to this point, has all dealt with our country as a self-contained unit—except that we have touched on tariffs

**International Relations** and on immigration and on the treatment of aliens.

In the article ALIEN (Vol. 1, p. 662) the reader will find the sentence: "In the United States the separate state laws largely determine the status of an alien, but subject to Federal treaties." And Mr. Bryce (Vol. 27, p. 652) characterizes some of the powers allotted to the national government "which relate to its action in the international sphere." See particularly Mr. Bryce's remarks (Vol. 27, p. 656) on the powers of the president:

In time of war or of public disturbance, however, the domestic authority of the

president expands rapidly. This was markedly the case during the Civil War. As commander-in-chief of the army and navy, and as 'charged with the faithful execution of all laws,' he is likely to assume, and would indeed be expected to assume, all the powers which the emergency requires. In ordinary times the president may be almost compared to the managing clerk in a large business establishment, whose chief function is to select his subordinates, the policy of the concern being in the hands of the board of directors. But when foreign affairs reach a critical stage, or when disorders within the Union require Federal intervention, immense responsibility is then thrown on one who is both commander-in-chief of the army and the head of the civil executive. In no European country is there any personage to whom the president can be said to correspond. He may have to exert more authority, even if he enjoys less dignity, than a European king. He has powers which are in ordinary times narrower than those of a European prime minister; but these powers are more secure, for instead of depending on the pleasure of a parliamentary majority, they run on to the end of his term.

In this connection you should read the articles INTERNATIONAL LAW and INTERNATIONAL LAW (PRIVATE), TREATIES, PEACE, PEACE CONFERENCES, PAN-AMERICAN CONFERENCES and ARBITRATION, INTERNATIONAL; the last showing plainly how large a part the United States has played in promoting better international feeling throughout the world.

Such articles as these tell how peace has changed from a purely negative condition to a positive subject of international regulation and an object of active political effort. They answer the following concrete questions on the subject:

What was the earliest plan of peace known to history? What were the Pax Romana, the "Truce of God," the "Grand Design" of Henry IV, and other schemes for the preservation of peace?

What was the greatest deliberate effort ever made to secure the peace of the world?

What has been done by the two Hague Conferences, and when will the next one be held?

How far can disarmament be carried out?

What standing-peace agreements have been executed?

What is the history of popular effort for international peace, and what peace societies exist to-day?

What are the present recognized limitations of international arbitration?

What are the first steps toward an era of universal peace?

What has been accomplished by the Pan-American Conferences?

On international affairs of today in which the United States has a special interest there is a wealth of information in

**International Affairs** the Britannica. The first topic that will naturally present itself to the mind of

the reader is the Panama canal. On this see the article PANAMA CANAL (Vol. 20, p. 666), with a large-scale map, a history of the project and a description of the engineering features; and on the politics, national and international, of the question of building the canal, the articles COLOMBIA, PANAMA, ROOSEVELT, UNITED STATES, *History* (Vol. 27, pp. 730 and 732), JOHN HAY, and PAUNCEFOTE.

Our relations with Colombia in connection with the canal will naturally lead the student to a general consideration of the relation of the United States with the Latin-American countries. Here the most interesting factor is the Monroe Doctrine, which has been characterized "as one of the things that every one knows about but that few can explain." Read the article MONROE DOCTRINE (Vol. 18, p. 738), by Dr. T. S. Woolsey, Professor of international law, Yale University; the article JAMES MONROE (Vol. 18, p. 736), and, in the article UNITED STATES, *History* § 156 (Vol. 27, p. 695).

A second topic in the story of Latin-America and the United States is Cuba; and this part of the story has probably never been told as accurately and interestingly as in the articles CUBA Vol. 7, p. 594, and HAVANA (Vol. 13, p. 76) in the Britannica, both by Dr. F. S. Philbrick.

American relations with the Orient is a third subject of importance in the foreign affairs of the United States; and in this subject the most interesting topic is Chinese and Japanese exclusion. On this

see the articles CALIFORNIA, SAN FRANCISCO, COOLIE, and UNITED STATES, *History* § 339 (Vol. 27, p. 723). At the end of the article JAPAN (Vol. 15, p. 156) there is a section on *The Claims of Japan*, by Baron Dairoku Kikuchi, which is of great interest in this connection.

The place of the United States as a world power, we are proud to say, depends little on its

**Sea-Power** army or navy—because of its enormous

latent strength, its commanding geographical position, etc. But the comparatively greater importance of navy over army is now admitted by nearly every serious thinker—it was the concrete lesson of the Spanish-American War of 1898 as it was the point of the valuable historical essays on sea-power written before and since that war by the American naval officer, Rear-Admiral A. T. Mahan. The American navy and the navies of the world are matters of interest to every one—and like all matters of importance they are to be found treated in the Britannica.

In general see the elaborate articles NAVY (Vol. 19, p. 299); SEA-POWER (Vol. 25, p. 548); and SEA, COMMAND OF THE (Vol. 24, p. 529); and for a detailed course of reading on naval history and theory see the chapter in this Guide *For Naval Officers*.

The topics just discussed will serve as an introduction to the study of the Imperial United States, which may be pursued in the articles

**The Greater United States** ALASKA, HAWAII, PHILIPPINE ISLANDS, PORTO RICO, GUAM

and CUBA, and the articles on the towns and cities in the outlying possessions.

The result of reading these articles will be a determination to know *more* about your country, to master its history, its industries and its commerce as well as its political conditions.

**PART V**  
**READINGS FOR WOMEN**





## CHAPTER LXV

### FOR WOMEN

IT would be absurd, in the full stream of the 20th century, to imagine that any of the articles in the new edition of the Encyclopaedia Britannica can be either beyond the comprehension of women or unlikely to interest women. And since any method of selection is also a method of elimination, it may be illogical to suggest that any one class of articles especially merits their attention. But the difficulty is purely formal. For perhaps the greatest victory of the feminist movement lies in the demonstrated proposition that women can, in one field after another, establish their equality with men, without losing any of their superiority in the exercise of those arts to which they were formerly restricted. And this chapter, therefore, after describing the articles which relate to the present political and economic position of women, naturally turns to subjects such as domestic science and the adornment of the home, which in all ages and all countries have been considered to be the special province of women.

If the question of women's ability to do a full share of the world's work any longer admitted of argument, there would be no more vivid

**Women Contributors** way of coming to an appreciation of the versatility and range

as well as the high quality of women's intellectual capacity than by looking at the contributions by women to the Britannica itself. First in mass, and first in practical value as because it vastly increases the usefulness of the entire book, is the Index volume with its 975 pages, its 500,000 index entries, its classified list of articles covering nearly 70 pages and its list of contributors and their principal signed articles. This volume was the work of a large and carefully organized staff under the supervision of Miss Janet Hogarth (now Mrs. W. L. Courtney). The following is a partial alphabetical list of women contributors to the Britannica with the more important articles they wrote:

#### *Contributors*

- Adelaide Mary Anderson  
(Principal Lady Inspector of Factories, British Home Office).  
Gertrude Atherton  
(Author of *Rezánov*, *The Tower of Ivory*, etc.).  
Mary Bateson  
(Late Fellow of Newnham College, Cambridge; Author of *Borough Customs*, etc.).  
Gertrude Bell  
(Author of *The Desert and the Sown*).  
Isabella Bird Bishop  
(Author of *Korea and her Neighbours*, etc.).

#### *Articles*

- LABOUR LEGISLATION (in part).  
REZÁNOV.  
BOROUGH ENGLISH.  
DRUSES (in part).  
KOREA (in part).

- Lady Broome  
(Author of *Station Life in New Zealand*).
- Margaret Bryant
- Agnes Muriel Clay  
(Joint Editor of *Sources of Roman History*).
- Agnes M. Clerke  
(Hon. Member Royal Astronomical Society, Author of *History of Astronomy*, etc.).
- Mrs. Craigie ("John Oliver Hobbes")  
(Author of *The School for Saints*, etc.).
- Lady Dilke  
(Author of *French Painters*, etc.).
- Mme. Duclaux  
(Author of *Life of Renan*, etc.).
- Lady Eastlake  
(Author of *Five Great Painters*, etc.).
- Lady Gomme  
(Author of *Traditional Games of Great Britain*, etc.).
- Dr. Harriet L. Hennessy, L.R.C.S.I.
- Lady Huggins  
(Author, with Sir William Huggins, of *Atlas of Representative Stellar Spectra*, etc.).
- Lady Lugard  
(Author of *A Tropical Dependency*, etc.).
- Kate A. Meakin
- Alice Meynell  
(Author of *The Rhythm of Life*, etc.).
- Hilda M. R. Murray  
(Lecturer on English, Royal Holloway College).
- Mrs. H. O. O'Neill  
(Formerly Fellow of Manchester University).
- Dr. Anna C. Paues  
(Author of *A Fourteenth Century Biblical Version*, etc.).
- Mrs. W. Alison Phillips  
(Associate of Bedford College, London).
- Bertha S. Phillpotts  
(Formerly Librarian of Girton College, Cambridge).
- WESTERN AUSTRALIA, *History*.
- ALEXANDER THE GREAT, *Legends*; CAESAR, *Medieval Legends*; CHARLEMAGNE, *Legends*; VIRGIL, *the Virgil Legend*; etc. AGRARIAN LAWS (in part); CENTUMVIRI; CURIA; DECURIO; MUNICIPIUM; PATRON AND CLIENT (in part); SENATE. ASTRONOMY, *History*; BRAHE, TYCHO; COPERNICUS; FLAMSTEED; HALLEY; HUYGENS; KEPLER; ZODIAC; etc.
- GEORGE ELIOT.
- GREUZE; INGRES; MILLET, J. F.
- RENAN.
- GIBSON, JOHN.
- CHILDREN'S GAMES.
- GYNÆCOLOGY; INFANCY; INTESTINAL OBSTRUCTION; MEDICAL EDUCATION, *U. S. A.* (in part); RESPIRATORY SYSTEM, *Pathology* (in part); TUBERCULOSIS, etc.
- ARMILLA; ASTROLABE.
- BRITISH EMPIRE; BAUCHI; BORNU; KANO; KATAGUM; NASSARAWA; NIGERIA; RHODES, CECIL; SOKOTO; ZARIA. MOROCCO (in part); TETUAN; SUS. BROWNING, ELIZABETH BARRETT.
- ENGLISH LANGUAGE (in part).
- PECKHAM, JOHN; PREBENDARY; PRELATE; PRIOR; PROCURATOR; VICAR.
- ENGLISH BIBLE (in part).
- LOUIS XVIII; MARIE ANTOINETTE, etc.
- GERMANY, *Archaeology*; NORWAY, *Early History*; SCANDINAVIAN CIVILIZATION.

Kathleen Schlesinger  
(Author of *The Instruments of the Orchestra*, etc.).

Mrs. Henry Sidgwick  
(Hon. Secretary to the Society for Psychological Research, late Principal of Newnham College.

Mrs. Alec. Tweedie  
(Author of *Porfirio Dias*).

Mme. Villari  
(English translator of works of Prof. Villari).

Mrs. Humphry Ward  
(Author of *Robert Elsmere*, etc.).

Lady Welby  
(Author of *What is Meaning?* etc.).

Jessie L. Weston  
(Author of *Arthurian Romances*, etc.).

Alice Zimmern  
(Author of *The Renaissance of Girls' Education*, etc.).

BAGPIPE; BUGLE; DRUM; HARP; HORN;  
ORGAN, *Ancient History*; PIANOFORTE  
(in part); SPINET; TIMBREL; VIOL;  
etc.

SPIRITUALISM.

DIAZ, PORFIRIO.

SAVONAROLA.

LYLY.

SIGNIFICS.

KING ARTHUR; ARTHURIAN LEGEND; THE  
HOLY GRAIL; GUENEVERE; LANCELOT;  
MALORY, SIR THOMAS; MAP, WALTER;  
MERLIN; PERCEVAL; THE ROUND  
TABLE; TRISTAN; ESCHENBACH, WOL-  
FRAM VON.

MARY CARPENTER.

This remarkable list shows that women have contributed to the Britannica on subjects so varied as astronomy, medieval literature, medicine, sociology, linguistics, literary biography, art criticism, law and politics, political science and sociology, musical instruments, education, the Bible and ecclesiastical history, and philosophy.

It may be noted as indicating the advance of women during the last century and a half that in the first edition of the

### Woman's Advance

Encyclopaedia Britannica, which was published in 1771, the article on women consisted of the following eight words "WOMAN,—the female of man—see HOMO." In the present 11th edition, published nearly a century and a half later, one single article entitled WOMEN in volume 28, beginning on page 782, is equivalent in its contents to 22 pages of this Guide.

What woman has accomplished in

scholarship, literature, art and science has been done very largely in the last hundred years. In authorship and, to a greater degree, on the stage her activity dates back a little further. In Shakespeare's time all women's parts on the stage were taken by boys. In fact as the Britannica tells us (Vol. 8, p. 521) in the days of Queen Elizabeth and Shakespeare "No woman might appear at a playhouse, unless masked."

It is only in comparatively recent times that the real "emancipation" of woman began; and this explains why the list of women famous in history is so much longer than any of the other lists given in this part of the Guide. Through earlier periods women attained power only by birth, by marriage, or by being "queens uncrowned," but none the less powerful on that account, like Aspasia, Nell Gwyn, Jane Shore and the Pompadour.

There can be no question that during most of the world's history, woman's

only place was in the home. And it is certain that no matter how far her emancipation may be carried the home will be a sphere for her. Her relation to her husband and her children, her right to a share of his property and of theirs—and to her own—as now more liberally granted and interpreted by law, are outlined in the Britannica. The status of women in early times is described in the article in the Britannica on women. It is, with variations in different places, everywhere a story of dependence. Even in Roman law a woman was completely dependent. If married she and her property passed into the power of her husband; if unmarried she was (unless a vestal virgin) under the perpetual tutelage of her father during his life, and after his death of her agnates, that is, of those of kinsmen by blood or adoption who would have been under the power of the common ancestor had he lived. Under English civil law a girl can contract a valid marriage at 12, a boy at 14. Under the common law "the father was entitled as against the mother to the custody of a legitimate child up to the age of sixteen, and could only forfeit such right by misconduct." But the Court of Chancery sometimes "took a less rigid view of the paternal rights and looked more to the interest of the child, and consequently in some cases to the extension of the mother's right at common law. Legislation has tended in the same direction." In England women are still under two remarkable disabilities: "the exclusion of female heirs from intestate succession unless in the absence of a male heir; and the fact that a husband could obtain a divorce for the adultery of his wife, while a wife could only obtain it for her husband's adultery if coupled with some other cause, such as cruelty or desertion."

