ELISHA HANSON

THE

# NATIONAL GEOGRAPHIC MAGAZINE

VOLUME V, 1893

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W J McGee, *Chairman*

A. W. Greely — C. Hart Merriam

*Publication Committee*

WASHINGTON

PUBLISHED BY THE NATIONAL GEOGRAPHIC SOCIETY

1894

## OFFICERS OF THE NATIONAL GEOGRAPHIC SOCIETY

1893

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*Resigned November 1, 1893, and elected a manager; vacancy filled by election of Cyrus C. Babb

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*CONTENTS*

## *ILLUSTRATIONS*

## PUBLICATIONS OF THE NATIONAL GEOGRAPHIC SOCIETY

### Regular Publications

In addition to announcements of meetings and various circulars sent to members from time to time, the Society issues a single serial publication entitled The National Geographic Magazine. During the first two years of the existence of the Society this serial was issued in quarterly numbers. With the beginning of the third year of the Society and the third volume of the Magazine the form of publication was changed, and the serial now appears at irregular intervals in parts or brochures (designated by pages and designed either for separate preservation or for gathering into volumes) which consist either of single memoirs or of magazine brochures made up of articles, notes, abstracts and other geographic matter, together with the Proceedings and other administrative records of the Society.

The *Magazine* is mailed free to members of the Society and to exchanges. The complete volumes, as well as the separate brochures of the third, fourth and fifth, are sold at the prices given below, by the Secretary, Mr Cyrus C. Babb, 1330 F street, Washington, D. C.

| | To Members. | To the Public. |
|---|---|---|
| Volume I, 1889: 4 numbers, 334 pages, 16 plates and 26 figures | $1 40 | $2 00 |
| Volume II, 1890: 5 numbers, 344 pages, 10 plates and 11 figures | 1 40 | 2 00 |
| Volume III, 1891: 5 brochures, 296 pages, 21 plates and 8 figures | 1 60 | 3 00 |
| Volume IV, 1892: 7 brochures, 239 pages, 20 plates and 5 figures | 1 75 | 3 00 |
| Volume V, 1893: Comprising— | | |
| Discoverers of America; Annual Address by the President, Gardiner G. Hubbard: pp. 1–20, pls. 1–5, April 7, 1893 | $0 35 | $0 50 |
| The Movements of our Population; by Henry Gannett: pp. 21–44, pls. 6–19, March 20, 1893 | 30 | 50 |
| Rainfall Types of the United States; Annual Report by Vice-President General A. W. Greely: pp. 45–58, pl. 20, April 29, 1893 | 15 | 25 |
| Magazine brochure, pp. 59–96, pl. 21, July 10, 1893 | 25 | 50 |
| Proceedings of the International Geographic Conference in Chicago, July 27–28, 1893: pp. 97–256, January 31, 1894 | 50 | 75 |
| Administrative brochure, pp. 257–263, i–lxviii, May 5, 1894 | 40 | 50 |
| | $1 95 | $3 00 |

## Irregular Publications

In the interest of exact bibliography, the Society takes cognizance of all publications issued either wholly or partly under its auspices. Each author of a memoir published in The National Geographic Magazine receives 25 copies, and is authorized to order any number of additional copies at a slight advance on the cost of press-work and paper; and these separate brochures are identical with those of the regular edition issued by the Society. Contributors to the magazine brochures are authorized to order any number of copies of their contributions at a slight advance on cost of press-work and paper, provided these separates bear the original pagination and a printed reference to the serial and volume from which they are extracted; but such separates are bibliographically distinct from the brochures issued by the Society. The *Magazine* is not copyrighted, and articles may be reprinted freely; and a record of reprints, so far as known, is kept.

The following separates from volume V have been issued:

*Edition uniform with the Brochures of the Magazine*

| | | | | | |
|---|---|---|---|---|---|
| Pages | 1–20, plates 1–5: | 225 copies, | April | 7, | 1893. |
| " | 21–44, " 6–19: | 25 " | March | 20, | " |
| " | 45–58, plate 20: | 50 " | April | 29, | " |

*Special Editions*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Pages | 59– 62: | 50 | copies | with | covers, | July | 10, | 1893. |
| " | 68– 75: | 25 | " | " | " | " | " | " |
| " | 84– 88: | 50 | " | " | " | " | " | " |
| " | 112–124: | 100 | " | " | " | January | 31, | 1894. |
| " | 137–153: | 700 | " | " | " | " | " | " |
| " | 167–172: | 100 | " | " | " | " | " | " |
| " | 197–234: | 100 | " | " | " | " | " | " |
| " | 235–256: | 50 | " | " | " | " | " | " |
| " | vi: | 1,000 | " | without | covers, | May | 5, | " |
| " | xxv–xxvi: | 700 | " | " | " | " | " | " |
| " | xxix–lxviii: | 50 | " | " | " | " | " | " |

## ERRATA

Facing page 59, outside cover, line 1 from top; *for* "IV" *read* V.
" " 59, inside cover, line 9 from top; *for* "Heredeen" *read* Herendeen.
Page 85, foot-note; *for* "pp. —" *read* pp. 475–482.
" 86, " " " " pp. 523-568.
" 134, line 8 from bottom; *for* "Helleland" *read* Helluland.
" 135, " 12 " top; " "Karlsevne" " Karlsefni.
" 136, " 11 " bottom; " "Erickson" " Ericsson.
" 153, " 3 " top; " "Proctor's" " Procter's.
" 176, " 4 " " " "1890" *read* 1891.
" 197, " 21 " bottom; " "Vinland" *read* Vineland.
" 200, lines 10, 14, 16 from top; *for* " " "
" 200, line 10 from top; *for* "Helleland" *read* Helluland.
" 211, lines 16 and 20 from top; *for* "Nicholas" *read* Nicolas.
" 212, line 11 from top; *for* "Nicholas" *read* Nicolas.
" 212, " 11 " " " "Amabric" " Arnabrie.
" 213, " 10 " bottom; *for* "Nicholas" *read* Nicolas.

# PROCEEDINGS

## OF THE

# NATIONAL GEOGRAPHIC SOCIETY

*(Abstract of Minutes)*

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*December 30, 1892.* *Special meeting.*

Meeting held in the Builders' Exchange Hall. President Hubbard in the chair. Attendance, 600.

Civil Engineer R. E. Peary, United States Navy, delivered a lecture on the results of his recent expedition to Greenland, exhibiting during the course of his address a large number of views.

*January 6th, 1893.* *74th meeting.*

Meeting held in the Assembly Hall of the Cosmos Club. President Hubbard in the chair. Attendance, 80.

The report of the Auditing Committee appointed at the annual meeting was read and approved.

General A. W. Greely read a paper on "Rainfall Types of the United States," illustrating his remarks by a colored map and several charts. *Printed in this volume, pp. 45–58.*

Mr H. G. Ogden spoke on "Methods of geographic and topographic Surveying." Remarks were afterward made by Messrs Baker, Wilson, Littlehales, and Gilbert Thompson.

*January 13, 1893.* *Special meeting.*

Meeting held in the Builders' Exchange Hall. Attendance, 400.

The President, Honorable Gardiner G. Hubbard, delivered the annual address on "Discoverers of America." *Printed in this volume, pp. 1–20.* At the conclusion Professor Alex. Melville Bell read Tennyson's poem on the return of Columbus.

*January 20, 1893.* *75th meeting.*

Meeting held in the Assembly Hall of the Cosmos Club. Mr Willits in the chair. Attendance, 50.

Dr T. C. Mendenhall read a paper on "The use of the Pendulum in determining the Figure and Density of the Earth," illustrating his remarks by diagrams. At the conclusion Mr E. D. Preston made a few remarks.

*January 27, 1893.* *Special meeting.*

Meeting held in the Builders' Exchange Hall. Vice-President Greely in the chair. Attendance, 400.

Mr Cyrus C. Adams, President of the Department of Geography of the Brooklyn Institute of Sciences and Arts, gave an illustrated lecture on "Recent Results of African Explorations."

*February 3, 1893.* *76th meeting.*

Meeting held in the Assembly Hall of the Cosmos Club. Vice-President Mendenhall in the chair. Attendance, 55.

Professor W. M. Davis, of Harvard University, spoke on the "Improvement of geographic Teaching." *Printed in this volume, pp. 68–75.*

*February 10, 1893.* *Special meeting.*

Meeting held in the Builders' Exchange Hall. President Hubbard in the chair. Attendance, 350.

Mr Rounsevelle Wildman, United States Consul at Singapore, gave a description of "Malaya and the Sultan of Johore," illustrating his subject by lantern slides and by a number of curios.

*February 17, 1893.* *77th meeting.*

Meeting held in the Assembly Hall of the Cosmos Club. Mr Gilbert in the chair. Attendance, 20.

The chairman read an announcement of the Loubat prizes offered by Columbia College for the best essays on geographic and other subjects.

Two papers were read on the subject of the evening, "The Geomorphology of the southern Appalachians," one by Mr M. R. Campbell, and the other by Dr C. Willard Hayes. Remarks were made at the close by Messrs Willis, Gilbert, and McGee.

*February 24, 1893.* *Special meeting.*

Meeting held in the Builders' Exchange Hall. President Hubbard in the chair. Attendance, 350.

Major J. W. Powell introduced the speaker of the evening, Mr W. D. Kelley, Engineer-in-charge of third Corps, Intercontinental Railway Commission. Mr Kelley exhibited a large number of lantern views, taken in the Andes while making a survey from the equator southward 1,700 miles.

*March 10, 1893.* *Special meeting.*

Meeting held in the Builders' Exchange Hall. President Hubbard in the chair. Attendance, 500.

Honorable H. L. Dawes in a short address introduced Mr C. L. Carter, one of the commissioners from the Hawaiian islands, who delivered an illustrated lecture on the peoples of these islands.

*March 15, 1893.* *Special meeting.*

The annual reception was held at the Arlington Hotel from 9 to 12 p m for the purpose of social intercourse between the members. Attendance, 350.

*March 17, 1893.* *78th meeting.*

Meeting held in the Assembly Hall of the Cosmos Club. Vice-President Merriam in the chair. Attendance, 30.

Honorable Edwin Willits, Assistant Secretary of Agriculture, delivered an address on "The Benefits to Agriculture of geographic Research." Remarks were made by Messrs Merriam and McGee.

*March 24, 1893.* *Special meeting.*

Meeting held in the Builders' Exchange Hall. President Hubbard in the chair. Attendance, 600.

General A. W. Greely presented the speaker of the evening, Miss Eliza Ruhamah Scidmore, who described "Japan and its Inhabitants." A large number of lantern views were shown.

*March 31, 1893.* *79th meeting.*

Meeting held in the Builders' Exchange Hall. President Hubbard in the chair. Attendance, 300.

Mr E. D. Preston, of the United States Coast and Geodetic Survey, gave the results of a scientific expedition to the Sandwich islands. A few lantern views were shown.

*April 7, 1893.* *Special meeting.*

Meeting held in the Builders' Exchange Hall. President Hubbard in the chair. Attendance, 300.

Professor William M. Brewer, of Yale University, gave a description of two visits to Colorado, one in 1869 and the other in 1892.

*April 14, 1893.* *80th meeting.*

Meeting held in the Assembly Hall of the Cosmos Club. President Hubbard in the chair. Attendance, 100.

Dr Elliott Coues, of the Smithsonian Institution, gave a description of Lewis and Clark's travels across the American continent, and exhibited the original note books of the expedition.

*April 21, 1893.* *Special meeting.*

Meeting held in the Builders' Exchange Hall. President Hubbard in the chair. Attendance, 300.

Mr Courtnay De Kalb read a paper on "Nicaragua and the unexplored Regions of the Mosquito Coast."

*April 28, 1893.* *81st meeting.*

Meeting held in the Assembly Hall of the Cosmos Club. President Hubbard in the chair. Attendance, 125.

The following proposed amendment to the By-laws was given its first reading by General A. W. Greely:

In article IV, last paragraph, change last sentence to read: "Five members of the Board of Managers shall constitute a quorum at regular meetings and nine members at special meetings."

The first paper of the evening was by Dr T. C. Mendenhall, entitled "The geographic Position and Height of Mount Saint Elias." *Printed in this volume, pp. 63–67.*

Reverend Sumantrao Vishna Karmarkar, a native of Bombay, then spoke of the origin and condition of castes in India.