In the United States the legal and political status of woman varies largely with the laws of the different states. For example, as is well known, in cer-

tain states women have the same right as men to the ballot.

### The Legal Status of American Women

Wyoming (1869) and Colorado (1893) were the first women's suffrage states. In more than half the

states, roughly everywhere except in the South and a few eastern states, she has the right to vote for the members of school boards and has a general school suffrage. In Louisiana since 1898 women tax-payers may vote on questions of tax levies. As regards property rights, in the state of New York, a woman in possession of property, who marries, has the unqualified use, irrespective of the wishes of her husband, of her property. That is, she owns and can spend as she pleases the whole of the income of her property, while, on the other hand, her husband is compelled by law to give her a certain proportion of his income. In other states, Mississippi, notably, the laws as regard property of married women are precisely the same as that for married men. If the husband is compelled to give a certain proportion of his income to his wife, she is compelled to give the same proportion of her income to him. This is true in several states, Michigan, for example, except that married women cannot usually convey property without the husband's permission. In the state of New York a married woman making her will has a right to dispose of her property as she pleases; whereas in other states, Missouri for instance, the law prescribes that at least one-half shall go to her husband, if there are no children. In other words, in no two states of the Union is the legal and political status of woman the same. It is often important, and in these days always a matter of interest, for a woman to know just what her legal position is in the state in which she lives. This information the Britannica gives.

What a mother can do for her children she may learn from the Britannica articles

indicated in the chapters of this Guide *For Children* and in the chapter *For Teachers*. Similarly she will find assistance in choosing, building or furnishing a house from the chapters *For Builders and Architects*, *For Designers*, *For Manufacturers of Furniture*, etc.

Such articles as LACE, EMBROIDERY, CARPETS, TAPESTRY, FURNITURE, PAINTING, SCULPTURE, JEWELRY, PLATE, particularly as they are all remarkably well illustrated, will be of great value either for the general formation of taste or for giving definite information about a particular style. For the adornment of "the House Beautiful" the *Britannica* is, however, valuable not merely because of the information it contains. The set on India paper, compact, slender and graceful, handsomely bound in leather, and contained in one of the "period" bookcases designed especially for the books, is in itself an adornment and an ornament for any library or drawing room. For the country home with flower or vegetable gardens the article HORTICULTURE (Vol. 13, p. 741) will be found full of helpful information, both in its general treatment, and in the gardeners' calendar for the United States, which tells in the most practical fashion what to do each month in the garden.

For the transformation of a house, well-situated, well-built, well-furnished, well-decorated into a home,—for *home-*

### Home Making

*making*,—any course of study in the *Britannica* should be helpful to a woman, by broadening her sympathies and her knowledge and by making a more interesting and better-informed companion to her husband, a more competent hostess to his and her guests, and a wiser mother to her children. But home-making is an art and not a science—or, if the modern woman will forgive the use of so old-fashioned a phrase, it is a spiritual grace rather than an intellectual achievement—and even a Guide to readings in the *Britannica*

cannot give an exact formula for it.

But there is a science whose field is the home and whose formulas are definite, and this "domestic science" may be

### Domestic Science

learned from the *Britannica*. Of primary interest is the article DIETETICS

(Vol. 8, p. 214), equivalent in length to 25 pages of this Guide. It is by the late Dr. Wilbur Olin Atwater, professor of chemistry, Wesleyan University, Middletown, Connecticut, who was special agent of the U. S. Department of Agriculture in charge of nutrition investigations, and R. D. Milner, formerly of the same Department. It contains 6 valuable tables: I. Percentage Composition of some Common Food Materials (64 in all); II. Digestibility (or Availability) of Nutrients in Different Classes of Food Materials (22 in all); III. Estimates of Heats of Combustion and of Fuel Value of Nutrients in Ordinary Mixed Diet; IV. Quantities of Available Nutrients and Energy in Daily Food Consumption of Persons in Different Circumstances; V. Standards for Diets—Available Nutrients and Energy per Man per Day; and VI. Amounts of Nutrients and Energy Furnished for one Shilling in Food Materials at Ordinary Prices (22 food materials, at 44 different prices). The topics of the article are:

Food and its functions—refuse, water, mineral matter, protein, including albuminoids and gelatinoids, fats, carbohydrates.

Conversion of food into body-material and of food and body-material into heat, muscular energy, etc., with results obtained from Dr. Atwater's famous experiments with men in the "respiration calorimeter," from measurement and analysis of food and drink, and from measurement of energy expended as heat and as external muscular work.

Composition of food materials.

Digestibility or availability of foods.



Full value of food.

Food consumption.

Quantities of nutrients needed—tentative estimates of the average daily amounts required.

Hygienic economy of food: Eat what agrees with you and use foods which give needed nutriment, but do not burden the body with superfluous material. The importance of good cooking, neatness and cleanliness.

Pecuniary economy of food.

Read also the article NUTRITION (Vol. 19, p. 920, equivalent to 25 pages of this Guide), by Dr. D. N. Paton, professor of physiology, University of Glasgow, and Dr. E. P. Cathcart, lecturer in chemical physiology, University of Glasgow. This article considers "the mode of digestion, the utilization and the elimination of the end products of the three great constituents, proteins, carbohydrates and fats," discussing in detail:

Chemistry of Digestion—digestion in the mouth, stomach and the intestines; bile.

Mode of Formation of Digestive Secretions—the salivary and gastric glands, secretion in the pancreas, intestinal juice.

Mechanism of the Alimentary Canal—mastication, swallowing, stomach movements, intestinal movements, etc.

Absorption by the mouth, stomach and intestines.

Changes in the cells—proteins, carbohydrates, fats, fasting, muscular work, internal secretions, pancreas.

Excretion—urea, ammonia, sulphur, phosphorus, etc.

There is much very practical information for the housewife in the article COOKERY (Vol. 7, p. 74), besides the interesting historical

### Cookery

sketch. Cookery, says this article, as an art "is only remotely connected with the mere necessities of nutrition or the science of dietetics. Mere hunger, though the best sauce, will not produce cookery,

which is the art of sauces." Oriental, Greek and Roman cookery, at least as we know them from literature, aimed at luxury, rich and rare foods, cost and show. After the Renaissance, the history of modern cookery began with Italy, and from Italy Catherine de' Medici brought "Italian cooks to Paris and introduced there a cultured simplicity which was unknown in France before." *Forks and spoons were "Italian neatnesses" unknown in England until the early part of the 17th century*; their use "marked an epoch in the progress of dining, and consequently of cookery." French cookery advanced under Louis XIV and XV; received an apparent set back from the French Revolution—which, however, marked the rise of Parisian restaurants; but revived with brilliancy early in the 19th century, so that now "French cooking is admittedly the ideal of culinary art, directly we leave the plain roast and boiled. And the spread of cosmopolitan hotels and restaurants over England, America and the European continent, has largely accustomed the whole civilized world to the Parisian type."

The article closes with eminently useful "notes on broiling, roasting, baking, boiling, stewing and frying."

The article FOOD (Vol. 10, p. 611) describes particularly the best foods for infants and children; foods for adults are treated in NUTRITION, DIETETICS, already mentioned, and in the article VEGETARIANISM (Vol. 27, p. 967). Other articles of importance to the cook are:

FOOD PRESERVATION (Vol. 10, p. 612), by Otto Hehner, English public analyst, formerly president of the Society of Public Analysts; and the same authority's article on ADULTERATION (Vol. 1, p. 218), which deals with legislation against adulteration, and discusses arsenic in foods, preservatives such as formaldehyde and salicylic acid, boracic preservatives,—colouring matter in food, metallic impurities; American laws against adulteration; German laws; particular arti-

cles adulterated—milk, condensed milk, cream, butter, margarine, cheese, lard, oils, flour and bread, sugar, marmalade, jams, tea, coffee, chocolate, cocoa, wine, beer, non-alcoholic drinks, vinegar, spirits drugs. See the chapter *For Manufacturers of Foods*.

The following is an alphabetical list of the principal articles on foods and beverages:

|                      |                        |
|----------------------|------------------------|
| Absinthe             | Liqueurs               |
| Aerated Waters       | Loaf                   |
| Ale                  | Macaroni               |
| Arrack               | Malmsey                |
| Aspic                | Malt                   |
| Bacon                | Marchpane, or Marzipan |
| Bannock              | pan                    |
| Barm                 | Margarine              |
| Beef                 | Marmalade              |
| Beer                 | Mate                   |
| Benedictine          | Mead                   |
| Biltong              | Mealie                 |
| Biscuit              | Meat                   |
| Bitters              | Milk                   |
| Bohea                | Molasses               |
| Brandy               | Mulligatawny           |
| Bread                | Negus                  |
| Brewing              | Omelette               |
| Butter               | Pemmican               |
| Calipash and Calipee | Perry                  |
| Caudle               | Pilau                  |
| Caviare, or Caviar   | Porridge               |
| Chartreuse           | Pudding                |
| Chasse               | Pulque                 |
| Cheese               | Punch                  |
| Chocolate            | Raisin                 |
| Chupatty             | Ratafia                |
| Chutney              | Rum                    |
| Cider                | Saké                   |
| Claret               | Salad                  |
| Confectionery        | Scone                  |
| Cookery              | Sherbet                |
| Couscous             | Sherry                 |
| Curacao              | Spirits                |
| Curry                | Steak                  |
| Food Preservation    | Suet                   |
| Ghee                 | Syrup                  |
| Gin                  | Tapioca                |
| Gravy                | Tart                   |
| Haggis               | Tea                    |
| Hippocras            | Toast                  |
| Jams and Jellies     | Treacle                |
| Junket               | Venison                |
| Kava (Cava, or Ava)  | Vermicelli             |
| Kedgeree             | Vermouth               |
| Ketchup              | Vinegar                |
| Kirsch               | Vodka                  |
| Koumiss              | Whisky                 |
| Kvass, or Kwass      | Wine                   |
| Lard                 | Yeast                  |

Turning sharply from the useful to the ornamental—from the kitchen to

the boudoir—the woman who uses the *Britannica* will find in it not merely the interesting information to which clues are given in the chapter for the jeweller and in the section on embroidery (Ch. 66) but many other articles about costume and dress, with illustrations which make the text far clearer and more valuable. With the constant turns of Fashion's wheel, dress, and especially women's dress, is always reverting to an earlier style or to a more primitive and semi-barbaric style of the present day—now Empire styles, Robespierre collars, close-fitting gowns of the pseudo-Greek style of the Napoleonic era, and now a quasi-folk style, Bulgarian, or Oriental, and again a hint of the ecclesiastical surplice, dalmatic, stole, or collar. The result is that the study of the styles of the past, especially when properly illustrated, may be not only interesting but actually valuable to a woman planning a new gown or a "novel" ornament for head or throat.

The article *COSTUME* (Vol. 7, p. 224), equivalent in length to 80 pages of this Guide, is written by T. A. Joyce of the Department of Ethnography, British Museum; by Stanley Arthur Cook, editor for the Palestine Exploration Fund, on Egyptian and Semitic costume; by Henry Stuart Jones, late director of the British School at Rome, on Aegean, Greek and Roman costume; by Oswald Barron, late editor of the *Ancestor*, on medieval and modern costume; and by W. Alison Phillips, author of *Modern Europe*, etc. Its 51 illustrations are chosen with great care from original sources, tombs, wall-paintings, seals, statues and statuettes, brasses, and portraits of many periods, and they are supplemented by illustrations in other articles:—*AEGEAN CIVILIZATION* (Vol. 1, p. 245), see Plate III, Fig. 7 and Plate IV, Fig. 7, for multiple or flounced skirts and basques—like those of the

early '80's—with short overskirt scalloped high on either side; GREEK ART, Figs. 2, 3, 21, 40, 42, 75; TERRACOTTA (Vol. 26, p. 653), see both plates and especially Fig. 4 of Tanagra and other figurines; ROMAN ART (Vol. 23, p. 474), see Figs. 11, 12, 16, 24, 28; BRASSES, MONUMENTAL (Vol. 4, p. 434), see all illustrations; ILLUMINATED MANUSCRIPTS (Vol. 14, p. 312), see Plates III and V; PAINTING (Vol. 20, p. 459), see Figs. 7, 10, 11, 14, 25, 27; LACE (Vol. 16, p. 37), see Figs. 4, 6, 8, 9, 10, 11, 12, 13, 15, 18, 33; MINIATURES (Vol. 18, p. 523), see both plates. One of the most interesting sources for the text of the article COSTUME is in the writings of satirists, who from period to period have praised the simplicity and frugality of the preceding generation and bewailed the extravagance in style and material of dress during the satirists' own day.

Besides this general article on costume there is special treatment of Chinese costume in the article CHINA (Vol. 6, p. 173) and a section on costume in the article INDIA (Vol. 14, p. 417), equivalent to 18 pages of this Guide, written by Col. Charles Grant, formerly inspector of military education in India, illustrated with 16 pen-and-ink drawings by J. Lockwood Kipling, who is best-known to most people as the father of Rudyard Kipling, and the illustrator of *Kim*, his son's story of native life in India. On Celtic dress see the article CLAN (Vol. 6, p. 421); on that of the Hittites the article HITTITES (Vol. 13, p. 537); on modern Egyptian the article EGYPT (Vol. 9, p. 31), on Persian, the article PERSIA (Vol. 21, p. 193), etc.

And see the following articles on costume and similar topics:

|                      |            |
|----------------------|------------|
| Aigrette             | Blouse     |
| Aiguillette          | Bonnet     |
| Apron                | Braid      |
| Backscratcher        | Burnous    |
| Baldric              | Buskin     |
| Bandana, or Bandanna | Caftan     |
| Beard                | Chape      |
| Beaver               | Chatelaine |

|                   |            |
|-------------------|------------|
| Costume           | Patten     |
| Cravat            | Pelisse    |
| Crinoline         | Peruke     |
| Cuff              | Petticoat  |
| Cummerbund        | Plaid      |
| Depilatory        | Pomade     |
| Dolman            | Pomander   |
| Doublet           | Poncho     |
| Dress             | Puttee     |
| Farthingale       | Queue      |
| Frock             | Razor      |
| Gaberdine         | Robes      |
| Girdle            | Sandal     |
| Glove             | Scarf      |
| Golosh, or Galosh | Shampoo    |
| Gown              | Shirt      |
| Haik              | Sleeve     |
| Hat               | Snow-shoes |
| Hood              | Sombrero   |
| Hose              | Sporran    |
| Jerkin            | Stocking   |
| Kaross            | Tabard     |
| Kilt              | Tarbush    |
| Kohl              | Toilet     |
| Mantle            | Towel      |
| Mitten            | Trousers   |
| Moccasin          | Tunic      |
| Moustache         | Turban     |
| Muff              | Veil       |
| Parasol           | Whisker    |
|                   | Wig        |

A study of the lives of great women will interest any one, and if this study is pursued by means of the Britannica the reader will have the double advantage of getting full and authoritative material presented in the most attractive and excellent style. From the lists that follow of articles on women in the Britannica, interesting groups may easily be chosen, such as:

**Famous American Women:**—ANNE HUTCHINSON, ALICE AND PHOEBE CARY, MARGARET O'NEILL EATON, MARGARET FULLER, the GRIMKÉ sisters, HARRIET BEECHER STOWE.

**Women of Ancient Times:**—ACCA LARENTIA, LUCRETIA, AGRIPPINA, ARTEMISIA, ASPASIA, CLEOPATRA, CORNELIA, FAUSTINA, MESSALLINA, VIRGINIA, ERINNA, CORINNA, SAPPHO, HYPATIA, ZENOBLIA.

**Heroines of Fiction in History:** compare Kingsley's *Hypatia* with the real woman, Ware's *Zenobia* with the queen as she is represented by a historian in the Bri-

tannica; the women of Dumas and of Scott in their historical novels and their originals as seen in the Britannica, for instance Mary Queen of Scots as portrayed by Sir Walter in *The Abbot* and by Swinburne in the Britannica, Elizabeth and Amy Robsart in *Kenilworth* and in the Britannica, Catherine de'

Medici in *Chicot the Jester* and in fact; or the women of Shakespeare's historical plays as compared with their true place in history.

Women in American political reform:—  
AMELIA B. BLOOMER, SUSAN B. ANTHONY,  
ELIZABETH CADY STANTON, LUCRETIA  
MOTT and LUCY BLACKWELL STONE.

The following is a partial list of articles in the Britannica dealing with Women, who may, for convenience, be booked under the broad head of *History* as distinct from Literature, the Arts and Science:—

|                        |                        |                        |                        |
|------------------------|------------------------|------------------------|------------------------|
| Acca Larentia          | Clotilda, St.          | Joanna the Mad         | Messallina             |
| Accoramboni, Vittoria  | Colonna, Vittoria      | Joanna of Naples       | Mignot, Claudine       |
| Acland, Lady Harriett  | Corday, Charlotte      | Josephine              | Marquise de Montespan  |
| Adelaide               | Cornelia               | Junot, Laure           | Marquise de Montesson  |
| Agnes of Meran         | Cornaro, Caterina      | Kingston, Elizabeth,   | Montpensier, Duchesse  |
| Agreda, Abbess of      | Diane de France        | Duchess of             | de                     |
| Agrippina              | Diane de Poitiers      | La Fayette, Louise de  | Octavia                |
| d'Aiguillon, Duchesse  | Du Barry               | Lamballe, Princesse de | Olga                   |
| Albany, Louise, count- | Eaton, M a r g a r e t | La Sablière, Margue-   | Orkney, Countess of    |
| ess of                 | O'Neill                | rite de                | Orleans, Henrietta of  |
| Alice, Princess        | Eleanor of Aquitaine   | La Vallière, Louise de | Parr, Catherine        |
| Amalasantha            | Elizabeth of Austria   | Lenclos, Ninon de      | Perrers, Alice         |
| Anna Amalia of Saxe-   | Elizabeth (C a r m e n | Lennox, Countess of    | Philippa of Hainaut    |
| Weimar                 | Sylva)                 | Lisle, Alice           | Phryne                 |
| Anna Leopoldovna       | Elizabeth, Electress   | Livia Drusilla         | Pompadour, Marquise    |
| Anne of Brittany       | Palatine               | Longueville, Duchesse  | de                     |
| Anne of Cleves         | Elizabeth of England   | de                     | Portsmouth, Duchess of |
| Anne of Denmark        | Elizabeth (princess)   | Louise of Prussia      | Prie, Marquise de      |
| Anne of England        | Elizabeth of France    | Louise of Savoy        | Radegunda, St.         |
| Anne of France         | Elizabeth Petrovna     | Lucretia               | Rich, Penelope         |
| Anne (of Russia)       | Este, Beatrice d'      | Macdonald, Flora       | Robsart, Amy           |
| Arria                  | Estrées, Gabrielle d'  | Maintenon, Mme. de     | Rosamond ( " T h e     |
| Arsinoë                | Etampes, Duchesse d'   | Maine, Duchesse du     | Fair ")                |
| Artemisia              | Eudocia                | Mally, Comtesse de     | Rothelin, Marquise de  |
| Aspasia                | Eudoxia                | Margaret of Austria    | Roxana                 |
| Barton, Elizabeth      | Eugénie                | Margaret of Denmark    | Semiramis              |
| Berenice               | Euphrosyne             | Margaret Maultasch     | Serres, Olyvia         |
| Blanche of Castile     | Elizabeth Farnese      | Margaret (Maid of      | Sforza, Caterina       |
| Boadicea               | Faustina               | Norway)                | Shore, Jane            |
| Boleyn, Anne           | Feuchères, Baronne de  | Margaret of Scotland,  | Snell, Hannah          |
| Borgia, Lucrezia       | Fredegond              | St.                    | Sophia Aleksyeevna     |
| Brunhilda              | Gilbert, M. D. E. R.   | Margaret of Scotland   | Sophia of Hanover      |
| Cappello, Bianca       | (" Lola Montez ")      | Maria Stella           | Sophia Dorothea of     |
| Caroline, Amelia Au-   | Godiva                 | Marie Antoinette       | Hanover                |
| gusta                  | Gontaut, Duchesse de   | Marie Leszczyńska      | Sorel, Agnes           |
| Caroline of England    | Grey, Lady Jane        | Marie Louise           | Stanhope, Lady Hester  |
| Castro, Inez de        | Hachette, Jeanne       | Marie de' Medici       | Stuart, Arabella       |
| Catherine of Aragon    | Henrietta Maria of     | Marie Amelie Thérèse   | Swynford, Catherine    |
| Catherine of Braganza  | England                | Marie Thérèse          | Talbot, Mary Anne      |
| Catherine de' Medici   | Howard, Catherine      | Matilda of Tuscany     | Tanaquil               |
| Catherine I and II     | Ida of Bernicia        | Mary of Burgundy       | Tarpela                |
| (Russia)               | Irene                  | Mary I and II of Eng-  | Theodora               |
| Catherine of Valois    | Isabella of Bavaria    | land                   | Theophano              |
| Châteauneuf, La Belle  | Isabella of Castile    | Mary of Lorraine       | Ursins, Princess des   |
| Christina, Maria       | Isabella of Hainaut    | Mary of Modena         | Victoria               |
| Christina of Sweden    | Isabella II of Spain   | Mary of Orange         | Virginia               |
| Clarke, Mary Anne      | Jacoba                 | Mary, Queen of Scots   | Walter, Lucy           |
| Cleveland, Duchess of  | Joan of Arc            | Masham, Lady           | Wilhelmina             |
| Cleopatra              | Joan (Pope)            | Matilda                | Zenobia                |

Quite as long and much more impressive is the list of women who have produced *literature*—excluding the heroines of mythology and literature—on whom there are separate articles in the *Encyclopaedia Britannica*.

|                        |                         |                        |                         |
|------------------------|-------------------------|------------------------|-------------------------|
| Ackermann, Louise      | Cork, Mary, countess    | Hamilton, Elizabeth    | Ouida                   |
| Adam, Juliette         | of                      | Haywood, Eliza         | Pardoe, Julia           |
| Agoult, Comtesse d'    | Cottin, Marie           | Hemans, Felicia Doro-  | Pardo-Bazan, Emilia     |
| Agullar, Grace         | Cowley, Hannah          | thea                   | Philips, Katharine      |
| Aisse, Mlle.           | Craddock, Charles Eg-   | Houdetot, Comtesse de  | Piozzi, Hester Lynch    |
| Alcott, Louisa May     | bert                    | Howe, Julia Ward       | Pisan, Christine de     |
| Anna Commena           | Craigie, Pearl ("John   | Hrosvitha              | Ploennies, Luise von    |
| Arnim, Elisabeth von   | Oliver Hobbes")         | Hypatia                | Porter, Jane            |
| Aulnoy, Baronne d'     | Craik, Dinah Maria      | Inchbald, Elizabeth    | Praxilla                |
| Austen, Jane           | Craven, Pauline         | Ingelow, Jean          | Radcliffe, Ann          |
| Austin, Sarah          | D'Arblay, Frances       | Jackson, Helen Maria   | Reeve, Clara            |
| Baillie, Lady Grizel   | Dashkov, Catherina      | ("H. H.")              | Rossetti, Christine     |
| Baillie, Joanna        | Deffand, Marquise du    | Jameson, Anna Brown-   | Sablé, Marquise de      |
| Bartauld, Lady Anne    | Delany, Mary Gran-      | ell                    | Sand, George            |
| Barnard, Anna Letitia  | ville                   | Jewett, Sarah Orne     | Sappho                  |
| Bashkirtseff, Maria    | Dickinson, Anna Eliza-  | Kavanagh, Julia        | Schelling, Karoline     |
| Behn, Aphra            | beth                    | Krüdener, Baroness     | Schreiber, Charlotte    |
| Bekker, Elizabeth      | Droste-Hülshoff, Freiin | von                    | Elizabeth               |
| Bernauer, Agnes        | von                     | Lamb, Mary             | Scudéry, Madeleine de   |
| Berners, Juliana       | Duff-Gordon, Lucie      | Lazarus, Emma          | Serao, Matilda          |
| Blamire, Susanna       | Edgeworth, Maria        | Lee, Sophia            | Sévigée, Marquise de    |
| Blessington, Margue-   | Edgren-Leffler, Anne    | Levy, Amy              | Seward, Anna            |
| rite, Countess of      | Charlotte               | Lewald, Fanny          | Sherwood, Mary          |
| Blind, Mathilde        | Edwards, Amelia Ann     | Lyall, Edna            | Martha                  |
| Bosboom-Toussaint,     | Blandford               | Malet, Lucas           | Sigourney, Lydia H.     |
| Anna                   | Eliot, George           | Marguerite de Valois   | Smith, Charlotte        |
| Braddon, Mary Eliza-   | Engelbrechts-           | Marie de France        | Southworth, Emma        |
| beth                   | datter, Dorthe          | Markham, Mrs.          | Staal, Baronne de       |
| Bremer, Frederika      | Épinay, Louise d'       | Martineau, Harriet     | Stael, Mme. de          |
| Brontë, Charlotte and  | Erinna                  | Meynell, Alice C.      | Steele, Florance        |
| Emily                  | Ewing, Juliana          | Mitford, Mary Russell  | Stein, Charlotte von    |
| Brooke, Frances        | Ferrier, Susan E.       | Molesworth, Mary       | Stowe, Harriet Beecher  |
| Browning, Elizabeth    | Flygare-Carlén, Emilie  | Louise                 | Strickland, Agnes       |
| Barrett                | Foote, Mary Hallock     | Monk, Maria            | Tautphoeus, Baroness    |
| Brunton, Mary          | Fuller, Margaret        | Montagu, Elizabeth R.  | von                     |
| Burnett, Frances E.    | Fullerton, Lady         | Montagu, Mary Wort-    | Taylor, Ann and Jane    |
| Hodgson                | Gaskell, Elizabeth      | ley                    | Thaxter, Celia          |
| Carter, Elizabeth      | Cleghorn                | More, Hannah           | Tighe, Mary             |
| Cary, Alice and Phoebe | Gay, Marie F. S.        | Morgan, Lady Sydney    | Tucker, Charlotte       |
| Cenci, Beatrice        | Genlis, Comtesse de     | Moulton, Louise Chand- | Maria                   |
| Centlivre, Susanna     | Girardin, Delphine de   | ler                    | Ward, Elizabeth Stuart  |
| Charrière, Agnes de    | Godwin, Mary Woll-      | Mundt, Klara (Luise    | Phelps                  |
| Child, Lydia Maria     | stonecraft              | Mühlbach)              | Ward, Mrs. Humphry      |
| Cockburn, Alicia       | Gore, Catherine G. F.   | Naden, Constance       | Wardlaw, Lady           |
| Coleridge, Sara        | Gyllembourg - Ehrens-   | Nairne, Baroness       | Wiggin, Kate Douglas    |
| Colet, Louise          | vård, Baroness          | Negri, Ada             | Wilkins, Mary E.        |
| Cook, Eliza            | Gyp                     | Norton, Caroline E. O. | Winchelsea, Countess of |
| Cooke, Rose Terry      | Hahn-Hahn, Ida von      | Oliphant, Margaret     | Wood, Mrs. Henry        |
| Corelli, Marie         | Havergal, Frances       | Opie, Amelia           | Wordsworth, Dorothy     |
| Corinna                | Ridley                  | Orzeszko, Eliza        | Yonge, Charlotte Mary   |