Mr Marçus Baker and General A. W. Greely discussed the evidence of the probable existence of certain islands off the northern coast of Alaska. *Printed in this volume, pp. 76–83.*

Mr J. S. Diller described a recently extinct volcano in Lassen county, California. *Printed in this volume, pp. 93–96.*

Mr F. H. Newell read a paper on the condition of membership and the library of the Society, illustrating the same with a number of diagrams.

Major J. W. Powell then spoke on the future of the Society, with the advantages incidental to an increase in membership.

*May 1, 1893.* *Field meeting.*

About 350 members and guests embarked on the steamer Charles Macalester for a trip down the Potomac river. On reaching Indian head, the party was received by Ensign R. B. Dashiell, United States Navy, who explained and illustrated by the actual firing of several guns, the operations of testing naval ordnance and armor plates.

Returning to Marshall Hall, a planked-shad dinner was served, and at 9 p m the Society left for the city.

On the return trip speeches were made by Honorable J. H. Outhwaite and others. Mr Tsunejiro Mijaoka, secretary of the Japanese legation, gave a brief description of Japan and its people. The Reverend Sumantrao Vishna Karmarkar, of Bombay, sang some of his native songs, accompanied by his wife, who afterward spoke briefly on the women of India.

*May 5, 1893.* *Special meeting.*

Meeting held in the Builders' Exchange Hall. President Hubbard in the chair. Attendance, 350.

Professor J. S. Rothrock, of the Pennsylvania Forestry Association, described a winter's cruise in the British West Indies. His lecture was illustrated with lantern slides.

*May 12, 1893.* *82d meeting.*

Meeting held in the Builders' Exchange Hall. President Hubbard in the chair. Attendance, 400.

Dr J. Walter Fewkes, of the Hemenway expedition, delivered an illustrated lecture on "The Moki Snake Dance."

*May 19, 1893.* *Special meeting.*

Meeting held in the Builders' Exchange Hall. President Hubbard in the chair. Attendance, 625.

Professor Albert S. Bickmore gave an illustrated lecture on "Moorish Spain."

*June 2, 1893.* *83d meeting.*

Meeting held in the Assembly Hall of the Cosmos Club. Vice-President Hayden in the chair. Attendance, 75.

The following amendment to the By-laws, proposed by General A. W. Greely, was read and adopted:

In article IV, last paragraph, change last sentence to read: "Five members of the Board of Managers shall constitute a quorum at regular meetings and nine members at special meetings."

Lieutenant W. H. Beehler, United States Navy, read a paper on the Solarometer.

Mr Robert T. Hill read a paper on the geography of Texas.

Mr Henry Gannett read a paper descriptive of the discovery and exploration of the Yellowstone National Park.

*June 28, 1893.* *Special meeting.*

About 200 members and guests enjoyed the hospitality of President Hubbard at a garden party, from 6 to 10 o'clock p m, at his summer house, Twin Oaks, West Washington.

*July 27–28, 1893.* { *International Geographic Conference held at Chicago under the Auspices of the Society.*

*Morning session, July 27.*

The Conference was opened at 10 a m in the hall of Washington, Art Institute building, on Michigan avenue. Honorable Gardiner G. Hubbard, President of the National Geographic Society, in the chair. Attendance, 400.

General John Eaton, formerly United States Commissioner of Education, introduced President Hubbard, who read a paper on "The Relations of Air and Water to Temperature and Life." *Printed in this volume, pp. 112–124.*

Honorable John Abercrombie, delegate from the Royal Scottish Geographical Society, spoke briefly on the general work of his society. *Printed in this volume, pp. 102–104.*

General A. W. Greely, chairman of the Committee on Awards of Prizes of the National Geographic Society, made an announcement of the progress of his committee.

Mme Regina Maney, from La Sociedade de Geographia de Lisboa, spoke briefly on the attitude of that society and of the Portuguese people toward the Conference.

General John Eaton read a paper on "The Relations which may or should exist between the National Geographic Society and geographic Instruction." *Printed in this volume, pp. 105–107.*

Major J W. Powell, Director of the United States Geological Survey, spoke on the "Study of Geography." *Printed in this volume, pp. 107–109.*

Colonel F. W. Parker, Principal of the Cook County Normal School, read a paper on "The Relations of Geography to History." *Printed in this volume, pp. 125–131.*

Captain Magnus Andersen read a paper on "Norway and the Vikings." *Printed in this volume, pp. 132–136.*

*Afternoon session.*

The Conference was resumed at 3 p m. Attendance, 200.

Professor W. B. Powell, Superintendent of Public Schools, Washington, D. C., read a paper entitled "Geographic Instruction in the Public Schools." *Printed in this volume, pp. 137–153.*

Professor T. C. Chamberlin gave an address on "The Relations of Geology to Physiography in our educational System." *Printed in this volume, pp. 154–160.*

Professor William Libbey, Junior, delegate from the American Geographical Society of New York, read a paper on "The Relations of the Gulf Stream and the Labrador Current." *Printed in this volume, pp. 161–166.*

Mr F. H. Newell, Secretary of the National Geographic Society, read a paper on "The arid Regions of the United States." *Printed in this volume, pp. 167–172.*

*Evening session.*

At 8 p m the conference was resumed. President Hubbard in the chair. Attendance, 500.

General A. W. Greely delivered an address entitled "International polar Expeditions."

At 9:30 p m the Conference adjourned, to meet next morning at the monastery of La Rabida, in the Columbian Exposition grounds, Jackson park, and afterward to continue the session at 11 a m in Recital Hall.

*Morning session, July 28.*

From 9 to 11 o'clock a m Mr W. E. Curtis, chief of the Latin-American department, and Captain John G. Bourke, United

States Army, conducted the members of the Conference through the monastery of La Rabida.

At 11 a m the session was called to order in Recital Hall, and Miss E. R. Scidmore read a paper on "Recent Explorations in Alaska." *Printed in this volume, pp. 173–179.*

Dr Adolph Ernst, Venezuelan Commissioner to the World's Columbian Exposition delivered an address on "Venezuela."

Ensign Roger Welles, Junior, United States Navy, described "A Trip up the Orinoco River."

Dr Emil Hassler, Paraguayan Commissioner to the Exposition, was present, but asked to be excused from attempting an address in English.

The Brazilian commissioners to the Exposition, Señor Graciano A. de Azambuja and Baron de Marajo, also made their apologies for not participating more fully.

*Afternoon session.*

President Hubbard in the chair. Attendance, 100.

Captain John G. Bourke. United States Army, read a paper on "The History of the old Monastery of La Rabida."

Paul B. du Chaillu then spoke of his travels among the Norsemen and of the character of their ancestors, the Vikings.

Captain Victor Maria Concas read a paper on "The Caravels of Columbus." *Printed in this volume, pp. 180–186.*

Mr F. A. Ober read a paper entitled "In the Wake of Columbus." *Printed in this volume, pp. 187–196.*

Mr W. E. Curtis read a paper entitled "Recent Disclosures concerning pre-Columbian Voyages to America in the Archives of the Vatican." *Printed in this volume, pp. 197–234.*

At 5 p m the Conference adjourned *sine die.*

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*October 23, 1893.* *Special meeting.*

Meeting held in the Builders' Exchange Hall. President Hubbard in the chair. Attendance, 600.

Captain Magnus Andersen, of Norway, gave an illustrated lecture on the "Vikings."

*October 27, 1893.* *84th meeting.*

Meeting held in the Builders' Exchange Hall. Vice-President Greely in the chair. Attendance, 300.

Reverend George E. Post delivered an address on the "Physical Geography and Ethnology of Syria and Palestine."

*November 9, 1893.* *Special meeting.*

Meeting held in Columbian University. Attendance, 400.

Dr W. A. Croffut, of the United States Geological Survey, gave an account of "A Winter's Trip through the Tropics." His lecture was illustrated with lantern views.

*November 17, 1893.* *85th meeting.*

Meeting held in the Assembly Hall of the Cosmos Club. President Hubbard in the chair. Attendance, 30.

The following amendment to the By-laws was proposed:

In article V, second paragraph, omit.

Article VI, second paragraph, change "December" to "May." Third paragraph, change to read as follows: "The last regular meeting in December shall be set apart for the President's annual address." Fourth paragraph, change "January" to "November and December."

The Board of Managers announced that it had been found impossible for a volunteer to carry on the duties of Secretary, and that therefore a permanent Secretary, Mr Cyrus C. Babb, had been employed, to assume office November 1, 1894.

The subject of the evening, "The future welfare of the Society," drew out the following speakers: Messrs Ogden, Mendenhall, Newell, Loomis, Blount and Baker.

*November 24, 1893.* *Special meeting.*

Meeting held in the Builders' Exchange Hall. Vice-President Greely in the chair. Attendance, 500.

Mr J. R. G. Pitkin, Envoy Extraordinary and Minister Plenipotentiary to the Argentine Republic, delivered an illustrated lecture on the "Development, Resources and Possibilities of the Argentine Republic."

*December 1, 1893.* *86th meeting.*

Meeting held in the Assembly Hall of the Cosmos Club. Vice-President Mendenhall in the chair. Attendance, 75.

Honorable Edwin Willits read a letter from Mr Frederick Funston, special agent of the United States Department of Agriculture, now on the upper Yukon river, Alaska.

Mr W. C. Hodgkins, of the United States Coast and Geodetic Survey, read a paper on the "Delaware boundary Survey." Remarks were made by Messrs Marcus Baker and Gilbert Thompson.

Mr Henry Gannett exhibited some proofs of American maps recently taken from copper plates engraved during revolutionary times.

The chair announced that a present of an Ortelius atlas of date 1595 had been made to the Society by Mr H. L. Hall.

*December 8, 1893.* *Special meeting.*

Meeting held in the Builders' Exchange Hall. President Hubbard in the chair. Attendance, 450.

Mme Alice Le Plongeon gave an illustrated lecture on "Yucatan and the ancient Civilization of the Mayas."

*December 15, 1893.* *Special meeting.*

Meeting held jointly with the American Forestry Association, in the National Rifles' Armory Hall. President Hubbard in the chair. Attendance, 700.

Honorable J. Sterling Morton, Secretary of Agriculture and President of the Forestry Association, in a short speech, introduced Mr B. E. Fernow, who delivered an address on "The Battle of the Forest," illustrating his remarks with lantern views.

*December 22, 1893.* *Special meeting.*

Meeting held in the National Rifles' Armory Hall. President Hubbard in the chair. Attendance, 700.

Professor William Libbey, Junior, of the College of New Jersey, Princeton, New Jersey, delivered an illustrated lecture on the "Physical Geography of the Hawaiian Islands."

*December 29, 1893.* *87th meeting.*

Meeting held in the Builders' Exchange Hall. President Hubbard in the chair. Attendance, 350.

Mr Justice Harlan delivered an address on "The Bering Sea Arbitration Question."

*January 5, 1894.* *88th (6th annual) meeting.*

Meeting held in the Builders' Exchange Hall. President Hubbard in the chair. Attendance, 400.

Professor W. B. Powell gave a talk on "Geographic Instruction in the Public Schools."

Mr W J McGee spoke on the "Geographic Development of the Atlantic Slope."

Major J. W. Powell made a few remarks.

After a recess the 6th annual meeting convened. Attendance, 60.

By vote of the Society, the following amendments to the By-laws were adopted:

Article V, second paragraph, omit.

Article VI, second paragraph, change "December" to "May." Third paragraph change to read as follows: "The last regular meeting in December shall be set apart for the President's annual address." Fourth paragraph, change "January" to "November and December."

The joint report of the Secretaries was presented and adopted.

The annual report of the Treasurer was presented and referred to an auditing committee consisting of Messrs Rizer, Winston and Flint.

By vote of the Society, the officers elected this date are to hold over until the last regular meeting in May, 1895.

The annual election of officers for the year 1894 was then held, with the following result:

*President*—Gardiner G. Hubbard.

*Vice-Presidents*—T. C. Mendenhall (land);
George W. Melville (sea);
A. W. Greely (air);
C. Hart Merriam (life);
W. B. Powell (art);
Henry Gannett (commercial geography).

*Treasurer*—C. J. Bell.

*Recording Secretary*—Cyrus C. Babb.

*Corresponding Secretary*—Eliza R. Scidmore.

*Managers*—Marcus Baker,
H. F. Blount,
G. K. Gilbert,
Everett Hayden,
John Hyde,
W J McGee,
F. H. Newell,
Edwin Willits.

## SIXTH ANNUAL REPORT OF THE SECRETARIES

(*Presented to the Society January 5, 1894*)

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*Membership.*—The membership of the Society is now 955 as against 693 of one year ago. Examining in detail the membership, it is found that there are 664 active, 280 corresponding, 9 life, and 2 honorary members. This shows an increase over last year's numbers of 188 active, 72 corresponding, 2 life and 2 honorary.

During the past year there have been 323 new members elected; 34 have resigned, 22 have been dropped for non-payment of dues, and 5 have died, as follows:

Charles Junken, January 24, 1893; Henry C. Swain, March 29, 1893; J. Henry Turner, June 12, 1893; Dr George Vasey, March 4, 1893; Eugene Willenbücher, May 24, 1893. The net increase has therefore been 262.

The death rate in large cities, according to the United States census, for ages corresponding to the average age of our members, is 17 per one thousand. Our death rate is 6, or ⅓ of the ordinary rate. This shows one of the many important advantages in holding membership in the National Geographic Society, and is a fact which, if enlarged on, should materially increase our membership.

*Meetings.*—There have been 34 meetings or assemblies of the members of the Society. Of these 15 were regular meetings and 19 special. The latter number includes one excursion on May 1 down the Potomac river to Indian head and Marshall Hall, and a lawn party on June 28 at Twin Oaks, where, by the invitation of the President, 200 members and guests were entertained.

One of the regular meetings was for the election of officers and transaction of business. At the remaining 31 meetings the total attendance was 10,110, averaging 326.

In regard to the places of meetings, the hall of the Cosmos Club has been used 10 times, the Columbian University once, the National Rifles' Armory hall twice and the Builders' Exchange hall 18 times.

On July 27 and 28, in connection with the World's Congress of Education, a Conference of European and American geographers was held at the World's Fair, Chicago, under the auspices of the National Geographic Society; its proceedings were marked by a degree of interest and an attendance quite beyond the expectations of the committee; and it is believed that it exercised a material and beneficial influence toward the study of geography in the United States.

*Managers.*—The Board of Managers have held 22 meetings for the transaction of business of the Society. On June 2, 1893, a change in the By-laws was adopted, facilitating the transaction of business at the meetings of the Board of Managers.

January 5, 1894, another amendment was adopted in conformity with a resolution passed by the Board of Managers: "That hereafter the annual election of officers shall be held at the last regular meeting in May, and that the Society year, for its fiscal operations, publications and lecture courses, shall begin and end with the annual election meeting."

Owing to the rapid growth of the Society, it has become impossible for a volunteer to carry on the duties of Secretary, and the Board of Managers found it necessary to employ a permanent Secretary, to assume office November 1, 1893.

*Magazine.*—Six brochures have been published during the year, two forming the last two numbers of volume iv and the remainder a portion of volume v.

The Society has on its exchange list about eighty foreign and domestic geographic societies and its library is increasing rapidly.

Special mention should be made of various gifts to the Society library. Mr H. L. Hall, of Washington, District of Columbia, has presented an old and valuable "Ortelius atlas," of date 1595. Honorable Gardiner G. Hubbard presented, among other things, an "Atlas of America," date 1776, and three volumes of Ramusio's "Navigationi et Viaggi," dates 1550, 1559 and 1565, respectively.

From His Imperial Highness the Arch Duke Ludwig Salvator of Austria there have been received 20 volumes of his works devoted to geographic research.

Cyrus C. Babb,
Eliza R. Scidmore,
*Secretaries.*

## SIXTH ANNUAL REPORT OF THE TREASURER

*(Presented to the Society January 5, 1894)*

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*To the President and Members of the National Geographic Society:*

I have the honor to submit herewith my annual report, showing receipts and disbursements for the year ending January 5, 1894.

The receipts for dues for 1893 amount to $2,626, an increase over the receipts for 1892 of $461.

The assets of the Society are:

| | |
|---|---|
| Amount invested in American Security and Trust Company 5 per cent bonds | $300 00 |
| Cash with Bell & Company | 307 80 |
| Dues for 1893, unpaid | 485 00 |
| | $1,092 80 |

The cash on hand includes $100, dues for two life memberships, which sum is to be invested in accordance with instructions from the Board of Managers.

Very respectfully,

C. J. Bell,
*Treasurer.*

DR. THE TREASURER *in account with* THE NATIONAL GEOGRAPHIC SOCIETY. CR.

| | Dr. | | | | Cr. | |
|---|---|---|---|---|---|---|
| 1894. | | | | 1894. | | |
| Jan'y 5. | To balance on hand Dec. 23, 1892 | | $205 31 | Jan'y 5. | By cash paid for— | |
| | Cash received for dues: 1891 | $27 00 | | | Publication of magazine | $938 03 |
| | " " " " 1892 | 182 00 | | | Expenses of meetings | 1,434 08 |
| | " " " " 1893 | 2,626 00 | | | Clerical assistance to the Secretary and Treasurer | 265 00 |
| | " " " " 1894 | 562 00 | | | Salary of Secretary | 200 00 |
| | " " " " 1895-6-7 | 8 00 | | | Deficit on social meeting, $47, and annual excursion, $47 | 94 00 |
| | " " " life membership | 50 00 | 3,455 00 | | Expenses of Committee on Prize Essays | 49 50 |
| | Interest on investment | | 15 00 | | Sundries, including postage, freight, stationery, joint directory, &c. | 534 80 |
| | Receipts from sale of magazine | | 147 90 | | Balance on hand (on deposit with Bell & Co) | 307 80 |
| | | | $3,823 21 | | | $3,823 21 |

WASHINGTON, D. C., *January 5, 1894.*

C. J. BELL, *Treasurer.*

## REPORT OF THE AUDITING COMMITTEE

*(Presented to the Society January 12, 1894)*

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*To the President and Members of the National Geographic Society:*

We, a committee appointed at the annual meeting of the Society to audit the accounts of the Treasurer for the year ending January 5, 1894, beg to submit the following report:

The Treasurer's statement of the receipts, consisting of dues from members, interest on investment and sale of magazine, has been examined and found correct, as shown by the books of his office.

The vouchers for expenditures and checks in payment therefor have been examined, compared and found correct.

We have examined the bank book, showing the account with Messrs Bell & Co, and found the cash balance to be three hundred and seven dollars and eighty cents ($307.80), as stated.

The three bonds for $100 each, registered in the name of the Society, were submitted to us for inspection.

H. C. Rizer,
Isaac Winston,
Weston Flint,
*Committee.*

# BY-LAWS

As Adopted with Amendments up to January 6, 1894

## ARTICLE I. Name.

The name of this Society is the "National Geographic Society."

## ARTICLE II. Object.

The object of this Society is the increase and diffusion of geographic knowledge.

## ARTICLE III. Membership.

The members of this Society shall be persons who are interested in geographic science. There may be three classes of members—active, corresponding and honorary.

Active members only shall be members of the corporation; shall be entitled to vote and may hold office.

Persons residing at a distance from the District of Columbia may become corresponding members of the Society. They may attend its meetings, take part in its proceedings, and contribute to its publications.

Persons who have attained eminence by the promotion of geographic science may become honorary members.

Corresponding members may be transferred to active membership, and, conversely, active members may be transferred to corresponding membership by the Board of Managers.

The election of members shall be entrusted to the Board of Managers.

## ARTICLE IV. Officers.

The officers of the Society shall be a President, six Vice-Presidents, a Treasurer, a Recording Secretary and a Corresponding Secretary.

The above-mentioned officers, together with eight other members of the Society, known as Managers, shall constitute a Board of Managers. Officers and Managers shall be elected annually, by ballot, a majority of the votes cast being necessary to an election; they shall hold office until their successors are elected; and shall have power to fill vacancies occurring during the year.

The President, or, in his absence, one of the Vice-Presidents, shall preside at the meetings of the Society and of the Board of Managers; he shall, together with the Recording Secretary, sign all written contracts and obligations of the Society, and attest its corporate seal; he shall deliver an annual address to the Society.

Each Vice-President shall represent in the Society and in the Board of Managers a department of geographic science, as follows:

Geography of the Land; Geography of the Sea; Geography of the Air; Geography of Life; Geographic Art; Commercial Geography.

The Vice-Presidents shall foster their respective departments within the Society; they shall present annually to the Society summaries of the work done throughout the world in their several departments.

They shall be elected to their respective departments by the Society.

The Treasurer shall have charge of the funds of the Society, shall collect the dues, and shall disburse under the direction of the Board of Managers; he shall make an annual report; and his accounts shall be audited annually by a committee of the Society and at such other times as the Board of Managers may direct.

The Secretaries shall record the proceedings of the Society and of the Board of Managers; shall conduct the correspondence of the Society; and shall make an annual report.

The Board of Managers shall transact all the business of the Society, except such as may be presented at the annual meeting. It shall formulate rules for the conduct of its business. Five members of the Board of Managers shall constitute a quorum at regular meetings and nine members at special meetings.

### ARTICLE V. Dues.

The annual dues of active members shall be five dollars, and of corresponding members two dollars, payable during the month of January, or, in the case of new members, within thirty days after election.

Annual dues may be commuted and life membership acquired by the payment of fifty dollars.

No member in arrears shall vote at the annual meeting, and the names of members two years in arrears shall be dropped from the roll of membership.

### ARTICLE VI. Meetings.

Regular meetings of the Society shall be held on alternate Fridays, from November until May, and excepting the annual meeting they shall be devoted to communications. The Board of Managers shall, however, have power to postpone or omit meetings, when deemed desirable. Special meetings may be called by the President.

The annual meeting for the election of officers shall be the last regular meeting in May.

The last meeting in December shall be set apart for the President's annual address.

The reports of the retiring Vice-Presidents shall be presented in November and December.

A quorum for the transaction of business shall consist of twenty-five active members.

### ARTICLE VII. Amendments.

These by-laws may be amended by a two-thirds vote of the members present at a regular meeting, provided that notice of the proposed amendment has been given in writing at a regular meeting at least four weeks previously.

# OFFICERS OF THE SOCIETY

1894

*President*

GARDINER G. HUBBARD

*Vice-Presidents*

T. C. MENDENHALL
GEORGE W. MELVILLE
A. W. GREELY
C. HART MERRIAM
W. B. POWELL
HENRY GANNETT

*Treasurer*

CHARLES J. BELL

*Secretaries*

CYRUS C. BABB
ELIZA R. SCIDMORE

*Managers*

MARCUS BAKER
H. F. BLOUNT
G. K. GILBERT
EVERETT HAYDEN
JOHN HYDE
W J McGEE
F. H. NEWELL
EDWIN WILLITS

## HONORARY MEMBERS OF THE SOCIETY

---

His Excellency Grover Cleveland,
Washington, D. C.

Don Christóbal Colón de Toledo de la Cerda y Gante, Duke of Veragua and Marquis of Jamaica,
Madrid, Spain.

Sir Archibald Geikie,
28 Jermyn street, London, England.

Honorable Charles P. Daly,
84 Clinton place, New York, N. Y.

Dr George M. Dawson,
Canadian Geological Survey, Ottawa, Canada.

Emmanuel de Margerie,
132 rue de Grenelle, Paris, France.

John Murray,
Challenger office, Edinburg, Scotland.

Baron Adolf E. Nordenskiöld,
Stockholm, Sweden.

Ferdinand, Freiherr von Richthofen,
Kurfürstenstrasse 117, Berlin W., Germany.

His Imperial Highness the Archduke Ludwig Salvator of Austria,
Wien, Austro-Hungary.

Dr D. Estanislao S. Zeballos,
Legation of the Argentine Republic, Washington, D. C.

# MEMBERS OF THE SOCIETY

1894

*a*, original members. *c*, corresponding members. *l*, life members.
In cases where no city is given in the address, Washington, D. C., is to be understood.

---

Abbe, Professor Cleveland, *a*, *l*,
Weather Bureau.

Abert, S. T.,
722 Seventeenth street.

Ackerman, Lieutenant A. A., U. S. Navy,
Navy Department.