Although women have appeared on the stage only in the last two centuries the list of actresses and singers on whom there are articles in the *Britannica* is a long one. A partial list in alphabetical order follows:

|                   |                       |                   |                    |
|-------------------|-----------------------|-------------------|--------------------|
| Abbott, Emma      | Bartet, Jeanne Julia  | Calvé, Emma       | Cushman, Charlotte |
| Abington, Frances | Bernhardt, Sarah      | Cary, Anna Louise | Després, Suzanne   |
| Albani, Mme.      | Birch-Pfeiffer, Char- | Celeste, Mme.     | Drew, Louisa Lane  |
| Albert, Mme.      | lotte                 | Chaminade, Cécile | Dumesnil, Marie    |
| Alboni, Marietta  | Bracegirdle, Anne     | Clairon, La       | Duse, Eleanora     |
| Anderson, Mary    | Campbell, Beatrice    | Clive, Catherine  | Ellsler, Fanny     |
| Ashwell, Lena     | Stella                | Coghlan, Rose     | Farren, Elizabeth  |



|                       |                      |                           |                        |
|-----------------------|----------------------|---------------------------|------------------------|
| Faucit, Helena        | Lacy, Harriette De-  | O'Neill, Eliza            | Seebach, Marie         |
| Félix, Lia            | orah                 | Patey, Janet Monach       | Siddons, Sarah         |
| Fenton, Lavinia       | Langtry, Lillie      | Philips, Adelaide         | Smithson, Henrietta C. |
| Fiske, Minnie Maddern | Lecouvreur, Adrienne | Pope, Jane                | Sterling, Antoinette   |
| Gilbert, Ann          | Lind, Jenny          | Porter, Mary              | Sterling, Fanny        |
| Grisi, Giulia         | Mara, Gertrude E.    | Raabe, Hedwig             | Taglioni               |
| Guilbert, Yvette      | Marlowe, Julia       | Rachel                    | Tempest, Marie         |
| Guilmard, Marie Made- | Mars, Mlle.          | Raucourt, Mlle.           | Terry, Ellen           |
| leine                 | Melba                | Rehan, Ada                | Tietjens, Thérèse      |
| Gwyn, Nell            | Menken, Adah Isaacs  | Réjane, Gabrielle         | Verbruggen, Susanna    |
| Hading, Jane          | Modjeska, Helena     | Ristori, Adelaide         | Vestris, Lucia Eliza-  |
| Horton, Christiana    | Morris, Clara        | Robinson, Mary            | beth                   |
| Jordan, Dorothea      | Neilson, Adelaide    | Sacher, Rosa              | Vincent, Mary Ann      |
| Keeley, Mary Anne     | Nethersole, Olga     | Sainton-Dobly, C. H.      | Vokes, Rosina          |
| Kellogg, Clara Louise | Nisbett, Louisa C.   | Schröder, Sophie          | Woffington, Peg        |
| Keene, Laura          | Nordica, Lillian     | Schröder-D e v r i e n t, | Yates, Mary Ann        |
| Klafsky, Katharina    | Oldfield, Anne       | Wilhelmine                |                        |

Both in Great Britain and in the United States the great social reform movements of the last century numbered among their most able advocates brilliant and devoted women. This is true of temperance, abolition of slavery, prison reform, the treatment of the insane and defectives, and nearly every branch which this Guide has enumerated, especially in Part 4, where there is a general outline of these reforms. For the part played by women see the biographies of the women just mentioned and, among many others, JANE ADDAMS, CLARA BARTON, BARONESS BURDETT-COUTTS, DOROTHEA LYNDE DIX, EMILY FAITHFUL, ELIZABETH FRY, OCTAVIA and MIRANDA HILL, MARY A. LIVERMORE and LUCRETIA MOTT. More particularly the following list of names of women connected with educational progress will supplement what has been said in the chapter of this Guide *For Teachers* and in the part of the Guide dealing with advances in education and educational problems in the chapter *Questions of the Day*:

|                   |                    |                     |                 |
|-------------------|--------------------|---------------------|-----------------|
| Astell, Mary      | Brace, Julia       | Clough, Anne Jemima | Shirreff, Emily |
| Beale, Dorothea   | Bridgman, Laura    | Crandall, Prudence  | Swanwick, Anna  |
| Bodichon, Barbara | Bass, Frances Mary | Keller, Helen       |                 |
| L. S.             | Carpenter, Mary    | Lyon, Mary          |                 |

And see also the articles CO-EDUCATION and articles on different colleges for women, e.g., MOUNT HOLYOKE, VASSAR, BRYN MAWR, SMITH, etc. One who wishes to realize the extent of feminine talent or genius should read the lives in the Britannica of the sculptor HARRIET HOSMER and of women painters including CECILIA BEAUX, ROSA BONHEUR, ARTEMISIA GENTILESCHI, KATE GREENWAY, ANGELICA KAUFFMANN, TERESA SCHWARTZE and MME. VIGÉE-LEBRUN. But the reader who is eager rather to know whether woman's intellectual powers—not her talent and her genius—compare favourably with those of the male, will find material in the biographical sketches of the physicist MME. CURIE; the geologist MARY ANNING; the travelers ISABELLA BIRD BISHOP and ALEXANDRINA TINNÉ; the biologists MARIANNE NORTH and ELEANOR ORMEROD; the American ethnologist ALICE C. FLETCHER; and above all—since mathematics has always been considered above the capacity of women—the mathematicians MARIA GAETANA AGNESI and SOPHIE KOVALEVSKY and the astronomers AGNES MARY CLERKE, MARIA CUNITZ, CAROLINE HERSCHEL, MARIA MITCHELL and MARY SOMERVILLE.

It is pertinent to add that the present 11th edition of the Britannica indicates the advance of women not only by embodying their collaboration to an unprecedented extent and devoting an unprecedented amount of its space to biographies of women, but by the circumstance that it has, to a far larger extent than any previous edition, been purchased by women.



**PART VI**

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**READINGS IN CONNECTION WITH  
RECREATION AND  
VACATIONS**



## CHAPTER LXVI

### RECREATION AND VACATION

**L**AYING out your work" is a familiar phrase, and describes a common practice. But hardly one man in a hundred deliberately "lays out" his play, planning his recreation so as to get the best value out of every hour of his leisure time. Yet when he consults a doctor because his work is not running smoothly, one of the first questions he has to answer is about the amount and form of recreation he takes.

An important branch of the art of playing is to learn the value of reading about play. The more a man knows

#### Recreative Reading about Recreation

about any form of amusement, the more he will enjoy the hours he devotes to it, and the better he will succeed in keeping his mind off his business during these hours. But there is another and an even greater advantage in this kind of reading: *it will take your mind out-of-doors during hours of leisure that you are compelled to spend in-doors.* Everyone recognizes that outdoor recreations, involving some degree of bodily activity, are the most wholesome for men whose work is sedentary, as is the case with nearly every reader of this Guide, and the best forms of outdoor recreation are those in which the

contrast with your work is accentuated by the complete change of scene and of habits which most men can only hope to get once a year, at vacation time.

Turn to the next best form of relaxation, the out-door amusements that lie close at hand. Here, again, your opportunities are limited, for all these pleasures require daylight, which, during a great part of the year, ends before your work is done; and most of them require weather conditions that you can only get at certain seasons. An hour spent in reading and thinking about out-door amusements and travel, and in making plans for such delights, even if the planning must be for a future that seems far away, is therefore always refreshing.

It is not the purpose of the present chapter to suggest a course of reading, in the strict sense of the phrase, for it cannot be assumed that everyone who would like to read about lawn-tennis would also like to read about tarpon-fishing. But a general account of the Britannica articles that afford information about recreation and vacations will give the reader a choice among subjects in which he is already interested and among others which may offer him new possibilities.

### MOTORING

In connection with motoring, the possessor of the Britannica will not be surprised to find in it, as might be expected from its universal comprehensiveness, much fuller technical information in regard to the structure and operation of his engine, the fuel he employs, and the friction and other resistances he must overcome, than in any of the ordinary

manuals on the subject. But it may not occur to him that in planning either a long or a short tour, he can find in the volumes information of other kinds that will give added interest and significance to everything he sees. It is not only when he crosses the Atlantic for his motoring trip that cities and villages and mountains and rivers have stories to



tell. In our own country, place-names which may at first suggest nothing, are found, on reference to the Britannica, to be associated with episodes of early exploration, of Indian hostilities, of local agitation, of one or another war, with the lives of famous men, the growth of industries and of commerce, the first success in a new branch of farming, the early days of railroad and canal construction, or the development of transportation by river, lake or sea. And what is being done to-day, in these places, is often quite as interesting, and quite as difficult to ascertain from any source other than the Britannica. This use of the work as a guide-book, or rather as doing a great deal that guide-books

lamentably fail to do, is discussed later in this chapter in connection with travel in general as a form of recreation; but motoring gives especial opportunities for observation enriched by knowledge.

The value of the Britannica in connection with the planning of a motoring trip may be illustrated by brief notes on some of the articles you might read if you were about to make, for example, the run from New York through the Berkshire Hills and on to the White Mountains. The following information is all from the Britannica, and from articles to which you would naturally turn in this connection.

*A Specimen Tour from New York to the White Mountains*

Leaving New York by Broadway, your first point is YONKERS (Vol. 28, p. 922), where, as the Britannica tells you, stands "one of the best examples of colonial architecture in America," Philipse Manor Hall, now a museum of Revolutionary relics. Frederick Philipse, owner in 1779 of the Hall and of an estate extending for some distance along the bank of the Hudson, was suspected of Toryism, and all his property was confiscated by act of legislature. A mile and a half beyond Yonkers you get a magnificent view of the Hudson, disclosing the Palisades, of lava rock (Vol. 13, p. 852) which, in cooling, formed joints like those of the Giant's Causeway in Ireland. The impressive breadth of the Hudson and its navigability throughout the 151 miles to

**Along the Hudson**

many New Yorkers would be amazed to be told that fact), is due to the low grade of the river bed, permitting the tide to enter and to back up the water, so that this long stretch of the river is really a fjord, not a stream. The article FJORD (Vol. 10, p. 452) tells you how such a rock basin or trough is formed by geological action. The ar-

Troy, notwithstanding that in all that distance it falls only five feet (a good

title HENRY HUDSON (Vol. 13, p. 849) tells you how the great navigator, himself an Englishman, although employed by the Dutch East India Company in 1608 to find a westward route to China, sailed the little "Half Moon" as far up the river as Albany before he was convinced that the Pacific did not lie ahead of him.

The next point after Yonkers, DOBBS FERRY (Vol. 8, p. 849), was a strategic centre of great importance during the Revolutionary War. "The American Army under Washington encamped near Dobbs Ferry on the 4th of July, 1781, and started thence for Yorktown in the following month," and it was there that Washington and Governor Clinton, in 1783, "met General Sir Guy Carleton to negotiate for the evacuation by the British troops of the posts they still held in the United States."

In TARRYTOWN, as the article under that title (Vol. 26, p. 433) recounts, Washington Irving, who made the legends of the Hudson immortal, built

**Sleepy Hollow**

his home at "Sunnyside," and was buried in the old Sleepy Hollow Cemetery. The article IRVING (Vol. 14, p. 856), by the late Dr. Richard Gar-

nett, the famous literary critic, tells you all about Irving's life; and Professor Woodberry of Columbia, in his article on AMERICAN LITERATURE (Vol. 1, p. 881), reminds you that, although Irving spent 21 of his adult years in Europe, he is the one American writer who has "linked his memory locally with his country so that it hangs over the landscape and blends with it forever." "Kaakoot," one of the large estates at Tarrytown, recalls the extraordinary career of its owner, described in the article JOHN D. ROCKEFELLER (Vol. 23, p. 433); and "Lyndhurst," that of Jay Gould, of whom and of whose daughter, the well-known philanthropist, the Britannica tells in the article GOULD (Vol. 12, p. 284). On the post road near Tarrytown is the bronze statue of a Continental soldier, erected to commemorate the capture of Major André, whose life is told in the article ANDRÉ (Vol. 1, p. 968).

As you mount the hill and leave the Hudson, you enter the beautiful region of hills, lake and streams, upon which the city of New York long depended for its water; and you will be interested in comparing what New York has accomplished in this connection with what has been done by other great cities, as described in the article WATER SUPPLY (Vol. 28, p. 387), by G. F. Deacon. Many of the large country places you pass are the property of prominent New York men, of whom there are biographies in the Britannica.

Your brief run through the hilly northwestern corner of Connecticut, of which the physical features are described and the history narrated in the article CONNECTICUT (Vol. 6, p. 951); takes you through SALISBURY (Vol. 24, p. 78), near Bear Mountain (2355 feet), "the highest point in the State." A few miles more and you cross the line into Massachusetts and enter the enchanting region of the Berkshire Hills. The article MASSACHUSETTS (Vol. 17, p. 851) says that "the Berkshire country—Berkshire, Hampden, Hampshire and Franklin counties—is among the most beautiful regions of the

United States. It is a rolling highland, dominated by long, wooded hill-ridges, remarkably even-topped in general elevation, intersected and broken by deep valleys. Scores of charming lakes lie in the hollows."

GREAT BARRINGTON (Vol. 12, p. 397) "was a centre of disaffection during Shays's Rebellion," an episode

### Great Barrington

for which you may consult the article DANIEL SHAYS (Vol. 24, p. 815), and the account in the historical section of the article MASSACHUSETTS (Vol. 17, p. 860). In 1786 Shays was known as having been "a brave Revolutionary captain of no special personal importance." The State finances were in a bad condition and taxes were heavy. Mobs of discontented citizens, under Shays's leadership, assembled to prevent the courts from sitting, so that the collection of taxes and other debts might be obstructed. "The insurrection is regarded as having been very potent in preparing public opinion throughout the country for the adoption of a stronger national government." WILLIAM CULLEN BRYANT (Vol. 4, p. 698), "earliest of the master-poets of America," practiced law at Great Barrington for nine years.