Ackley, Lieutenant Commander S. M., U. S. Navy,
Navy Department.

Adams, Cyrus C.,
512 Madison street, Brooklyn, N. Y.

Adams, F. G., *c*,
State Historical Society, Topeka, Kans.

Adams, Miss Julia M.,
Fourth Auditor's office.

Addison, A. D.,
808 Seventeenth street.

Adler, Dr Cyrus,
Smithsonian Institution.

Ahern, Lieutenant Geo. P., U. S. Army, *c*,
College of Montana, Deer Lodge, Mont.

Ahern, Jeremiah, *c*,
661 Market street, San Francisco, Cal.

Alden, Colonel C. H., U. S. Army,
War Department.

Allen, Andrew H.,
State Department.

Allen, Miss A. Augusta,
15 Coulter street, Germantown, Pa.

Allen, Dr J. A.,
American Museum of Natural History, New York, N. Y.

Alton, Edmund,
Wormley's Hotel.

Alvord, Major Henry E.,
932 New York avenue.

Anderson, Mary L., *c*,
P. O. box 977, Salt Lake, Utah.

| | |
|---|---|
| Andrews, C. L., *c*, | P. O. box 106, Fremont, Wash. |
| Andrews, Ensign Philip, U. S. Navy, | Navy Department. |
| Andrews, Wells F., | Chief Clerk's office, Treasury Department. |
| Aplin, S. A., Junior, *l*, | U. S. Geological Survey. |
| Ashley, Osborn, | 513 Fourth street. |
| Aspinwall, Reverend J. A., | 17 Dupont circle. |
| Auhagen, Wilhelm, | Naval Observatory. |
| Austin, Professor E. P., *c*, | 964 West Fourth South street, Salt Lake, Utah. |
| Avery, Robert S., | 320 A street S. E. |
| Aydelotte, Wm., | Loan and Trust building. |
| Ayres, H. B., | Allamuchy, N. J. |
| Ayres, Miss Susan C., *a*, | 1813 Thirteenth street. |
| Babb, Cyrus C., | U. S. Geological Survey. |
| Babb, Cyrus K., *c*, | 12 Somerset street, Boston, Mass. |
| Babcock, Major J. B., U. S. Army, | 2005 G street. |
| Baber, Honorable George, | 937 K street. |
| Baber, Miss Zonia, *c*, | 6840 Perry avenue, Englewood, Ill. |
| Bacon, Mrs E. O., | 915 Sixteenth street. |
| Badger, Commander O. C., U. S. Navy, | 1517 Twentieth street. |
| Bagg, R. M., Junior, *c*, | Johns Hopkins University, Baltimore, Md. |
| Bailey, Vernon, | Agricultural Department. |
| Baker, David, *c*, | Sparrow Point, Md. |
| Baker, Lucius, *c*, | P. O. drawer T, Fresno, Cal. |
| Baker, Marcus, *a*, | U. S. Geological Survey. |

BALDWIN, A. L., 722 Sixth street N. E.

BALDWIN, H. L., JUNIOR, *a*, U. S. Geological Survey.

BALDWIN, WM. D., 25 Grant place.

BALL, CHARLES B., 942 T street.

BALLOCH, GENERAL G. W., P. O. box 557.

BANCROFT, DR C. F. P., *c*, Phillips Academy, Andover, Mass.

BARBER, A. L., 802 F street.

BARKER, CAPTAIN A. S., U. S. Navy, Navy Department.

BARNARD, E. C., *a*, U. S. Geological Survey.

BARNARD, JOB, 1306 Rhode Island avenue.

BARNES, CHARLES A., *c*, P. O. box 1198, Seattle, Wash.

BARRINGTON, WM. L., 3514 N street.

BARRINGTON, WM. M., Sun building.

BARROLL, LIEUTENANT H. H., U. S. Navy, *c*, Navy Department.

BARRY, CHARLES E., 1421 G street.

BARTLE, R. F., 947 Virginia avenue S. W.

BARTLETT, MISS E. M., 1012 Twelfth street.

BARTLETT, CAPTAIN J. R., U. S. Navy, *a*, Lonsdale, R. I.

BARTON, GEORGE H., *c*, Massachusetts Institute of Technology, Boston, Mass.

BARTON, MISS MARY L., Treasury Department.

BASSETT, C. C., *a*, U. S. Geological Survey.

BATCHELDER, DR C. F., *c*, 7 Kirkland street, Cambridge, Mass.

BATCHELDER, GENERAL R. N., U. S. Army, War Department.

BATES, DR HENRY H., The Portland.

Bates, Dr Newton L., U. S. Navy, The Shoreham.

Bayley, Dr W. S., *c*, Colby University, Waterville, Me.

Baylis, Jerome Z., *c*, Case School Applied Science, Cleveland, Ohio.

Beaman, Wm. M., U. S. Geological Survey.

Beardslee, Captain L. A., U. S. Navy, *c*, U. S. Naval station, Port Royal, S. C.

Beckham, Miss Blanche, 2721 N street.

Bell, Dr A. Graham, *a*, 1331 Connecticut avenue.

Bell, Professor A. Melville, 1525 Thirty-fifth street.

Bell, C. J., *a*, 1405 G street.

Bell, J. Lowrie, 2017 O street.

Belt, Dr E. Oliver, The Albany.

Benton, Frank, Agricultural Department.

Bergmann, H. H., 511 Seventh street.

Bernadou, Lieutenant J. B., U. S. Navy, *c*, Navy Department.

Berthoud, Edward L., *c*, P. O. box 45, Golden, Colo.

M. W. Beveridge, 1618 H street.

Bibbins, Arthur, *c*, Woman's College of Baltimore, Baltimore, Md.

Bien, Julius, *a*, 140 Sixth avenue, New York, N. Y.

Bien, Morris, *a*, General Land Office.

Bigelow, Professor Frank H., 1625 Massachusetts avenue.

Bigelow, Otis, 1501 Eighteenth street.

Birch, Charles E., Hydrographic Office.

Bixby, Captain W. H., U. S. Army, *c*, U. S. Engineer's office, Newport, R. I.

Blair, H. B., *a*, U. S. Geological Survey.

Blount, Henry F., 3101 U street.

Blount, Mrs L. E., 3101 U street.

Blout, H. L., 24 Grant place.

Bodfish, Sumner H., *a*, 58 B street N. E.

Bond, Miss Mary E., 813 First street.

Boursin, Henry, Slack block, Everett, Wash.

Bower, R. A., *c*, 166 Adams street, Chicago, Ill.

Bowers, Dr Stephen, *c*, Ventura, Cal.

Boyce, Silas, 917 R street.

Bradley, Honorable A. C., 2013 Q street.

Bradley, George L., 2035 P street.

Bradley, Mrs J. M., 816 K street.

Branner, Dr J. C., Leland Stanford Junior University, Cal.

Breckinridge, General J. C., U. S. Army, War Department.

Brewer, Miss Clara G., 1009 Thirteenth street.

Brewer, Miss Kate, 1409 Thirtieth street.

Brewer, Professor Wm. H., 418 Orange street, New Haven, Conn.

Brigham, Professor A. P., *c*, Colgate University, Hamilton, N. Y.

Bright, Richard R., 130 B street N. E.

Briton, A. T., 622 F street.

Broadhead, Professor G. C., *c*, Columbia, Mo.

Brooks, Newton M., 233 Second street S. E.

Brooks, Alfred H., *c*, 404 Harvard street, Cambridge, Mass.

Brooks, Major T. B., *c*, Newburg, N. Y.

Brown, Edward J., 820 Twentieth street.

Brown, Miss Jennie A., Howard avenue, Mount Pleasant.

Brown, Will Q., *c*, Riddles, Ore.

Browne, A. B., 622 F street.

Brownell, Ernest H., *c*, Brown University, Providence, R. I.

Bryan, Samuel M., 2025 Massachusetts avenue.

Buck, Miss Ada P., 635 Maryland avenue N. E.

Buckley, Miss M. L., Bureau of Pensions.

Buckley, Fred. G., *c*, Aspen, Colo.

Burchell, N. L., 1102 Vermont avenue.

Burr, J. H. Ten Eyck, *c*, Cazenovia, N. Y.

Burton, Professor A. E., *a*, Massachusetts Institute of Technology, Boston, Mass.

Butler, Miss Ella C., 1107 Eleventh street.

Cabell, Professor Wm. D., 1401 Massachusetts avenue.

Campbell, Miss J. S., 136 C street S. E.

Campbell, M. R., U. S. Geological Survey.

Cantwell, Lieutenant J. C., U. S. Revenue Marine, *c*, 1818 Sacramento street, San Francisco, Cal.

Carleton, P. J., *c*, Rockport, Me.

Carman, Miss Ada, 1351 Q street.

Carpenter, Frank G., 1318 Vermont avenue.

Carr, General E. A., U. S. Army, The Richmond.

Carroll, Captain James, *c*, Juneau, Alaska.

Catlin, Captain Robert, U. S. Army, 1428 Euclid place.

Chamberlin, Professor T. C., *c*, University of Chicago, Chicago, Ill.

Chapman, D. C., U. S. Coast and Geodetic Survey.

Chapman, R. H., *a*, U. S. Geological Survey.

Chatard, Dr T. M., *a*, 1758 K street.

Chenery, Lieutenant Commander L., U. S. Navy, *c*, University Club, New York, N. Y.

Cherry, Charles H., 1115 S street.

Chester, Commander C. M., U. S. Navy, *c*, U. S. Naval Academy, Annapolis, Md.

Chester, Miss J. M., 1016 Eleventh street.

Childs, Professor T. S., 1308 Connecticut avenue.

Chilton, William B., U. S. Coast and Geodetic Survey.

Chisholm, C. F., 87 Patent Office.

Christie, Alex. S., 115 Fourth street N. E.

Christie, P. H., U. S. Geological Survey.

Clapp, George H., *c*, 116 Water street, Pittsburg, Pa.

Clark, Charles S., Gales school.

Clark, Dr Egbert A., 1756 M street.

Clark, E. B., *a*, U. S. Geological Survey.

Clark, Professor Isaac, Howard University.

Clark, Miss May S., U. S. Geological Survey.

Clark, Miss S. H., 931 French street.

Clark, Dr W. B., *c*, Johns Hopkins University, Baltimore, Md.

Claypole, Professor E. W., *c*, Buchtel College, Akron, Ohio.

Clements, Miss L. H., 1610 Q street.

Clover, Lieutenant Commander R., U. S. Navy, 1535 New Hampshire avenue.

Cogswell, Mrs T. F., Treasury Department.

Colby, Honorable Leonard W., 1325 Tenth street.

Cole, T. L., Corcoran building.

Coleman, Major F. W., The Richmond.

Collie, Professor G. L., *c*, Beloit College, Beloit, Wis.

Colonna, B. A., 138 B street N. E.

Colton, Francis, 1635 Connecticut avenue.

Comstock, Mrs S. C., 1464 Rhode Island avenue.

Comstock, Professor T. B., *c*, University of Arizona, Tucson, Ariz.

Conley, Miss M. J., *c*, Cohocton, N. Y.

Connolly, Miss Louise, 1416 Sixth street.

Cook, Fred. W., *c*, 515 Power building, Helena, Mont.

Cooley, Miss Grace E., *c*, Wellesley College, Wellesley, Mass.

Coon, Charles E., 1708 H street.

Copelin, Miss E. G., Kendall Green.

Corson, Miss Ida, 914 Farragut square.

Cottman, Lieutenant V. L., U. S. Navy, *c*, Navy Department.

Coues, Dr Elliot, Smithsonian Institution.

Coville, Frederick V., Agricultural Department.

Cox, Miss Alice C., 1454 Rhode Island avenue.

Cragin, Professor F. W., *c*, Colorado College, Colorado Springs, Colo.

Craighead, Dr J. G., The Concord.

Crane, Augustus, Junior, 1344 F street.

Cresson, Dr H. T., *c*, The Gladstone, Philadelphia, Pa.

Croffut, W. A., U. S. Geological Survey.

CROSS, WHITMAN, U. S. Geological Survey.

CROUTER, A. L. E., *c*, "Mount Airy," Philadelphia, Pa.

CROWELL, MRS A. S., *c*, 114 North Twenty-fourth street, Omaha, Neb.

CULBERTSON, DR EMMA B., *c*, 33 Newbury street, Boston, Mass.

CULVER, PROFESSOR G. E., *c*, 835 Harrison avenue, Beloit, Wis.

CUMMIN, ROBERT D., *a*, U. S. Geological Survey.

CUMMINGS, PROFESSOR GEORGE J., Howard University.

CUMMINGS, MISS M. B., 520 Sixth street.

CUMMINGS, MISS S. E., 520 Sixth street.

CUNNINGHAM, JOHN M., *c*, Cosmos Club, San Francisco, Cal.

CUNNINGHAM, MRS W. O., 1723 K street.

CURRY, J. L. M., 1736 M street.

CURRY, W. W., 1510 Ninth street.

CURTIS, G. CARROLL, *c*, 68 Thayer hall, Cambridge, Mass.

CURTIS, WILLIAM E., *a*, 1801 Connecticut avenue.

CUSHING, MISS S. C., 310 Indiana avenue.

CUSTIS, DR G. W. N., 112 East Capitol street.

CUTTER, W. P., Agricultural Department.

DABNEY, DR C. W., JUNIOR, Agricultural Department.

DAGGETT, MRS M. S., 1501 R street.

DALL, MRS CAROLINE H., 1526 Eighteenth street.

DALL, WM. H., Smithsonian Institution.

DALY, HONORABLE CHARLES P., 84 Clinton place, New York, N. Y.

DALY, REGINALD A., *c*, 10 Mellen street, Cambridge, Mass.

DARTON, N. H., U. S. Geological Survey.

DAVIDGE, WALTER D., JUNIOR, 1 Corcoran building.

DAVIDSON, PROFESSOR GEORGE, *a*, *c*, U. S. Coast and Geodetic Survey, San Francisco, Cal.

DAVIES, CHARLES, 1915 Sixth street.

DAVIS, MISS ADELAIDE, 115 B street S. E.

DAVIS, ARTHUR P., *a*, U. S. Geological Survey.

DAVIS, MRS J. T. 1126 Thirteenth street.

DAVIS, WALTER W., 714 A street N. E.

DAVIS, PROFESSOR WM. M., *a*, 2 Bond street, Cambridge, Mass.

DAVIS, W. T., *c*, American Bank building, Kansas City, Mo.

DAWSON, MISS A. B., U. S. Geological Survey.

DAWSON, THOMAS F., U. S. Senate annex.

DAY, C. A., National Safe Deposit Company.

DAY, DR DAVID T., U. S. Geological Survey.

DAY, E. WARREN, War Department.

DENNEY, MISS E. A., 707 Thirteenth street.

DENNY, ARTHUR A., *c*, 1328 Front street, Seattle, Wash.

DETWEILER, F. M., 420 Eleventh street.

DICKINS, COMMANDER F. W., U. S. Navy, Navy Department.

DILLER, J. S., *a*, U. S. Geological Survey.

DODGE, R. E., *c*, 22 Stoughton Hall, Cambridge, Mass.

DOLE, MRS E. G., 1014 Fourteenth street.

DOLLEY, DR CHARLES S., *c*, 3707 Woodland avenue, Philadelphia, Pa.

DOOLITTLE, M. H., U. S. Coast and Geodetic Survey.

DOUGLAS, E. M., *a*, U. S. Geological Survey.

DOUNAN, MRS G. W., 1227 I street.

DREWRY, W. S., *c*, Surveyor General's Office, Victoria, British Columbia.

DRYER, DR CHARLES R., *c*, Fort Wayne, Ind.

DU BOIS, COLONEL J. G., 1423 Chapin street.

DUNCKLEE, JOHN B., 940 Westminster street.

DUMBLE, PROFESSOR E. T., *c*, State Geological Survey, Austin, Tex.

DUTTON, MAJOR C. E., U. S. Army, *a*, San Antonio, Tex.

DYER, LIEUTENANT G. L., U. S. Navy, *c*, U. S. Naval Academy, Annapolis, Md.

EASTERLING, H. V., Record and Pension Office.

EASTMAN, CHARLES R., *c*, 297 Laurel avenue, Saint Paul, Minn.

EATON, PROFESSOR D. G., *c*, 55 Pineapple street, Brooklyn, N Y.

EDDY, MRS MARY H., The Shoreham.

EDMANDS, PROFESSOR J. R., Harvard University, Cambridge, Mass.

EDSON, JOHN JOY, 1003 F street.

EDSON, JOSEPH R., *a*, 927 F street.

EDSON, HONORABLE OBED, *c*, Sinclairville, N. Y.

EGLESTON, DR N. H., 1530 Sixteenth street.

EIMBECK, WILLIAM, U. S. Coast and Geodetic Survey.

ELDRIDGE, GEORGE H., U. S. Geological Survey.

ELIOT, CHARLES, Brookline, Mass.

ELLIOTT, MISS ELIZABETH, 1114 Fifteenth street.

EMERSON, DR B. K., *c*, Amherst, Mass.

EMMONS, LIEUTENANT GEORGE T., U. S. Navy, "Edgehill," Princeton, N. J.

| | |
|---|---|
| Erbach, John, | U. S. Geological Survey. |
| Evans, H. C., | Central National Bank building. |
| Evans, Mrs John O., | 1219 Sixteenth street. |
| Evans, Samuel G., *c*, | 211 Main street, Evansville, Ind. |
| Evans, Dr W. W., | 1756 M street. |
| Evermann, Professor B. W., | 1859 Harewood avenue. |
| Ewing, Charles, | 1610 Riggs place. |
| Eyerman, John, *c*, | "Oakhurst," Easton, Pa. |
| Ezdorf, Richard von, | 918 N street. |
| Fairchild, Professor H. L., *c*, | University of Rochester, Rochester, N. Y. |
| Fairchild, John F., *c*, | Bank building, Mount Vernon, N. Y. |
| Fairfield, George A., *a*, | 1407 Stoughton street. |
| Fairfield, W. B., *a*, | U. S. Coast and Geodetic Survey. |
| Faris, R. L., | U. S. Coast and Geodetic Survey. |
| Farquhar, Henry, | U. S. Coast and Geodetic Survey. |
| Fenneman, N. M., *c*, | Greeley, Colo. |
| Fernow, B. E., *a*, | Agricultural Department. |
| Ffoulke, Charles M., | 2013 Massachusetts avenue. |
| Fischer, E. G., *a*, | U. S Coast and Geodetic Survey. |
| Fischer, Louis A., | U. S. Coast and Geodetic Survey. |
| Fisher, Mrs A. B., | 902 Massachusetts avenue N. E. |
| Fisher, Robert J., | 614 F street. |
| Fitch, Charles H., *a*, | 3025 N street. |
| Flemer, J. A., | 414 A street S. E. |

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|---|---|
| Fletcher, L. C., *a*, | U. S. Geological Survey. |
| Fletcher, Dr Robert, *a*, | Army Medical Museum. |
| Flint, Charles, | 1519 O street. |
| Flint, Dr Weston, | 1101 K street. |
| Flynn, Harry F., | U. S. Coast and Geodetic Survey. |
| Flynn, P. J., *c*, | P. O. box 916, Los Angeles, Cal. |
| Forbes, W. H., *c*, | 233 Chestnut avenue, Jamaica Plain, Mass. |
| Forney, Stehman, | U. S. Coast and Geodetic Survey. |
| Forrest, Julius C., | Hydrographic Office. |
| Foshay, Dr P. Max, *c*, | 282 Prospect street, Cleveland, Ohio. |
| Foster, Honorable John W., | 1405 I street. |
| Foster, Professor Richard, | Howard University. |
| Fowler, Francis, | 1449 Q street. |
| Frank, George W., *c*, | Kearney, Neb. |
| Fraser, Daniel, | 458 Pennsylvania avenue. |
| French, Dr George N., | 1834 I street. |
| French, Owen B., | 2212 F street. |
| Fuller, Miss A. H., | 1321 Rhode Island avenue. |
| Fuller, Thomas J. D., | 1509 H street. |
| Gage, N. P., *a*, | Seaton school. |
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| Life members . . . . . . . . | 10 |
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THE

# NATIONAL GEOGRAPHIC MAGAZINE

# DISCOVERERS OF AMERICA

## ANNUAL ADDRESS BY THE PRESIDENT

HON GARDINER G. HUBBARD

NATIONAL GEOGRAPHIC SOCIETY
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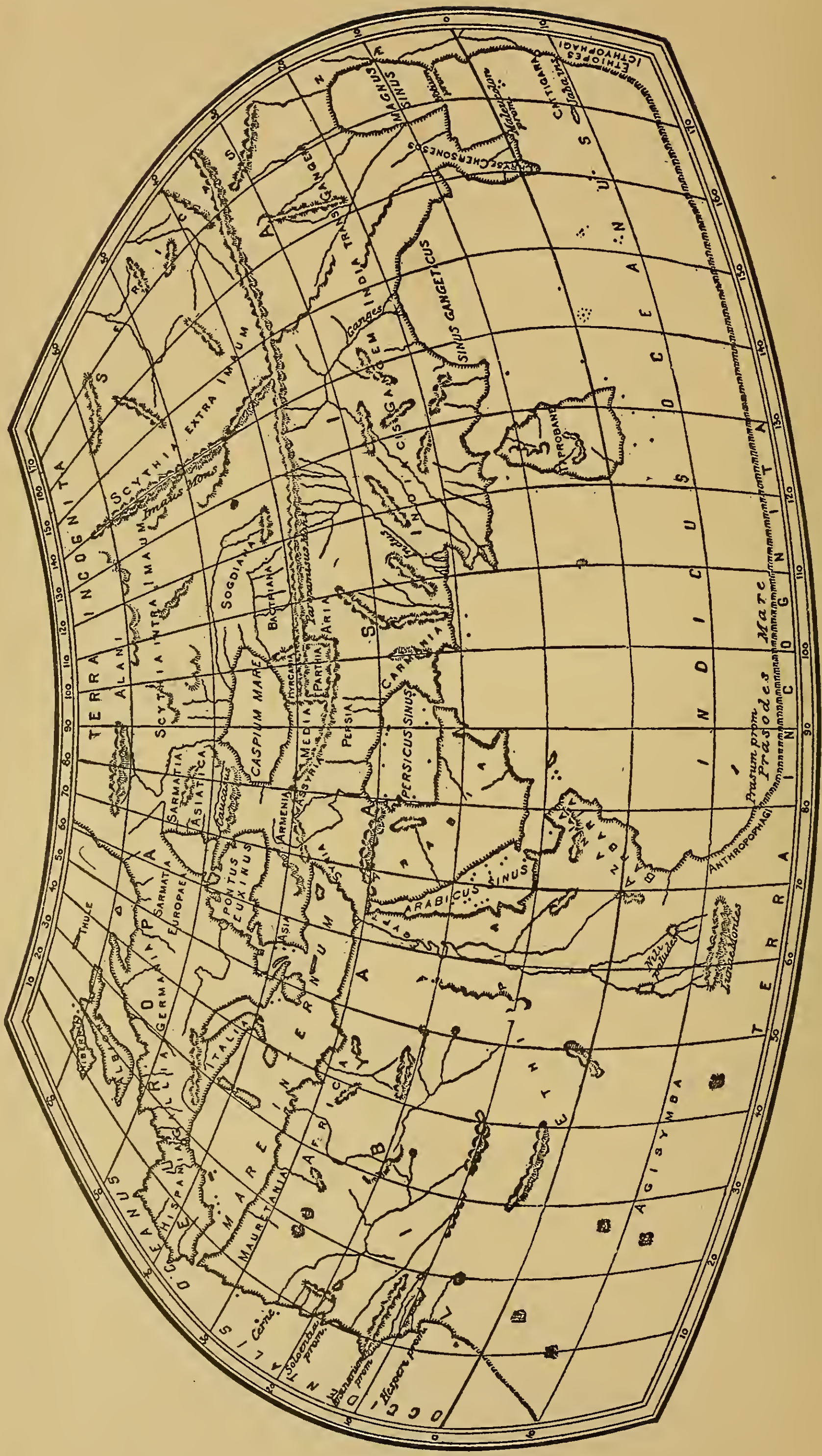


CLAUDIUS PTOLEMY MAP, CIRCA 150.