Leaving Great Barrington, you cross Monument Mountain (1710 feet) on your way to STOCKBRIDGE (Vol. 25, p.

### Stockbridge

929) with its famous avenue of elms—perhaps the most characteristic New England scene in all the Berkshire country. The conspicuous bell-tower was erected by DAVID DUDLEY FIELD (Vol. 10, p. 321), the law reformer, whose proposed code of laws for the State of New York was the model on which most of the existing state codes have been based. The park was the gift of his brother, CYRUS W. FIELD (Vol. 10, p. 320), born at Stockbridge, to whom we owe the first Atlantic cable. In 1884, at the age of 15, he became a clerk in the great New York store described in the article A. T. STEWART (Vol. 25, p. 912); later embarked in the wholesale

paper business in New York, failed, formed the firm of Cyrus W. Field & Co., and in 1858, at the age of 84, had made a quarter of a million, a large fortune in those days, paid off the debts of the paper business, and nominally retired. From that time he was chiefly occupied with the cable scheme, of which the early difficulties are described in the cable section of the article TELEGRAPH (Vol. 26, p. 527), although he operated actively in stocks, was associated with JAY GOULD (Vol. 12, p. 284) in completing the Wabash Railroad, and had a controlling interest in the New York Elevated Railroad, besides being chief proprietor of the New York *Mail and Express*.

When, in 1750, JONATHAN EDWARDS (Vol. 9, p. 8), the famous New England theologian, had to leave his church at Northampton, he became pastor at Stockbridge and missionary to the Housatonic Indians, remaining there until 1759. It was there that he wrote his famous treatise on the *Freedom of the Will*. In a cleft on Bear Mountain, just outside the village, is the curious Ice Glen, with caverns ice-lined even in midsummer.

On the road from Stockbridge to Lenox you pass the beautiful lake called the Stockbridge Bowl, on the shore of which NATHANIEL HAWTHORNE, in 1851, wrote *The House of the Seven Gables*. His reason for adopting literature as a vocation is quaintly stated in a letter to his mother quoted in this Britannica biography.

"I do not want to be a doctor and live by men's diseases, nor a minister to live by their sins, nor a lawyer and live by their quarrels. So I don't see that there is anything left for me but to be an author." LENOX (Vol. 16, p. 421) is surrounded by high hills, famous for their vivid coloring when the leaves change their hues

**Lenox** in the fall, Yokun Seat (2080 feet), South Mountain (1200 feet), Bald Head (1588 feet) and Rattlesnake Hill (1540 feet). "The surrounding region contains some of the most beautiful country of the Berkshires—hills, lakes,

charming intervals and woods. As early as 1835 Lenox began to attract summer residents. In the next decade began the creation of large estates, although the great holdings of the present day, and the villas scattered over the hills, are comparatively recent features." The township was named after the third Duke of RICHMOND AND LENNOX (Vol. 28, p. 807), "a firm supporter of the colonies in the debates on the policy that led to the War of American Independence; and he initiated the debate of 1778 calling for the removal of the troops from America."

Among other names associated with Lenox and with its famous schools are those of the actress FRANCES KEMBLE—"Fanny" Kemble (Vol. 15, p. 724); HENRY WARD BEECHER (Vol. 3, p. 689); HARRIET HOSMER (Vol. 18, p. 791), the sculptor; MARK HOPKINS (Vol. 18, p. 684), the famous president of Williams College; ALEXANDER H. STEPHENS (Vol. 25, p. 887), vice-president of the Confederate States, who, the article CONFEDERATE STATES OF AMERICA (Vol. 6, p. 899), says, was "during the war a strong antagonist of President Davis's policy;" and WILLIAM H. YANCEY (Vol. 28, p. 902), whose fortunes were influenced by a singular event. A lawyer, and editor of a little anti-nullification weekly in South Carolina, he married a wealthy woman; but a few years later, in 1839, the accidental poisoning of all the slaves on the estate forced him to return to the law; and he subsequently became one of the political leaders of the Confederacy.

PITTSFIELD (Vol. 21, p. 682) is both a popular resort and a prosperous manufacturing town, with ample water

**Pittsfield** power supplied by the east and west branches of the Housatonic on either side of it. It was here that HENRY W. LONGFELLOW (Vol. 16, p. 977) wrote *The Old Clock on the Stairs* at "Elm Knoll," the house of his father-in-law, NATHAN APPLETON (Vol. 2, p. 224), a reference to whose biography in the Britannica discloses the interesting fact that

his son, Thomas Gold Appleton, a famous wit in his day, originated the saying, "Good Americans when they die, go to Paris," which is generally attributed to Oliver Wendell Holmes. Just outside Pittsfield lies the village of the SHAKERS (Vol. 24, p. 771), the curious sect founded by Ann Lee, daughter of a blacksmith in Manchester, England, who came to America with a small party of her adherents in 1714. The road through ADAMS (Vol. 1, p. 181), affords a view of Greylock Mountain (3535 feet), the highest point in Massachusetts; and at NORTH ADAMS (Vol. 19, p. 760), there is a natural bridge 50-60 feet high across Hudson Brook; and you can see the ruins of Fort Massachusetts, captured in 1746 by the French with the aid of the Indians. Here is also the western end of the Hoosac Tunnel,  $5\frac{3}{4}$  miles long. The article TUNNELS (Vol. 27, p. 405) says that the piercing of this tunnel, begun in 1835 and not finished until 1876, was marked by the first American use of air drills and nitroglycerin; and the article POWER TRANSMISSION (Vol. 22, p. 282) describes the influence which this successful employment of compressed air had in furthering its use for the noisy "gun" tools now so familiar.

WILLIAMSTOWN (Vol. 28, p. 685), the last town in Massachusetts on your route, is the seat of Williams College;

### Williamstown

and the "Haystack Monument" in Mission Park, stands where the prayer meeting was held which was the forerunner of the American foreign missionary movement described in the article MISSIONS (Vol. 18, p. 583), which contains the interesting statement that in the 3rd century the proportion of Christians to the whole human race was one to 150, while it is now one to three. The article VERMONT (Vol. 27, p. 1025) contains an interesting summary of the early disputes over state boundaries in this part of New England.

BENNINGTON (Vol. 3, p. 748) lies at the foot of the Green Mountains,

near Mt. Anthony (2845 feet). "The

### Bennington

Bennington Battle Monument, a shaft 801 feet high, is said to be the highest battle monument in the world. It commemorates the success gained on the 16th of August, 1777, by a force of nearly 2000 'Green Mountain Boys' and New Hampshire and Massachusetts militia . . . over two detachments of General Burgoyne's army," of whom 700 were taken prisoners. The article AMERICAN WAR OF INDEPENDENCE (Vol. 1, p. 842) shows how important an effect this victory had on Burgoyne's campaign. In 1825 WILLIAM LLOYD GARRISON (Vol. 11, p. 477), the anti-slavery leader, edited a paper at Bennington, leaving it when BENJAMIN LUNDY (Vol. 17, p. 124), the Quaker abolitionist, determined to secure Garrison's co-operation on a Baltimore abolitionist magazine, "walked through the ice and snow of a New England winter from Boston to Bennington, 125 miles," and persuaded Garrison to join him. Bennington was the home of ETHAN ALLEN (Vol. 1, p. 691), the frontier hero who led the "Green Mountain Boys" and of SETH WARNER (Vol. 28, p. 827), who subsequently became their colonel.

On leaving Bennington you can choose any one of several routes to bring you over to the Connecticut River, but, whichever you take, you will be fairly on the main route to the White Mountains (by which you would have gone from New York through Waterbury, Springfield and Greenfield if you had not included the Berkshires in your itinerary) when

### Hanover

you reach HANOVER, N. H. (Vol. 12, p. 927). Here, "ranges of rugged hills, broken by deep, narrow gorges and by the wider valley of Mink Brook, rise near the river and culminate in Moose Mountain, 2326 feet above the sea." Near the foot of that peak is the birthplace of LAURA D. BRIDGMAN (Vol. 4, p. 559), the first blind deaf-mute to be successfully educated. Dr. S. G. HOWE (Vol. 18, p. 887), who was head of the



Perkins Institute for the Blind in Boston, heard of her case in 1837, took charge of her in October of that year, and by June, 1840, at eleven years of age, her mind had become as well developed as that of a normal child of her age. Charles Dickens saw her when he was in America in 1842, and his account of her case led to the introduction in England, and afterwards in all parts of Europe, of the Howe system of training.

The attractions which Hanover owes to its picturesque site are enhanced by the fine buildings and the notably beautiful campus of DARTMOUTH COLLEGE (Vol. 7, p. 888). The purpose for which this college was originally founded is quaintly expressed in its charter, granted by George III in 1769. See the article on INDIANS, NORTH AMERICAN (Vol. 14, p. 452). This document ordains "that there be a college erected in our Province of New Hampshire by the name

### Dartmouth College

of the Indian Tribes in this Land in reading, writing and all parts of Learning which shall appear necessary and expedient for civilizing and christianizing children of pagans . . . and also of English youth and any other."

With the name of Dartmouth College will always be associated that of DANIEL WEBSTER (Vol. 28, p. 460), not only because he was graduated there in 1801, but because the famous "Dartmouth College case," in which Webster appeared for the college before the United States Supreme Court, was the first in which that august tribunal fully asserted its power to support the Federal constitution by nullifying any usurpatory statutes passed by state legislatures.

When you turn away from the Connecticut River to go up the valley of the Ammonoosuc, you are fairly in the White Mountain region, which the Britannica (Vol. 19, p. 490) describes in part as follows:

"The White Mountains, a continuation of the Appalachian system, rise very abruptly in several short ranges and in

### The White Mountains

outlying mountain masses from a base level of 700-1500 ft. to generally rounded summits, the heights of several of which are nowhere exceeded in the eastern part of the United States except in the Black and the Unaka mountains of North Carolina; seventy-four rise more than 8000 ft. above the sea, twelve more than 5000 ft., and the highest, Mount Washington, attains an elevation of 6293 ft.

The principal ranges, the Presidential, the Franconia and the Carter-Moriah, have a north-eastern and south-western trend. The Presidential, in the north-eastern part of the region, is separated from the Franconia on the south-west by the Crawford, or White Mountain Notch, about 2000 ft. in depth, in which the Ammonoosuc and Saco rivers find a passage, and from the Carter-Moriah, parallel to it on the east, by the Glen-Ellis and Peabody rivers, the former noted for its beautiful falls. On the Presidential range, which is about 20 m. in length, are Mount Washington and nine other peaks exceeding 5000 ft. in height: Mount Adams, 5805 ft.; Mount Jefferson, 5725 ft.; Mount Sam Adams, 5585 ft.; Mount Clay, 5554 ft.; Boot Spur, 5520 ft.; Mount Monroe, 5390 ft.; J. Q. Adams Peak, 5384 ft.; Mount Madison, 5380 ft.; and Mount Franklin, 5028 ft. On the Franconia, a much shorter range, are Mount Lafayette, 5269 ft.; Mount Lincoln, 5098 ft.; and four others exceeding 4000 ft. The highest peak on the Carter-Moriah range is Carter Dome, 4860 ft., but seven others exceed 4000 ft. Loftiest of the isolated mountains is Moosilauke noted for its magnificent view-point, 4810 ft. above the sea. Separating Franconia and Pemigewasset ranges is the romantic Franconia Notch, overlooking which from the upper cliffs of Profile Mountain is a remarkable human profile, *The Great Stone Face*, immortalized by Nathaniel Hawthorne; here, too, is the Franconia Flume, a narrow upright fissure, 60 ft. in height, with beautiful waterfalls.

The whole White Mountain region abounds in deep narrow valleys, romantic glens, ravines, flumes, waterfalls, brooks and lakes. . . . The headwaters of the rivers are for the most part mountain streams or elevated lakes; farther on their swift and winding currents—flowing sometimes between wide intervales, sometimes between rocky banks—are marked by numerous falls and fed by lakes.

The lakes and ponds, numbering several hundred, were formed by glacial action and the scenery of many of them is scarcely less attractive than that of the mountains. The largest and most widely known is Lake



Winnepesaukee on the S. border of the White Mountain region; this is about 20 m. long and from 1 to 8 m. wide, is dotted by 274 islands, mostly verdant, and has clear water and a rather level shore, back of which hills or mountains rise on all sides. Among the more prominent of many others that are admired for their beauty are Squam, New Found, Sunapee and Ossipee, all within a radius of a few miles from Winnepesaukee; Massabesic farther S.; and Diamond Ponds, Umbagog and Connecticut lakes, N. of the White Mountains. The rivers with their numerous falls and the lakes with their high altitudes furnish a vast amount of water power for manufacturing, the Merrimac, in particular, into which many of the larger lakes, including Winnepesaukee, find an outlet, is one of the greatest power-yielding streams of the world."

After exploring the country thus described in the *Britannica*, you can take for your return trip to New York, the route by Portland, Me., that by Lake Winnepesaukee and Portsmouth, or, that by Plymouth and Manchester, N. H. By any of these ways, you will visit Boston, and its famous suburbs, Concord, Lexington, Brookline, Salem and Marblehead, whose historical and literary associations are fully described in the *Britannica*.