Vol. V, pp. 1-20 April 7, 1893

THE

# NATIONAL GEOGRAPHIC MAGAZINE

## DISCOVERERS OF AMERICA

Annual Address by the President

HON GARDINER G. HUBBARD

(*Presented before the Society January 13, 1893*)

It is appropriate that we should take as the theme of our annual address for the year 1892 the discoverers of America.

The discovery of America was the work, not of one explorer but of many, carried on during a long series of years, beginning with the Northmen, continued by Columbus, Vespucius, Magellan and Drake, and ending only with the nineteenth century.

Before we speak of the discoverers let us hastily review the condition of the old world prior to the discovery of the new.

Two thousand years ago philosophers generally believed the world to be round, and the most noted of ancient geographers, Eratosthenes, computed its circumference at 25,200 geographic miles. The true figure is 21,600 geographic miles or 24,899 English miles.

Ptolemy, two hundred years later, estimated it at 18,000 geographic miles, and made a series of twenty-six maps, showing the the equator and the zones north of the equator, with parallels of latitude and meridians of longitude. As his base-line was too short and his knowledge of places was generally derived only from seamen who had no accurate means of determining distances, his maps, though showing most of the countries of Europe, Asia and northern Africa (plate 1*), were inaccurate and unreliable, though vastly superior to those of a later date. These maps were either entirely lost sight of or so changed by the pictorial extravagances of the map-makers of succeeding ages as to be of little value (plates 2 † and 4).

St Augustine, Thomas Aquinas and other fathers of the church believed the earth to be a vast plain. They said with Isaiah, that the heaven which embraces the universe is a vault; with Job, that it is joined to the earth; and with Moses, that the length of the earth is greater than the breadth. This they insisted was the teaching of the word of God and must be accepted. Those who believed that the world might be round declared that there could be no inhabitants on the other side, for that Christ said "All tribes of the earth shall see the Son of Man coming in the clouds of heaven with power and great glory."

The famous bull of Alexander VI, published in 1493, which gave all newly discovered land one hundred leagues west of the Azores to the Spaniards and all east of that line ‡ to Portugal, implied that the earth was a plain.

For 1,500 years science and the church were in opposition as to the shape of the earth, and there were very few, whatever might be their convictions, who dared question the infallibility of the church. Thus all progress in natural science was checked, and geography and map-making practically ceased to exist.

Early in the fourteenth century Marco Polo's book of travels appeared. This greatly increased geographic knowledge and had a direct and strong bearing on the discovery of America.

In the preceding century the father and uncle of Marco Polo, merchants of Venice, made two journeys to the court of the great Khan Kublai, in eastern China. On the second journey Marco Polo accompanied his father and uncle. They went by Persia, over the Pamir mountains, through Turkestan, across the great desert of Gobi, and through Mongolia to China. There they resided for many years, sent by the Khan on several missions and

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*Claudius Ptolemy's map of the world (circa A D 150), forming the accompanying plate 1, is reproduced from "The Discovery of America," by John Fiske, 1892, vol. i, p. 263.

† Photolithographed directly from the "Chronicon Nurembergense" (auctore Hartman Schedel), 1493, fol. xiii.

‡ Shown in the Juan de la Cosa map, plate 4.

occupying important positions. On their return they sailed through the China sea and Indian ocean to India, stopping at the Philippine and Spice islands, Sumatra and Ceylon; from India they traveled by land through Persia and Asia Minor, and by the Black and Mediterranean seas to Venice. Soon after his return Marco Polo was taken prisoner by the Genoese, and during his captivity wrote an accurate description of the countries through which he traveled and in which he had lived so many years, and of the island of Cipango or Japan, with its inexhaustible riches of gold and pearls, 500 miles east of China. He also described the voyages of the Chinese to the islands of the Pacific, to Ceylon, and to India, and of the rich trade carried on by the Mohammedans between the Spice islands, India and the Mediterranean. These travels became gradually known to geographers, and in the fifteenth century gave a new impulse to geographic study.

About the same time the old maps of Ptolemy, which had been hopelessly obscured by the graphic fancies of the cosmographers of the dark ages, were, with his writings, brought from the East to Italy. The maps of the dark ages showed the Mediterranean and the countries around it, Arabia, Persia, Media, Gog and Magog, and a little of northern Africa; but so vaguely and incorrectly that today one would scarcely recognize these countries on existing maps.

Toscanelli, an Italian, prepared a map about 1474, taking the travels of Marco Polo as his guide. On other maps Cathay, or China, had been delineated as east of Europe; Toscanelli's transferred it to the west. His map shows the Atlantic ocean, Cipango 100° west of Europe, and still further westward, Cathay. He sent a copy of this map to the king of Portugal, and subsequently another to Columbus, urging him to make his contemplated voyage to "The land where the spices are born, where the temples and royal palaces are covered with planks of gold" (plate 3*).

Let us consider the condition of Europe at the time of the voyages of the Northmen to America, and the great changes which were gradually preparing the way for the colonization of America.

For nearly one thousand years B C the ships of Tyre and Sidon, Alexandria and Greece, sailed through the Mediterranean into the Atlantic ocean as far as Britain. The early sailors were more adventurous and their ships more seaworthy than those of

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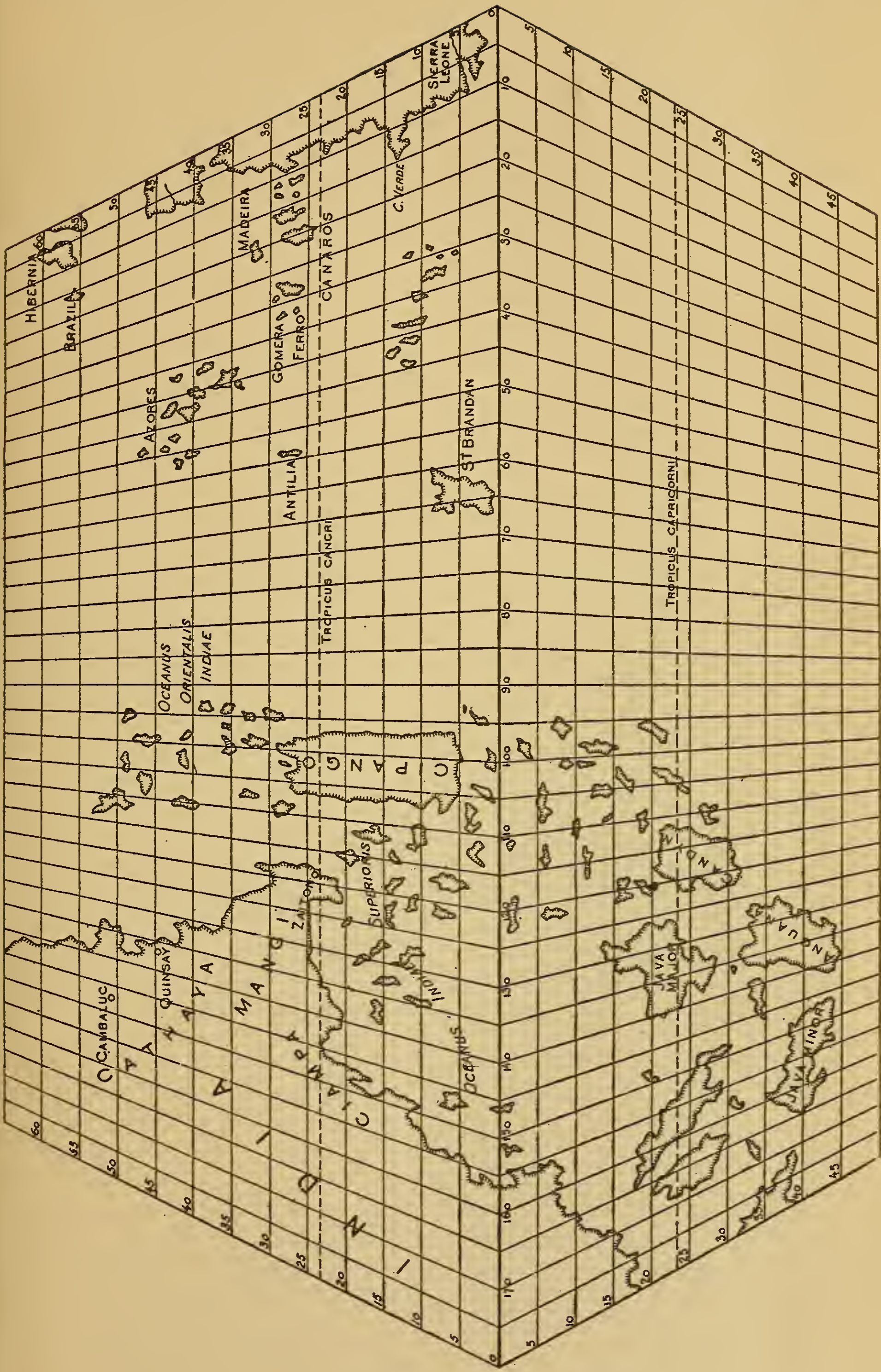
* Reproduced from Fiske, op. cit., p. 357.

Columbus, but as the mariners' compass was not known they rarely ventured out of sight of land.

When Rome became the imperial city commerce, as well as dominion and authority, centered in Rome, and with her decline and fall shipping and commerce disappeared from the Mediterranean.

Then, far away in the north on the Baltic sea, the Northmen began to sail the ocean, not for discovery or commerce but to plunder and ravage richer countries than their own. The vikings became noted as bold rovers of the sea, pillaging every country they could reach by water. Sailing southwestward, they landed on the coast of France and made a permanent settlement in Normandy. They coasted along the shores of France and Spain, plundering as they went; passing the Pillars of Hercules into the Mediterranean, they ravaged the coast of Italy and established colonies in southern Italy and Sicily. Sailing westward, they conquered and colonized the eastern coast of England and Scotland, the Shetland, Orkney and Faroe islands, and from these islands, in A D 850, they sailed 300 or 400 miles northwestward to Iceland, where they made settlements which have continued until our day. One of the early settlers of Iceland was driven by adverse winds to Greenland, where he was compelled to winter, returning in the spring with an account of his discovery. About 986, Eric the Red, an outlaw, fled from Iceland with a few friends to Greenland. Prevented by the icebergs from landing on the eastern coast, they sailed around cape Farewell to the western coast where they founded two small colonies near Juliansburg, which existed for four hundred years until, forgotten and neglected by the mother country, overcome by want and hunger, they succumbed to the climate and the attacks of the Eskimo. Shortly after Eric had colonized Greenland, Bjarni, another Northman, sailing for Greenland, was driven by northeasterly winds continuing for many days far southwestward, to a land covered with dense woods. There is every reason to believe that this was America, and that Bjarni was its first discoverer. It was not the land of ice and glaciers he was seeking, so he sailed northeastward again, and in ten days reached Greenland.

Leif Ericsson, one of the Norse vikings, hearing of this land of woods, about the year 1000 sailed from Greenland in search of it. Passing the barren coasts of Labrador and Newfoundland, which he called Helluland, his party reached Nova Scotia, or Markland, and sailed southward to a place where they found grapes, and hence called it Vineland. They were surprised at the




TOSCANELLI MAP 1474.

length of the winter days, which were nine hours long. The natives they described resembled our Indians and not the Eskimo of northern latitudes, and from these statements and the calculation of latitude from the length of the day, it is believed that it was New England. There they founded the colony of Norumbega, but after a few years it was abandoned, as the settlers were unable to withstand the attacks of the natives. All original records of the discovery of Vineland have perished, and our present knowledge is derived from the sagas of the Northmen, written at least one or two generations after Vineland had been abandoned. These legends bear the impress of truth, and there is no reasonable doubt that Leif Ericsson is a real character and Vineland his discovery. The sagas were lost, or laid away and forgotten in the libraries of Norway and Sweden. In our day some of them have been unearthed, and we know more of the work of Leif Ericsson and his Northmen than was ever known before.

This discovery was not known beyond Greenland and Iceland except to a few men in Scandinavia, for this was the darkest age in the history of Europe.

When the Northmen were making their settlement in Greenland, Peter the Hermit appeared in southern Europe, mustering his forces for the first of those crusades which in their ultimate results accomplished a work of vastly greater importance than the redemption of the holy places from the Mohammedans. The transportation of pilgrims to and from the Holy land gave employment to the ships of Venice and Genoa and restored commerce to the Mediterranean. Their vessels brought the treasures of the Orient and the science and art of Greece and Asia Minor to Venice and Genoa, whence they were distributed through Italy and Europe. The feudal system was broken down and the renaissance brought in. Europe awoke from the long sleep of the dark ages to new life and energy; progress in art and science became rapid, and the world entered upon an era of invention and discovery.

By the middle of the fifteenth century, Brunelleschi had finished the Duomo at Florence, where Savonarola was preaching and Michael Angelo was studying. Faust and Gutenberg were inventing movable types at Frankfort, upon which the Bible—the first book ever issued from the printing press—was printed. Gunpowder and the mariners' compass were just coming into use in European countries, though both had been discovered earlier.

In England, the Wars of the Roses were over. Henry VII was king, and with him the reign of the Tudors and the prosperity of England commenced.

In Spain, Ferdinand and Isabella were preparing for that war with the Moors which resulted in their expulsion from the Spanish dominion.

In eastern Europe, the Turks had a short time before captured Constantinople and destroyed nearly all the commerce of Venice and Florence, and were now raising an army to ravage Austria and Hungary.

In Portugal, Prince Henry the Navigator was making those voyages to the coast of Africa for discovery and trade which made Portugal for one hundred and fifty years the greatest maritime nation of the world. Each year these expeditions sailed further and further southward, passing the Gold coast, the equator, the river Congo. They sailed out into the ocean and rediscovered the Azores, Madeira and the Canary islands, formerly known to the Phenicians. In 1442 their ships brought home African negroes to be sold as slaves in Lisbon, the beginning of the African slave trade. In 1486 Diaz rounded the southern extremity of Africa and called it the Stormy cape, though Prince Henry named it the cape of Good Hope. Greater discoveries were made during the lives of men contemporary with Columbus than in all times previous or subsequent.

Columbus is for us the principal figure in this new world. He was born in Italy about 1446, though we know with certainty neither the place nor time of his birth and but little of his early life. He followed the sea for many years, sailing to Africa, England, and probably Iceland. About the year 1470 he is found in Portugal, where some say he was shipwrecked on the coast while on a piratical voyage. Here he married a Portuguese lady, whose father had been governor of one of the islands off the coast of Africa; and there he resided for several years, making maps and pursuing those studies which fitted him for his great voyage of discovery. He knew that the spices from the islands of the Indian ocean, the silks, diamonds and pearls of India, were carried by the Arabs through the Red sea or up the Euphrates in boats and thence by caravans to the Mediterranean and Black seas, where they were exchanged with the merchants of Venice and Genoa for the goods of Europe.

He was convinced by the study of Marco Polo not only of the wealth of Cipango and Cathay and of the great trade between the

Orient and the Mediterranean, but also of the possibility of reaching those countries and obtaining that trade for Spain by sailing west rather than by circumnavigating Africa. The actual distance from Europe in a due west line to Cipango is nearly twelve thousand miles; Toscanelli estimated it as 100° or nearly five thousand miles, but his map showed islands on the route which would reduce the distance between any two lands to about 2,000 miles.*

Columbus was a devout Catholic, holding to the teachings of the church. In the book of Esdras he read that God on the third day of the creation made the earth, six parts of land and one-seventh water. He knew the vast extent of the Atlantic north and south, and reasoning from these facts he thought it could not be over 2,000 or 2,500 miles to Cipango, though he actually sailed 3,230 miles before he reached a new world.

After Columbus determined to cross the Atlantic he applied for help to the king of Portugal. He wrote, "They took my charts and writings from me, saying they would ponder them, but secretly they sent out the ships they had denied me. God drove them back on their own coasts and punished their treachery, but I could no longer trust them." He therefore left Portugal for Spain. Las Casas describes him at this time as a man of noble and commanding presence, tall and well built, with a ruddy complexion, keen, blue-gray eyes that often kindled, while his waving white hair made him quite picturesque; his manner courteous and his conversation charming. He had an indefinable air of authority, as became a man of great heart and lofty thoughts. It was this commanding presence which enabled him to stand before Ferdinand and Isabella as their equal.

In 1484 he arrived in Spain a foreigner, poor and in debt. A stranger and friendless, he appeared at the court of the proudest sovereigns of Europe. Yet such was his bearing and the effect produced upon the king and queen by his eloquence that they appointed several learned men to consider his project. Some few believed, many remained in doubt, but most laughed at him as visionary and ridiculed his proposals as the dream of a madman. Those that were convinced by his reasoning became his firm friends. For seven years he waited patiently at the court, renewing his suit from time to time, until Grenada was conquered, when Isabella had promised to listen to him. A man less con-

* Plate 3.

fident, less in earnest, would have succumbed before the many difficulties and delays he encountered. Again he applied to Isabella, and she agreed to equip a fleet. Columbus demanded that he should be made high admiral of the western seas and viceroy and governor of all the continents and islands which might lie therein, and that he should receive one-eighth of the net profits from all trade with such countries. Isabella refused, but Columbus, knowing that the discovery of a new and shorter route to the Spice islands would give Spain the control of their trade, and realizing the power and wealth that would accrue to the Spanish throne through such discovery, insisted on his demands, and for this great constancy and loftiness of soul Las Casas commends him.

After this refusal Columbus mounted his mule and started for France, but was soon recalled; he returned to the court, which agreed to his demands. A patent was granted appointing "Christopher Colon, as soon as he shall have discovered said islands or mainlands in the ocean sea, or any one of them, to be our admiral of the ocean sea, viceroy and governor, in the said islands or mainland: I the Queen; I the King."

The fleet of Columbus was three small vessels; the largest a single-decked ship 90 feet long, the others with decks only in the stern and prow. His crew was 90 men. On August 6, 1492, they sailed from Palos, and on October 21 discovered the Indies. Columbus returned to Spain and appeared at the court of Isabella with his train of Indians bearing gold, silver, precious stones, and other products of the islands he had discovered. It was Cathay and the shorter route to the Indies he supposed he had found, though he did not find the cities and rich countries, the gold and silver, the pearls and jewels, that he sought. He thought these treasures lay further westward, and that he must find the straits of Malacca, and through them sail to the Spice islands and India, and for that purpose he sailed on his second voyage, and after following the coast of Cuba 1,000 miles, believing he had found the continent of Asia, returned to Spain.

Ferdinand and Isabella gave many persons the right to visit the new-discovered lands, as was their prerogative, but they also appointed governors over the land and water, contrary to their agreement with Columbus.

On his third voyage, in 1498, he reached South America, the first European to discover that continent. He found a large bay and thought he had reached the straits; but, alas, the waters were fresh—it was only the Orinoco river. He coasted for some distance along the shore of the Caribbean sea still looking for the straits, and then set sail for Hispaniola (or Cuba), where he had left his brother governor. On arriving he found his brother deposed and imprisoned. Columbus himself was put in chains and sent home. The captain of the vessel offered to remove his chains, but he refused, saying that they had been put on by order of the king and could be removed only by him.

While Columbus was vainly searching in the new world for the Orient, Vasco de Gama found it for Portugal in 1497 by sailing around the cape of Good Hope and crossing the Indian ocean to India and the Spice islands. He returned to Lisbon bringing all manner of precious stones, silks and satins, and spices of every kind. Columbus for the time was forgotten, and it was only after a long detention that he was permitted again to sail toward the western world.

On his fourth and last voyage Columbus landed at Honduras, followed the coast of Nicaragua and the isthmus of Panama, and then sailed along the Caribbean sea vainly searching for the straits that would lead him to the promised land.

On his return from this voyage the queen, his friend, was dead, and the last eighteen months of his life were spent in poverty and sickness at Valladolid, where he died in 1506, so little known that the local records of the city, which give many insignificant details, make no mention of his death.

After Columbus had opened the way it was easy for other navigators to follow where he had led. Two other Italians, John Cabot and Sebastian, his son, sailed from England in 1497 nearly due westward for Cathay. They discovered Newfoundland and sailed thence northeastward along the coast of Labrador, and were probably the first discoverers of the continent of America. The next year they made another voyage to Newfoundland, and then followed the coast of North America southward, probably reaching the Carolinas. These voyagers, still seeking Cathay and the Spice islands, cared little for a land of hills and rocks, where neither gold nor silver was found.

Two generations pass before we hear of any further English expeditions to the new world.

The most noted of the followers of Columbus was Americus Vespucius, like Columbus and the Cabots an Italian, a pilot of great reputation, sailing in the service of Portugal. In 1497 he sailed around the gulf of Mexico, Honduras, Mexico and Florida, and thence along the coast of North America nearly to Chesapeake bay.

On another voyage he sailed to South America, reaching it a little north of cape Saint Roque. He followed the coast nearly to the mouth of the Rio de la Plata, taking possession of the country for the king of Portugal.

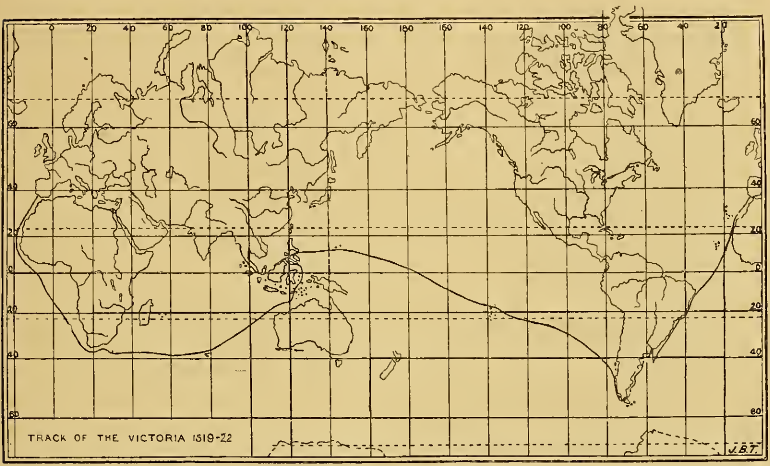
Vespucius knew that this country was south of every part of Asia, and therefore could not be a part of the world as then known; he realized that he had discovered a "new world." An account of this voyage was published in German, Italian and French, with the title in the French edition, "*Novus Mundus.*" In a map published in 1514 it was called "America." Thus the name of Americus Vespucius was given to the new world, and he received the honor due to Columbus. It was said that "Columbus had discovered new islands, Vespucius a new world"—that world already discovered by the Northmen, then by Columbus, the third time by Cabot, and now by Americus Vespucius.

After Columbus, Magellan was the greatest of the discoverers of America. Born of a noble Portuguese family, he early entered the naval service and sailed to India, where for seven years he was employed on land and on sea in laying the foundation of the Portuguese empire. He gained a great reputation for his services, and returned to Lisbon. Disappointed in an application to the king of Portugal, he went to Spain, where Charles V gladly received him and gave him the command of a fleet of five vessels, in which he set sail for India and the Spice islands. Magellan, like Columbus and Vespucius, hoped to find a way to India through some strait dividing South America, or, failing in that, by sailing around the mainland.

He left Spain in 1518 for Brazil, sailing then southwardly along the coast to about 50° south, where he spent the winter. Three of his captains became discouraged, mutinied and determined to return. Magellan heard of their treachery. He summoned the leader to his vessel. On his refusal to obey, the officer bearing the summons plunged a dagger into the heart of the mutineer; at the same moment a boat's crew from Magellan's vessel mounted the deck, and the mutiny was over. The other mutineers were either hung or left to perish on the coast of Patagonia.

Early in the spring of 1519 the fleet set out again, one vessel having been shipwrecked, and found a channel which proved to be the long-sought passage to India. Three months were spent in exploring the straits of Magellan before they entered the Pacific ocean. One of the vessels sent to explore a channel in the straits deserted and returned to Spain.

They sailed along the coast of Patagonia 400 or 500 miles, and then northeastward toward Cathay and the Spice islands. The wind was light, the ocean was as calm and smooth as an inland sea, and they called it the Pacific ocean. For months their progress was slow; their food failed; scurvy and sickness broke out.




* FIGURE 1.—*Magellan's Circumnavigation.*

Finally they reached the Ladrone islands and found the food and rest they so much needed. They then sailed for the Philippine islands, where in a foolish affray with the natives Magellan was killed; but he had finished his work—he had circumnavigated the globe; he had reached the east by sailing west.