The article **MOTOR VEHICLES** (Vol. 18, p. 914), with 37 illustrations, is by the late C. S. Rolls, the famous builder and driver of motor cars,

**Automobiles** with a special section on commercial vehicles, by Edward Shrapnell Smith, editor of *The Commercial Motor*. The story of the development of the car, told at the beginning of the article, is full of human interest, for it shows how national characteristics affect industries. From 1802, when Richard Trevithick built, in England, the first practical road carriage, until 1885, all the most promising efforts to further mechanical road traffic were made by English inventors. As early as 1824 there was a regular motor-omnibus service between Cheltenham and Gloucester, at a speed that sometimes (perhaps down a hill) reached 14 miles an hour; and if inventors had

been encouraged, the effort to lighten road engines would have produced the tubular boiler long before it actually appeared. But the influence of the land-owning, horse-breeding, horse-loving English aristocracy was too strong, and one act of Parliament after another imposed destructive restrictions, culminating in the law passed in 1865, making 4 miles an hour the maximum speed, and requiring that a man showing a red flag should march ahead of the engine! Of course this drove every engine off the road except a steam roller or the heaviest type of traction engine. In 1885 Daimler invented the internal combustion engine, and for a moment Germany seemed likely to lead the world. But Daimler failed to hit upon a satisfactory system of transmission, and although his engine worked well in motor boats, the risk of starting a car on the road was too great. His boat, shown at the Paris Exposition of 1887, attracted the attention of the French firm of Panhard & Levassor, makers of wood-working machinery. They bought the French rights, and Levassor devised the clutch, the gear-box and the whole system of connecting the engine with its work, which, save for improvements in detail, are all in use to-day. In 1895 the French car which won the race from Paris to Bordeaux covered the 744 miles at a mean speed of 15 miles an hour, and the world realized that the motor car was a practical means of transportation. But it was not until 1896 that the English parliament gave cars the freedom of the roads, and that English manufacturers could see a future for themselves.

In the United States, the industry began under great difficulties. The roads, except in the immediate outskirts of the larger cities, were abominable, and no system of suspension that could make them tolerable had yet been discovered. But though starting late, by 1906 the United States overtook and passed France, becoming the foremost car building and car using nation of the world.

Nowhere else are factories worked upon so large a scale, and nowhere else are really serviceable cars so light and so cheap. And the greatest recent improvement in the gasolene engine, the Knight sleeve-valve, is an American invention. It is, altogether, a curious story, this struggle in which England, Germany and France, one after another, seemed destined to attain the leadership which in the end fell to the United States.

Turning to the subsidiary articles which relate to motoring, the gasolene engine is elaborately discussed in OIL ENGINE (Vol. 20, p. 35), by Dugald Clerk, an expert engineer and himself the inventor of the Clerk cycle engine. This article shows how complete a change in engineering practice was effected in 1883, when it was demonstrated that small engines could be run at a thousand revolutions a minute, a speed four times as great as any previously contemplated. All the types of carburetter are described,

with mechanical diagrams. Other diagrams show the action of the inner and outer sleeves of the Knight valves. Gasolene, and the experiments made in search of a less costly fuel, are dealt with in the article FUEL (Vol. 11, p. 274), by Prof. Georg Lunge, of the Zurich Polytechnic, the greatest of all authorities on the subject. Tires, the bugbear of every car-owner, form the subject of a separate article TIRE (Vol. 26, p. 1006), by Archibald Sharp, which contains a number of curious and instructive diagrams showing the direction of the stress on a tire at the point where the road slightly flattens it. RUBBER (Vol. 23, p. 795), by W. R. Dunstan, president of the International Association of Tropical Agriculture, is well worth reading for its information as to the effect upon tires of exposure to air and light, apart from wear. The materials used, and the mechanical principles involved, in the construction of cars are discussed in a number of separate articles under obvious titles.

## PHOTOGRAPHY

A large place, in any review of recreations, must be given to photography, which, even in its most elementary form, provides a record and an echo of an infinite variety of amusements, and, after a little study, not only does this all the better, but becomes a delightful art in itself, to be enjoyed in-doors as well as out-doors, at all hours and at all seasons. The amateur can find no more authoritative, full and yet concise manual of the subject than the Britannica article PHOTOGRAPHY (Vol. 21, p. 485), equivalent to about 125 pages of this Guide. The first section on History and Technique is by Sir William de Wiveleslie Abney, author of *Instruction in Photography, Colour Vision*, etc. Next is a section on photographic apparatus by Major-Gen. James Waterhouse, whose photographic work in India is known throughout the world. And then comes a discussion of pictorial

photography by A. Horsley Hinton, author of *Practical Pictorial Photography*. The following is an outline of the article:

History. — Eighteenth century experiments of Scheele, Senebier and Count Rumford. Early 19th century discoveries. The Daguerreotype and its improvements by Goddard, Claudet and Fizeau. The Fox-Talbot process. Albumen process on glass. Collodion process. Positive pictures by the collodion process. Moist collodion process. Dry-plates; alkaline developers with formulæ for some of the most effective; developers of organic salts of iron; developer restrainers. Dry-plate bath process of R. Manners Gordon, with formula for preservative. Collodion emulsion processes—work of Bolton and Sayce and of M. C. Lea and W. Cooper; Bolton's modification; Col. Wortley introduces strongly alkaline developer. Formula for alkaline de-

veloper for collodion plates. Gelatin emulsion process — Maddox (1871), King (1873), Burgess (1873), Stas (1874), Bennett (1878), Abney (1879), van Monckhoven (1879) and his use of hydrobromic acid on silver carbonate with ammonia. Heating the emulsion—Wortley (1879), Mansfield (1879).

Relative rapidities of the processes described.

|                            |                            |                   |
|----------------------------|----------------------------|-------------------|
| Daguerreotype, originally, | } Half an hour's exposure. |                   |
| Calotype .....             |                            | 2 or 3 minutes' " |
| Collodion .....            |                            | 10 seconds' "     |
| Collodion emulsion.....    |                            | 15 seconds' "     |
| Rapid gelatin emulsion..   |                            | .1/15 second "    |

The second part of the article deals with the technique of photography. The major topics in it are:

Gelatin emulsions: formulae and directions for emulsion with and without ammonia. Coating the plates. Exposure. Development, with formula for alkaline developer. Intensifying and varnishing the negative.

Printing processes. Albumen method of Fox-Talbot. Sensitizing bath. Toning and fixing the print—formulae for toning-bath. Collodio-chloride silver printing process: Simpson's formula. Gelatino-citrochloride emulsion: Abney's formula. Printing with uranium salts: an early formula. Self-toning papers. Printing with chromates: carbon prints—work of Ponton, Becquerel, Dixon, Fox-Talbot, Poitevin, Pouncey, Fargier, Swan, Johnson and Sawyer. Printing with salts of iron. Photo-mechanical printing processes: discoveries of Oreloth, de Motay, Marechal and Albert; "Lichtdruck" and heliotype. Woodbury type. Photo-lithography: the work of E. J. Asser, J. W. Osborne and Sir H. James.

Photographs in natural colours are next described, and their history is traced from 1810 when Seebeck of Jena made experiments described in Goethe's famous work on *Colours*. The first successful colour photography was by Becquerel in 1848 on a daguerreotype plate,

chlorinized. The later methods of Lippmann and Lumière, respectively, with collodion dry plates prepared with albumen and with dyed gelatin plates (orthochromatic), produce pictures in which the colours show only from an angle.

The section on the *Action of Light on Chemical Compounds*, with a plate showing spectra and graduation scales, contains valuable diagrams and a chronological table of observers of the action of light on different substances. The paragraphs of particular interest to the practical photographer are those on:

Measurement of the Rapidity of a Plate.

Effect of Temperature on Sensitiveness.

Effect of Small Intensities of Light on a Sensitive Salt.

Effect of Very Intense Light on a Sensitive Salt.

Intermittent Exposure of a Sensitive Salt.

Effect of Monochromatic Light of Varying Wave-Lengths on a Sensitive Salt.

Reproduction of Coloured Objects by 3 Photographic Positives: Ives' process; Joly's process; Autochrome of Lumière; Positives in 3 Colours.

Another division (equivalent to 60 pages at least in this Guide) of the article is on Apparatus. It deals especially with the hand camera as developed from 1855 to 1888 when the Eastman Kodak came out. And it has separate paragraphs on Focusing; Plate-holders or Dark-slides (1 illustration); Studio cameras; Portable and Field cameras; Hand cameras (7 illustrations); Twin-lens and Reflex cameras (2 illustrations); Panoramic cameras (2 illustrations); 3 Colour cameras (1 illustration); Enlarging cameras and cinematographs.

A separate section deals with objectives, and contains 45 illustrations, giving special attention to: single achromatic (landscape) lens, including aplanatic; unsymmetrical doublets; symmetrical doub-

lets; triple combinations; anastigmatic combinations; telephotographic objectives; anachromatic lenses; diaphragm apertures.

Then follows a discussion of instantaneous shutters (with 9 illustrations) and a discussion under "lateral" and "central" of flap, drop, drop and flap, rotary, roller blind, focal plane, moving blade, central and iris shutters.

Exposure meters (4 illustrations) with a discussion of the actinic power of light; sensitive plates, films and papers: sensitive dry plates, plates for colour photography, celluloid films, photographic printing papers, apparatus for development (with 4 illustrations); photographic printing apparatus; bibliography.

The last division of this great article is on *Pictorial Photography*, and this is illustrated by three full-page plates. It deals not merely with portrait photography but with "artistic" landscape work, and combination printing, which "is really what many of us practiced in the nursery, that is, cutting out figures and pasting them into white spaces left

for that purpose in the picture book."

In addition to this comprehensive treatise, in itself a complete manual of photography, there are other articles which will be useful to the advanced amateur who desires either to study the scientific aspects of the subject or to undertake the reproduction of his work by processes other than the ordinary printing. The production of chemical changes by the action of light are discussed in *PHOTOCHEMISTRY* (Vol. 21, p. 484). *LENS* (Vol. 16, p. 421) is by Dr. Otto Henker, of the staff of the Zeiss factory at Jena, Germany. *ABERRATION* (Vol. 1, p. 54) is by Dr. Eppenstein, another expert of the same establishment. The making of blocks from your own negatives is covered by the article *PROCESS* (Vol. 22, p. 408), by Edwin Bale, art director of Cassell & Co., and contains coloured plates showing the stages of superimposed printing. *SUN COPYING* (Vol. 26, p. 93), by F. Vincent Brooks, a practical printer, describes direct-contact printing without the use of a camera.

## OUT-DOOR GAMES

The authority which is back of the articles in the Britannica and the fact that its articles are on a larger scale than those of other works of reference make its articles on sports and games singularly valuable. The reader who is interested in *FOOTBALL*, for instance, will find an article (Vol. 10, p. 617), of more than 12,000 words, part of it written by Walter Camp, the famous American expert. It includes a historical sketch; a description of the Rugby Union game by Charles James Nicol Fleming, inspector in the Scotch Education Department, and Charles John Bruce Marriott, secretary of the Rugby Football Union; of the Association game, by Charles William Alcock, late secretary of the Football Association, London, and Frederick Joseph Wall, secretary of the Football Association; and of the game in

the United States, by Walter Camp and Edward Breck. The article *GOLF* is by H. G. Hutchinson, amateur golf champion in 1886-87, and author of *Golf, Book of Golf and Golfers*, etc. In the same way there are authoritative and full articles on the following subjects:

|                                 |                  |
|---------------------------------|------------------|
| Athletic Sports                 | Children's Games |
| Acrobat                         | Circus           |
| All-Round Athletics             | Cricket          |
| Amateur                         | Croquet          |
| Archery                         | Cycling          |
| Ball                            | Discus           |
| Base-ball                       | Football         |
| Battledore and Shuttle-<br>cock | Game             |
| Botori                          | Games, Classical |
| Bowls                           | Golf             |
| Boxing                          | Gymkhana         |
| Bull-fighting                   | Hammer Throwing  |
| Caber-Tossing                   | Hurdle-Racing    |
| Caestus                         | Jumping          |
| Camping-Out                     | Kite-Flying      |
|                                 | Lacrosse         |



|                  |                 |
|------------------|-----------------|
| Lawn-Tennis      | Rackets         |
| Long Fives       | Ringgoal        |
| Marbles          | Rounders        |
| Matador          | Rowing          |
| Palaestra        | Running         |
| Pall-Mall        | Scul            |
| Pallone          | Skittles        |
| Pelota           | Sport           |
| Pigeon Flying    | Stadium         |
| Pole Vaulting    | Stool-Ball      |
| Potato Race      | Swimming        |
| Pugilism         | Toreador        |
| Pushball         | Tournament      |
| Putting the Shot | Tug-of-War      |
| Quarter Staff    | Walking-Races   |
| Quintain         | Water Polo      |
| Quoits           | Weight-Throwing |

And among active indoor games on which the Britannica contains articles, are **FENCING**, **CANE FENCING**, **EPÉE-DE-COMBAT**, **FOIL-FENCING**, **SABRE-FENCING**, **SINGLE-STICK**, **BASKET BALL**, **BADMINTON**, **BOWLING**, **TENNIS**, **STICKÉ**, **FIVES**, **LONG FIVES**, **ROLLER-SKATING**, **SQUAILS**, **SHUFFLE-BOARD**, **TRAPEZE**, **WRESTLING**.

The distinction between games and athletic sports is an arbitrary one, and the articles on athletics have been included

### Athletics

in the list of those on out-door games; but a few of them seem to call for special mention. The article **ATHLETIC SPORTS** (Vol. 2, p. 846) gives a general account of amateur associations and of national and international meetings; and contains a special section on the revived Olympic Games. **ATHLETE** (Vol. 2, p. 846) and **GAMES, CLASSICAL** (Vol. 11, p. 443) deal with the ancient Greek and Roman contests. **ALL-ROUND ATHLETICS** (Vol. 1, p. 709) describes the championship, instituted in this country, for the highest awards attained by one athlete in eleven different branches of sport. **AMATEUR** (Vol. 1, p. 782) is a very full and impartial discussion of the interminable controversies regarding the distinction between professionals and amateurs. Among the articles on special sports are **RUNNING** (Vol. 23, p. 853), dealing with every form of race from the 100-yard dash to the Marathon run; **HURDLE-RACING** (Vol. 13, p. 958); **JUMPING** (Vol. 15, p. 533); **POLE VAULTING**

(Vol. 21, p. 977); **WEIGHT-THROWING** (Vol. 28, p. 494); **PUTTING THE SHOT** (Vol. 22, p. 672); **HAMMER THROWING** (Vol. 12, p. 899); **CABER-TOSSING** (Vol. 4, p. 917); **DISCUS** (Vol. 8, p. 312); and **TUG-OF-WAR** (Vol. 27, p. 365).

The reader interested in hunting will turn first to the articles on sporting weapons. **GUN** (Vol. 12, p. 717), by Sir

### Hunting

Henry Seton Karr, one of the world's most famous big game shots, describes the modern shot gun in great detail, with full particulars as to barrels, locks and ejectors. **RIFLE** (Vol. 23, p. 325) of course includes full descriptions of the military rifles of all armies, and the sections on sporting rifles and target rifles (p. 334) are by the contributor of the article on shot guns just mentioned. **PISTOL** (Vol. 21, p. 654) gives a full account of the modern automatic pistol, with diagrams showing the mechanism of the Mauser and Colt types. A useful table shows the length-over-all, barrel-length, weight and composition of cartridges, of the eleven standard types of Colt and Smith & Wesson revolvers. **AMMUNITION** (Vol. 1, p. 864) deals with the cartridges used for guns, rifles and pistols. The "propellants" employed are discussed in **GUNPOWDER** (Vol. 12, p. 723), by Prof. Hodgkinson; **EXPLOSIVES** (Vol. 10, p. 81); and **CORDITE** (Vol. 7, p. 139). **SHOOTING** (Vol. 24, p. 995), by Percy Stephens, deals with the pursuit of birds, ground game and big game in all parts of the world. Among the varieties of American big game mentioned are the huge grizzlies of Alaska, the wapiti, moose, caribou, antelope, big horn and puma or mountain lion. The section on the hunter's personal equipment contains excellent practical hints as to outfit. Among other articles of interest in this connection are **BIRD** (Vol. 3, p. 959), by Prof. Hans Gadow; **RABBIT** (Vol. 22, p. 767), by Sir William Flower and Richard Lydeker; **DEER** (Vol. 7, p. 923); **ANTELOPE** (Vol. 2, p. 89); **ELK** (Vol. 9,



p. 290); BEAR (Vol. 3, p. 573); PUMA (Vol. 22, p. 644); and CARNIVORA (Vol. 5, p. 366). There is a separate article on PIGEON SHOOTING (Vol. 21, p. 597). On each species of African and Asiatic big game there is an elaborate article. The dogs used in sports of all kinds are described in the article DOG (Vol. 8, p. 374), by Walter Baxendale, kennel editor of the *London Field*, and Prof. Chalmers Mitchell, with five full-page plates.

Riding to hounds, including fox-hunting, stag-hunting, hare-hunting and the drag hunt, is covered by the article HUNTING (Vol. 13, p. 946), by A. E. T. Watson, editor of the *Badminton Library*. Other forms of the chase are dealt with in COURSING (Vol. 7, p. 321) and FALCONRY (Vol. 19, p. 141), by Lieut.-Col. Delmé Radcliffe.

The key article on line fishing is ANGLING (Vol. 2, p. 21), in length equivalent to 35 pages of this Guide. It begins with

### Fishing

a most interesting historical section, showing that, before the days of the earliest hooks, the cave-men used on their lines a little flake of flint or strip of stone, fixed in the bait, with a groove in the middle of it, around which the line was so fastened that when the pull came the instrument turned crossways in the fish's stomach and could not be disgorge. A delightful section on angling literature follows this historical matter; and then comes treatment of fresh water fishing, with fly-casting and the use of surface baits; live-baiting and spinning; and bottom-fishing; each of the three fully treated. A detailed study is then made of the habits of the salmon and of the tackle and methods devised for his beguiling. Trout, muskelunge, bass, perch and roach are successively discussed; and then comes the section on sea-angling, the tarpon, tuna, jewfish and the giant black bass. The article ends with a complete bibliography of the subject. There are 96 articles on individual fish, all listed on p. 891 of Vol.

29, if the reader desires to refresh his memory as to the varieties. FISHERIES (Vol. 10, p. 429), by Prof. Garstang and Prof. Chalmers Mitchell is concerned with the industry rather than with sport, but it contains much information about sea fish which will be of use to the sea-angler.

A thoroughly practical article is TAXIDERMISTRY (Vol. 26, p. 464), by Montague Browne, author of a manual of the art.

His book and Dr. Taxidermy W. T. Hornaday's

*Taxidermy and Zoological Collecting* are the most important special books on the subject, and Mr. Browne in this article constantly refers to the improved methods introduced by Hornaday and other Americans. He points out the dangers of using arsenical soap and gives the formula for the substitute, quite safe except when hot, which he himself invented. Minute directions are given for skinning, mounting, etc. And the article also treats of the advantages of modelling as compared with the old method of "stuffing"; and the placing of specimens in natural surroundings, with panoramic back-grounds, top- and side-lighting, etc.

On sailing, boating and kindred subjects the reader should first consult the article YACHTING (Vol. 28, p. 890), equivalent to 26

Sailing and Boating pages of this Guide, by B. Heckstall-Smith, yachting editor

the *Field*, and secretary of the Yacht Racing Association and of the International Yacht Racing Union. The historical part of this article traces yachting in England back to the state-barges of the Anglo-Saxon kings and through the pleasure ship of Elizabeth (1588), which was built at Cowes in the Isle of Wight, so that this place has been associated with the sport for more than three centuries. Charles II in 1660 received the present of a yacht from the Dutch, and at this time the Dutch word "yacht" first

found its way into the English language. Yachting clubs date from the establishment in 1720 of the Cork Harbour Water Club, now the Royal Cork Yacht Club. At Cowes races were sailed as early as 1780 and a yacht club was organized there in 1812. The first yacht club in the United States was formed in 1844 and the first race in the United States was at New York in 1846 to Sandy Hook light-ship and back. The first important alteration in type was in 1848 when the "Mosquito" was built—a 50-ton vessel, 59 ft. 2 in. at water line, 15 ft. 3 in. beam, with a long hollow bow and a short and rather full after-body. The first races in the United States resulted in the building of the "America," which in 1851 crossed the ocean and won a race round the Isle of Wight, bringing back to the New York Yacht Club the "America's" cup. The later races for this cup are described in detail at the close of the article, with elaborate tables showing the exact tonnage or sailing length of competing yachts, dates of races, time allowance, elapsed time, corrected time, and margin by which each race was won. The article describes 1870-1880 as the first great era of yachting. Changes in the method of reckoning length, introduced in 1879, resulted in the "lead mine" or plank-on-edge type. In 1887 the system of tonnage measurement was introduced and a method of rating by water-line length and sail area—and this "crushed the plank-on-edge type completely. There was not another boat of the kind built." The era of big cutters followed—in America notably the Herreshoff boats. The success of the bulb keels in the small classes threatened the use of "skimming dishes" in the larger classes—and a consequent lack of head room and cabin accommodation. New linear rating rules were therefore adopted—one in 1896 and another in 1901, followed in 1904 by international rating rules. The English types of Fife and Nicholson were succeeded by such boats from the Krupp

yard at Kiel as the "Meteor" and "Germania." See also the article MODEL YACHTING (Vol. 18, p. 640).

Other articles on the subject of boating are CANOE (Vol. 5, p. 189); MACGREGOR, JOHN (Vol. 17, p. 232) (for the famous "Rob Roy"); CATAMARAN (Vol. 5, p. 502); and ROWING (Vol. 23, p. 783), by Charles Murray Pitman, formerly stroke of the Oxford University eight, with a special treatment of rowing in the United States and a comparison of English and American "styles." The articles SWIMMING (Vol. 26, p. 231) by William Henry, author of *Swimming* in the Badminton Library, and DROWNING AND LIFE SAVING (Vol. 8, p. 592) are of practical value.

The article MOUNTAINEERING (Vol. 18, p. 937) is by Sir W. Martin Conway, famous for his ascent to a height of 23,000 feet in the

**Mountaineering** Kara Koram Himalayas, for the High Level route through the Alps which he originated, and for his climbs in Spitsbergen. It contains paragraphs on the dangers from falling rocks, falling ice, snow avalanches, falls from rocks, ice slopes, crevasses, and weather; and an outline of history of the sport, which has been systematically pursued only since 1854. GLACIER (Vol. 12, p. 60), by E. C. Spicer is another article of great interest to those who love climbing. Among the articles on individual mountains and on the great ranges, the first place must be given to the scene of the classic exploits of the early mountaineers. The relevant part of the article ALPS (Vol. 1, p. 737) is by W. A. B. Coolidge who, although an American by birth, is more at home in the Alps than any other living writer. This magnificent article, which would fill nearly 40 pages of this Guide, contains a table giving the heights of no less than 1,317 separate peaks and passes, and also a consecutive narrative of Alpine exploration. HIMALAYA (Vol. 13, p. 470) is by Sir Thomas H. Holdich,

superintendent of Frontier Surveys in India. The best mountaineering section of the Rockies is described in a section of the article CANADA (Vol. 4, p. 145). ANDES (Vol. 1, p. 960) describes the peaks of the Southern Cordillera. Full articles on the mountaineering sections of our own country, such as the Appalachians, the Adirondacks, the Catskills and White Mountains will be found under the obvious titles.

SKATING (Vol. 25, p. 166) deals with both speed skating and figure skating, and tells of the exploits at Newburgh, N. Y., of Charles

**Winter Sports** June and of the famous Donoghue family. A table of amateur records is also given. Ice hockey is treated in a section of the article HOCKEY (Vol. 13, p. 554). CURLING (Vol. 7, p. 645) describes the "rink" and stones, as well as the game, and contains a glossary of technical terms. ICE YACHTING (Vol. 14, p. 241) explains the mechanical paradox which makes it possible for a boat propelled by the wind to move faster than the wind is blowing. Ski-running and jumping, with the new development of military skiing in France and Italy, are described in SKI (Vol. 25, p. 186); and it will surprise many readers to learn that a clear jump of more than 130 feet has been made. Other articles dealing with winter sports are SNOWSHOES (Vol. 22, p. 296), COASTING (Vol. 6, p. 603) and TOBOGANNING (Vol. 26, p. 1042).

For information in regard to sports connected with the horse the reader should first study the article HORSE and particularly that part

**Driving, Riding and Polo** which concerns the history of horse breeding (pp 717-723 of Vol. 13), written by E. D. Brickwood, an English authority on sport, and the sections on "breeds of horses" by the late William Fream, agricultural correspondent of the London *Times*, and Prof. Robert Wallace, of Edinburgh Univer-

sity, who also wrote the section on management.

HORSE-RACING (Vol. 13, p. 726) contains a section on racing in the United States, including the development of trotting races and the stress put upon time records, pacing races, racing centres, the predominance of dirt-tracks as contrasted with the turf courses of England; a section on the history of English racing, including the institution of the St. Leger, the Derby, the Oaks, the Ascot races, the Goodwood, Two Thousand Guineas, etc., present conditions, including classic races, handicaps, with scale of weight for age, the £10,000 races, the two-year-old races, Newmarket, Ascot and other meetings, value of horses, trainers and jockeys, foreign horses, time, the Jockey Club and steeple-chasing, the Grand National; a section on racing in Australia; a section on racing in France, where, as in England, American owners and jockeys have for some years past been much to the front; and also a mention of the chief meetings in other European countries and in Australia. HORSEMANSHIP (Vol. 13, p. 726) is chiefly concerned with exhibition riding. DRIVING (Vol. 8, p. 585), by R. J. McNeill, discusses the intricacies of tandem and four-in-hand coachmanship, and contains a section on the use of the whip. The importance of acquiring a light hand, and the extent to which this depends on the proper use of the three joints in the arm, are clearly explained. COACH (Vol. 6, p. 574) tells about the amateur road coach and the four-in-hand clubs in America and elsewhere. The coaching horn or "post-horn," as it used to be called, is treated under HORN (Vol. 13, p. 697) by Kathleen Schlesinger, the great authority on musical instruments. CARRIAGE (Vol. 5, p. 401), by J. A. McNaught, notes that, although the buggy and rockaway are the characteristic pleasure vehicles of this country, the heavier dog-cart and ralli-cart are much used with horses of a certain type.

The article **POLO** (Vol. 22, p. 11), by Thomas F. Dale, steward of the Polo and Riding Pony Society, describes the twelve varieties of the game played during its existence of at least 2,000 years. The three modern forms are the Indian, the English and the American, the game in England dating from 1869 when it was introduced from India by the 10th Hussars—and more definitely from 1873 when it was adopted by the Hurlingham Club. The rules of the game are given, and its development is traced, and there is a section on the polo pony and the much discussed systems of measurement.

Out-door recreation in the garden may be fully studied in the article **HORTICULTURE** (Vol. 13, p. 741), which is a

### Gardening

book in itself, for its contents are the equivalent of about

140 pages of this Guide. It is written by Liberty Hyde Bailey, director of the College of Agriculture, Cornell University, who contributes a valuable gardeners' calendar for the United States, M. T. Masters, editor of *Gardeners' Chronicle*, and W. R. Williams, superintendent of the London County Council Botany Centre, who write on "principles"; and John Weathers, author of *Practical Guide to Garden Plants*, who writes on the "practice" of gardening. The following is a partial list of the topics treated in this article:

Roots, Root-Pruning and Lifting, Watering, Bottom-Heat; Stem; Leaves; Buds; Propagation by Buds; Layering; Grafting or "Working"; Planting; Pruning; Training; Sports or Bud Variations; Formation of Flowers; Forcing; Retardation; Double Flowers; Formation of Seed, Fertilization, Hy-

bridization, Reversion, Germination, Selection—all to be supplemented by the article **BOTANY** (Vol. 4, p. 299) for more scientific and less practical discussion of these topics.

#### The Practice of Horticulture.

Formation and Preparation of the Garden—Site, Soil, Subsoil, Shelter, Water Supply, Fence, Walks, Edgings.

Garden Structures—Walls, Espalier Rails and other means of training; Plant Houses (with 12 illustrations), including Conservatory, Greenhouse, Fruit House, Vinery, Peach House, Forcing House, Pits and Frames, Mushroom House, Fruit Room, Heating Apparatus, Pipes, Boilers, Water Supply, Solar Heat, Ventilation, etc.

Garden Materials and Appliances—Soil, Loam, Sand, Peat, Leaf Mould, Composts. Manures, with descriptions and appraisals of different varieties, organic and inorganic. Tools, Tallies and Labels.

Garden Operations—Propagation—by seeds, offsets, tubers, division, suckers, runners, proliferous buds, grafts, with description and diagrams of different methods—buds, branch cutting, leaf cutting, root cutting, single-eye cutting, with 12 illustrations.

Planting and Transplanting; Watering; Pruning (with 9 illustrations); Ringing; Training—horizontal, fan, trellis, etc.

Flowers—Flower Gardens, Pleasure Grounds, Lawns; Hardy Annuals, with long list and description of plants recommended; Hardy Biennials, with list; Herbaceous Perennials, with classified list (containing more than the equivalent of 18 pages of this Guide); Hardy Trees; Bedding Plants, etc.

#### Vegetables.

#### Calendar for the United States.

A list of other articles on special aspects of gardening will be found in the chapter *For Farmers*.



## IN-DOOR GAMES

For learning in-door games—excluding in-door athletic games which have been listed above—the Britannica is particularly valuable, because of its elaborate treatment by noted authorities and because the handy and convenient form of the India paper volume makes an article on any indoor game as easy to consult as a hand-book dealing with only one game.

For example, the article on BRIDGE (Vol. 4, p. 528) is by William Henry Whitfeld, card-editor of *The Field*. The article is the equivalent of 15 pages in this Guide; and it describes both auction and ordinary bridge, with paragraphs on advice to players, declarations, doubling, redoubling, play of the hand, playing to the score; and other forms of bridge,—three-handed bridge, dummy bridge, misery bridge, and draw or two-handed bridge; and contains a list of authorities.

Even more elaborate, as befits the subject, is the article CHESS (Vol. 6, p. 93), equivalent to 45 pages of this Guide. It contains diagrams showing the arrangement of pieces and the English and German methods of notation and a vocabulary of terms of the game; it treats the comparative value of the pieces—"pawn 1, bishop 3.25, knight 3.25, rook 5, queen 9.5. Three minor pieces may more often than not be advantageously exchanged for the queen. The knight is generally stronger than the bishop in the end of the game, but two bishops are usually stronger than two knights, more especially in open positions." English, French and German modes of notation and names of pieces are given. The treatment of chess problems is accompanied by eight typical problems with diagrams and analyses. The section on the history of chess gives not

merely very interesting early material but a study critical and biographical, of the great chess masters—for example: Ruy Lopez, the first chess analyst. Greco; Philidor, a great blindfold and simultaneous player of the 18th century; Allgaier; Mahé de la Bourdonnais; the English school of the 19th century, Sarratt, Lewis, Mac Donnell, Evans (of the gambit), Staunton (on whom there is a separate article) and Buckle, the historian of civilization; the Berlin "Pleiades" and the Hungarians, Grimm, Szen and Löwenthal; Morphy, the American; and among the great players of the last half century, Steinitz, Paulsen, Blackburne, Zukertort, Horwitz, Mason, Teichman, Pillsbury, Lasker, Mieses, Marshall, Tarrasch, Tchigorin, etc. The results of international tournaments are given from 1851 on; and modern tournament play is criticised. The article closes with an elaborate bibliography.

The article on DRAUGHTS or Checkers (Vol. 8, p. 547) is by J. M. M. Dallas, late secretary of the Edinburgh Draughts Club, and Richard Jordan, former draughts champion of the world, and gives the history of the game, with a study of the different openings.

The usefulness of the Britannica for card games in general may be easily tested. Let us turn for instance to the article POKER (Vol. 21, p. 899). It is equivalent in its contents to seven or eight pages of this Guide, and among other interesting features it contains a vocabulary of technical terms, including "big dog", "little dog", "cold feet", "splitting", and the following mathematical table of approximate chances.

To improve any hand in the draw, the Britannica tells us, the chances are:



| Having in Hand         | To make the Hand below   | The Chance is |
|------------------------|--|---------------|
| 1 pair .....           | To get two pairs (3-card draw) .....   | 1 in 4 1-2    |
| 1 pair .....           | To get three of a kind (3-card draw).....                                      | 1 in 9        |
| 1 pair .....           | To improve either way average value.....                                       | 1 in 3        |
| 1 pair and 1 odd card. | To improve either way by drawing two cards.                                    | 1 in 7        |
| 2 pairs .....          | To get a full hand drawing one card .....                                      | 1 in 12       |
| 3's .....              | To get a full hand drawing two cards .....                                     | 1 in 15 1-2   |
| 3's .....              | To get four of kind drawing two cards ....                                     | 1 in 23 1-2   |
| 3's .....              | To improve either way drawing two cards.                                       | 1 in 9 2-5    |
| 3's and 1 odd card.... | To get a full hand by drawing one card ...                                     | 1 in 15 1-3   |
| 3's and 1 odd card.... | To improve either way by drawing one card                                      | 1 in 11 3-4   |
| 4 straight .....       | To fill when open at one end only or in the middle as 3 4 6 7, or A 2 3 4..... | 1 in 11 3-4   |
| 4 straight .....       | To fill when open at both ends as 3 4 5 6..                                    | 1 in 6        |
| 4 flush .....          | To fill the flush drawing one card .....                                       | 1 in 5        |
| 4-straight flush ..... | To fill the straight flush drawing one card.                                   | 1 in 23 1-2   |
| 3-card flush .....     | To make a flush drawing two cards .....  | 1 in 24       |

Among indoor-games and kindred topics, each in a separate article, in the *Britannica*, are:

|                     |                     |                            |                    |
|---------------------|---------------------|----------------------------|--------------------|
| Ace                 | Cards, Playing      | Halma                      | Pope Joan          |
| Acrostic            | Casino              | Hazard                     | Prestidigitation   |
| All-Fours           | Catch the Ten       | Hearts                     | Primero            |
| Ambigu              | Charades            | Hoyle                      | Puzzle             |
| Anagram             | Checkers            | Jones, Henry ("Cavendish") | Raffle             |
| Auction Pitch       | Chess               | Juggler                    | Rebus              |
| Aunt Sally          | Children's Games    | Knucklebones               | Riddles            |
| Automaton           | Commerce            | La Grâce                   | Roulette           |
| Baccarat            | Conjuring           | Legerdemain                | Salta              |
| Backgammon          | Consolation         | Loo                        | Shio-ghi           |
| Bagatelle           | Conundrum           | Lotto                      | Skat               |
| Bank                | Crambo              | Matrimony                  | Snip Snap Snorem   |
| Barley-Break        | Cribbage            | Mora                       | Solitaire          |
| Basset              | Deuce               | Napoleon                   | Solo Whist         |
| Beggar-my-Neighbour | Dice                | Nine Men's Morris          | Speculation        |
| Betting             | Doll                | Old Maid                   | Spelling Bee       |
| Bézique             | Dominoes            | Ombre                      | Spillikins         |
| Billiards           | Draughts            | Pachisi                    | Spoil-Five         |
| Biribi              | Ecarté              | Patience                   | Top                |
| Blind Hookey        | Euchre              | Petits-Chevaux             | Toy                |
| Blindman's-buff     | Fantan              | Ping-Pong                  | Trente et Quarante |
| Boston              | Faro                | Pinochle                   | Ventriloquism      |
| Bouillotte          | Fast and Loose      | Piquet                     | Vingt-et-Un        |
| Brag                | Gaming and Wagering | Poker                      | Vint               |
| Bridge              | Go, or Go-bang      |                            | Whist              |
| Calabresella        | Goose               |                            |                    |

Needlework as treated in the *Britannica* has one element of peculiar value and novelty. In this Needlework, etc. department, as throughout the book, the illustrations have been chosen upon a

principle unusual in works of reference: they really illustrate; they throw light on the text; they are not mere pretty pictures intended to catch the eye and inserted in the book haphazard. Turn for instance to the article LACE (Vol. 16,

p. 37). Among its 61 illustrations are not only small diagrams explaining different stitches and meshes and patterns and larger half-tone illustrations of "Bone Lace" "Reticella Needlepoint", "Gros Point de Venise", "Point de Flandres à Brides" "Point de Venise à Brides Picotées," "Réseau Rosacé," etc., but there are reproductions of portraits of the 16th, 17th and early 18th centuries, showing not merely patterns of lace but the method in which it was used and how it "combined" and harmonized with styles of costume, and of hair dressing. These "lace portraits" are: one from the Louvre, about 1540 of Catherine de' Medici, wearing a linen upturned collar of cut work and needlepoint lace; one by Morcelse, about 1600, of Amelie Elisabeth, comtesse de Hainault, wearing a ruff of needlepoint reticella lace; one, 1614, of Mary, countess of Pembroke, wearing a coif and cuffs of reticella lace; one by Le Nain, about 1628, of Henri II, duc de Montmorency, wearing a falling lace collar; one by Riley, about 1685, of James II, wearing a jabot and cuffs of raised needlepoint lace; one, about 1664, of Mme. Verbiest, wearing pillow-made lace *à réseau*; one, about 1695, of Princess Maria Teresa Stuart, wearing a flounce or tablier of delicate needlepoint lace with small relief clusters; and one of de Vintimille, about 1730, wearing needlepoint of the *Point de Venise à brides picotées*. This article on Lace, equivalent in length to 60 pages of this Guide, is by A. Summerly Cole, author of *Ancient Needle Point and Pillow Lace*. EMBROIDERY (Vol. 9, p. 309) is by Mr. Cole and A. F. Kendrick, keeper of the Victoria and Albert Museum, South Kensington; and is illustrated with 18 figures showing many styles of early embroidery. There are also articles on Tapestry, Needlework, Knitting, Yarn, etc.

On dancing and the stage there is much of interest in the Britannica. The article on the DANCE (Vol. 7, p. 794)

distinguishes dancing as an expression of emotion, whether social joy or religious exultation; dancing for pleasure to the dancer or the spectator; and mimetic dancing, "to represent the actions or passions of other people." A section on primitive and ancient dancing describes various early dances, many of them not unlike the "trots" and "hugs" so notorious during the last few years. At an Aztec feast, "called Huitzilopochtli, the noblemen and women danced tied together at the hands, and embracing one another, the arms being thrown over the neck." Primitive imitative dances, the attitude of the ancient Romans towards the dance, religious dances and the attacks on the dance of such Puritan sects as the Albigenses and Waldenses close the section on ancient dancing.

"Modern dancing" describes the branle (or brawl), the pavane, saraband, minuet, gavotte, écossaise, cotillon, galop, lancers, schottische, bourrée, waltz, fandango, bolero, jota, Morris dances, hornpipe, and other English dances of the 17th and 18th centuries. In treating of present-day dancing the article deals especially with the waltz, quadrille, country-dance, lancers, polka, galop, Washington Post and other American barn-dances, polka-mazurka, Polonaise, Schottische and Sir Roger de Coverley. And it discusses ballet dancing (on which there is also a separate article) and musical gymnastics. There are separate articles on the following dances: ALLEMANDE, BERGAMASK, CHACONNE, CHASSE, COURANTE, GAVOTTE, JIG, MAZURKA, MORRIS DANCE, PASSACAGLIA, PAVANE, POLKA, POLONAISE, QUADRILLE, SARABAND, SCHOTTISCHE.

For a sufficient knowledge of the theatre and the drama to heighten his enjoyment of a play, the theatre-goer should read up the subject, the period and the author in the Britannica. For

a more serious and thorough study of opera, music in general and the drama | as a literary form, he may turn to special chapters of this Guide.

### TRAVEL AT HOME AND ABROAD

If the traveler would make the most of his vacation journeys—as has already been suggested—he should “read up” in the *Britannica*, even if he does not wish to make a systematic study of the literature, art, architecture, music, etc., of the country he is to visit. If he does wish to pursue systematic study he can use the *Britannica* to better advantage than a whole library of books of travel or special treatises.

The *Britannica* has often and successfully been used in this way. A single instance: The Rev. Dr. George R. Van DeWater of St. Andrews Church, New York City, in a letter addressed to the publishers of the new *Britannica*, wrote:

“I have recently had occasion to look up South America with a view to obtaining needed information for a proposed tour there, and I found all that I wanted to know and found it readily.”

Among the general classes of valuable information for the traveler are:

The excellent maps, newly made with the greatest care from the best sources;

Articles on the great countries of the world. Particularly valuable sections are those at the beginning of each of these articles on physiography, climate, etc., and those on transportation by rail and water;

Articles on the states of the Union, similarly arranged, and like them accompanied by maps and with full descriptions of the surface of the country and the means of communication, climate, etc.;

Articles on regions, rivers, mountains, etc.,—for instance on the RIVIERA, ALPS, NILE, RHINE, HUDSON, YOSEMITE, YELLOWSTONE.

Articles on cities and towns, with de-

scriptions of the principal places of interest, historical sketches, diagrams of battle-fields, etc.;

General articles such as ARCHITECTURE, PAINTING, MUSEUMS, which give critical and related accounts of great art treasures of different periods and schools. To this information, as bearing on the particular place the traveler intends to visit, he will be guided by the Index;

Biographical articles related to the special vicinity to be visited—as for instance, WORDSWORTH, COLERIDGE and DEQUINCEY for the Lake District.

This survey, already too long for the limited space of this Guide, yet far too brief to represent properly the aspect of the *Britannica* with which it deals, will have accomplished its purpose if it induces the possessor of the volumes to go to them when he needs relaxation. Articles of the kind described in this chapter, showing you how to make the most of leisure hours, are doubly serviceable, giving pleasure while they are being read, and again when their suggestions are carried into effect.

But it is not only in the articles dealing with recreation that *Britannica* reading insures future as well as present enjoyment. Lafcadio Hearn said it was worth while to visit Japan if only because what one sees there makes one's dreams more beautiful all through later life. And so the fascination of history, of science, of biography, does not end, but only begins, with the reading which opens for you a gate leading into fresh fields. What you read this coming year, in any department of the *Britannica*, will be still, ten years from now, a source of pleasure, for knowledge, once acquired, brings continually renewed delight.



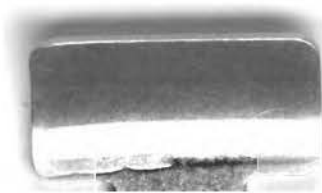




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