One of the three vessels which had crossed the Pacific was abandoned and burnt in the Phillippine islands, another was lost in the Malaccas; the last, loaded with spice, returned to Spain and finished the most remarkable voyage on record. Of the 280 men who sailed with Magellan in September, 1519, only 18 returned in September, 1522. The cost of this fleet, with

* Reproduced, with minor alterations taken from the text, from a tracing of a chromolith showing the "Voyage of the Victoria" in "The Life of Ferdinand Magellan," by F. H. H. Guillemard, 1891 (?), pl. ii, p. 142.

all its equipment, was about $20,000.00, less than one-half the cost of the steamer plying between Washington and Mount Vernon. The sale of the spices left a large profit to Charles V and the merchants who had furnished the funds for the adventure.

The king of Spain gave to the heirs of Ferdinand Magellan for their coat of arms a terrestrial globe belted with the legend "*Primus circumdedisti me*"—"Thou first encompassed me."

In 1513 Vasco Nunez Balboa, a Spaniard who had married an Indian princess, heard, from the natives, of the Pacific ocean and of the land of the Incas, where gold, silver and precious stones abounded. On September 25, from the top of the mountains tains he looked down on the Pacific ocean, the first European to behold it. He collected a few vessels on the Atlantic coast for a voyage of discovery to Peru, and, taking them to pieces, he carried them across the isthmus and launched them on the Pacific. Two thousand Indians, we are told, perished in this work. When nearly ready to sail he was recalled by the governor of Darien and beheaded.

After the death of Balboa, Francisco Pizarro, one of his followers, returned to Spain with an account of the land of the Incas, and in 1529 was made governor and captain-general of this country, then called the province of New Castile, with leave to fit out at his own expense an expedition to conquer that territory. He left Panama with three ships, 180 men and 27 horses, but it was not until two years later that they landed in Peru and began that contest which resulted in the overthrow of the Incas and in loading with riches the meanest of Pizarro's followers. The civilization of the Incas, the highest type in America, was crushed.

The Spaniards soon after this conquest sailed still further southward, along the coast of Peru and Chili, even to the straits of Magellan.

Rumors of an eldorado beyond the Andes came to Pizarro. One of his followers, Orellano, was sent to cross the Andes and descend to the headwaters of the Amazon, but he could not find the promised land. His party, famished and decimated by the fatigue of the journey and unable to return to the Pacific, built a boat and floated down the Amazon river 4,000 miles, to its mouth.

Before the discovery of Peru by Pizarro, Sebastian Cabot, with a small Spanish fleet, in 1527, sailed up the Rio de la Plata to the great falls of the Parana. He found some silver and gold mines in Brazil and heard of the civilization and riches of the Incas of Peru, but was unable to cross the mountains to their country.

Thus within fifty years after the discovery of America, South America had been circumnavigated, its great rivers navigated, and the general features of the interior and its treasures of gold and silver made known to the Spaniards and Portuguese.

Some time before the conquest of Peru, the Spaniards heard rumors of the great city of the Montezumas. In March, 1519, Hernando Cortez, one of the most daring and able of the adventurous Spaniards, landed on the coast of Mexico with ten vessels, 600 to 700 soldiers, 18 horsemen and some cannon. He burnt his ships, thus cutting off all retreat, and then marched toward the city of Mexico. By his courage, address and strategy he conquered or made friends of several tribes of Indians hostile to Montezuma. He pushed onward to the city of Mexico, where he was received with great pomp by Montezuma and escorted into the city as his friend and guest. Soon after Cortez, learning that Montezuma was preparing to attack the inavders, visited him in his palace, and by persuasion and force took him to the Spanish quarters and kept him a prisoner. Some time later the Indians chose another king and attacked the Spaniards, but after a slight success were defeated with great loss. Then Cortez, having captured and fortified the city of Mexico, defeated the other tribes and subdued the whole country. He subsequently explored it to the gulf of California and Lower California, on the other side of the gulf. He then returned to Spain, but was not received by Charles V as he expected. Forcing his way to the royal presence, Cortez replied to Charles, who wished to know who the intruder was, "I am the man who has given you more provinces than your father left you cities." There is no tale in the history of the world more marvelous than the conquest of Peru and Mexico, when we consider the high culture and strength of the natives, the small number of Europeans engaged, the extent of the conquests, and the value of the treasures obtained.

The Spanish discoverers of America were men of marked ability, capable of enduring privations of every kind, prompt in action, prepared for every emergency, proud, brave and selfreliant to the verge of rashness, eager for adventures, cruel, unscrupulous and rapacious, of unbounded greed and ambition. They sought and found gold and silver in Peru and Mexico in such quantities as they had never dreamed of; the new world brought to Spain greater wealth and glory than Columbus ever expected to find in Cathay or the Spice islands. Spain, it is said, drew from America during the sixteenth century seven hundred millions of dollars in gold and silver, a sum fully equal to ten times as much in purchasing power at that time as it would be to-day.

In the exploration of North America the Spaniards took little interest. "What need have we," they said, "of things which are common to all the countries of Europe—to the south, to the south for the great and exceeding riches of the equinoctial; they that seek riches must not go into the cold and frozen north."

The French, though they made some remarkable journeys in the continent of North America, furnished but one discoverer whom we shall notice, Jacques Cartier, a French navigator, who was appointed in 1534 by Francis I to the command of two ships for exploring the district near the fishing grounds of Newfoundland. He sailed up the Saint Lawrence and took possession of Canada for France, erecting a wooden cross with the inscription, "*Vive le Roy de France.*" In 1541 a settlement was made near Quebec, the commencement of the French colonization in Canada.

The English were far behind the Spanish and Portuguese in the exploration of America. Their first great voyagers after the Cabots were slavers, buccaneers and pirates. Their most noted commanders were John Hawkins and Francis Drake, who carried a cargo of negro slaves from Africa to the West Indies and sold them at an enormous profit. They there heard of the Spanish galleons bearing the treasures of Peru and Mexico to Spain, and of the cruelties with which English seamen, taken prisoners, had been treated. On their return, fleets were equipped and sent to the gulf of Mexico to capture the treasure ships and avenge the wrongs of the English sailors.

The queen frequently furnished ships belonging to the royal navy; they were equipped by Raleigh and other English noblemen, and the prizes were divided between the crew, officers, nobles and queen, the queen obtaining the largest share. Sir Francis Drake, one of the boldest and most successful of these cruisers, on one trip overhauled and plundered over 200 vessels and pillaged towns and cities. Several times Philip II of Spain demanded his surrender as a pirate, for during all this time the two nations were at peace; the queen hesitated and delayed, but never yielded to the demand. There and then the foundation was laid of the navy and seamen of Great Britain.

In 1577 Drake was summoned to a private audience with the queen, at which it was agreed that a fleet of five ships should be equipped, nominally for the Mediterranean but really for the South seas, as the Pacific ocean was then called, to capture the great galleons, the treasure ships of Spain; and that the queen should contribute 1,000 crowns to the cost. On August 20, 1578, Drake, with this fleet, reached the straits of Magellan and sailed through them in two weeks into the Pacific. There they encountered long and terrific storms, which carried them far south of the straits. One of Drake's vessels had been broken up for fire-wood, another swamped in his sight, and the third deserted and returned to England.

On the fifty-third day of the tempest, Drake found himself south of cape Horn, where no other vessel had ever sailed. Here, according to all the maps, was the great Austral continent, which extended an unbroken land area from the straits of Magellan to the antarctic pole; but he found only water—before him rolled the waters of the Atlantic and Pacific in one great flood. He walked to the end of the farthest island, lay down, and with his arms embraced the southernmost ground of the new world. Then the weather changed and all went well. He sailed along the coast of South America, captured Valparaiso, took all the treasures he could find, refitted and provisioned his ships, and sailed northward, taking treasure ships and plundering cities until his vessel could carry no more, although it was ballasted with silver and gold.

Instead of returning as he had come, Drake determined to seek and find the fabulous strait so long sought by Columbus, and by that channel to find his way home. He followed the coast from Central America northward to the latitude of Vancouver and took possession of the land for England, calling it New Albion; then, finding the coast still trending to the northwestward and the weather growing more severe, he gave up his attempt, landed at the harbor of San Francisco, refitted his ships, and returned home by the cape of Good Hope, reaching Plymouth in September, 1580, the second man to circumnavigate the world (figure 2*). What his reception would be at home was questionable. The news of his exploits had reached Spain the year before, and the ambassador of Philip demanded that he should be executed as a pirate, and renewed the demand as soon as he heard of the explorer's return. The result of this demand was for some time doubtful; but when it was heard that a Spanish hostile fleet had landed on the Irish coast, the queen determined to support Drake and receive her share of the spoils. What they were we are not told, but they must have been very

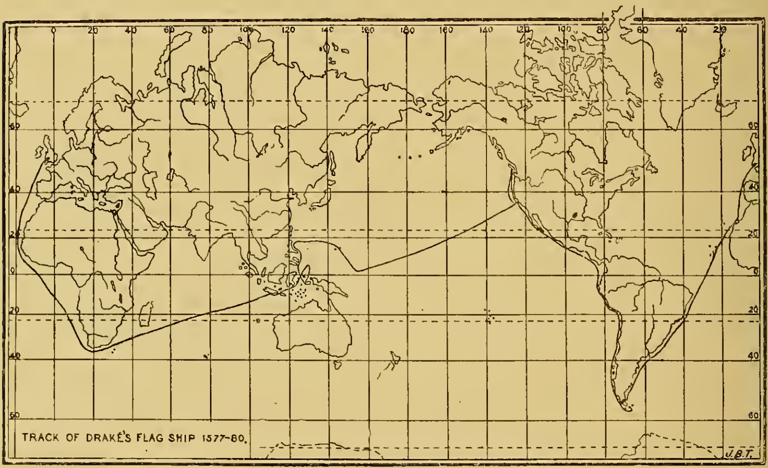



FIGURE 2—*Drake's Circumnavigation.*

great as Drake's share was 10,000 pounds, equal to $400,000 of our money today. This voyage of Drake completed the discovery of America from the northern coast of Labrador southward around cape Horn and northward to 48°, the latitude of Vancouver island.

Nearly one hundred years elapsed from the first voyage of Columbus to the voyage of Drake, each of whom vainly sought a way through America—the one from the Atlantic to the Pacific, the other from the Pacific to the Atlantic.

Thus, before the end of the sixteenth century, the whole continent of America, save the arctic border, had been circumnavi-

* Compiled by John B. Torbert from "The Life of Sir Francis Drake," by Julian Corbett, 1892.

gated and the southern part of it colonized; but it was not until after another century and another age that another race found homes for themselves on the coast of North America.

The voyages of the discoverers of America gradually became known to the public. It is interesting and instructive to examine the early maps representing these voyages to see how slowly the geography of the new world became known.

On the Zeni map of 1400, published in 1558, Greenland is connected with Norway. The same connection is shown in the Claudius Clavus map of 1427, in the Portuguese mappemonde of 1490, and even in the Ptolemy map by Waldseemüller in 1513; while in the map of Europe at the end of the "Chronicon Nurembergense," 1493, Greenland is shown as an isthmus connecting Norway and Sweden with Russia.

One of the first maps drawn after the discovery of America was that made in 1500 by Juan de la Cosa, a celebrated pilot and cartographer who accompanied Columbus on his first and second voyages and Vespucius on his first voyage. It delineated parts of the eastern coasts of South America and North America, showing by the flags of Spain, England and Portugal the coast explored by the ships of each country. On that part of the map between North America and South America, Columbus is drawn as Saint Christopher bearing the Christ child on his shoulders. The figure thus fulfills a double purpose of honoring Columbus and covering the undiscovered portions of the continent (plate 4*).

On the Cantino chart of 1501–1502 South America is delineated as surrounded by water from about 30° south to the isthmus of Darien, then Cuba, the West India islands and the coast of North America from 37° to 54° north. There is no land connecting North America and South America.

On the Ruysch map of 1508, two years after the death of Columbus, Greenland and Labrador are connected with Asia. The new world appears as an island near the equator (plate 5†).

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* The original of this map is preserved in the Museo de la Marina at Madrid. Plate 5 is reduced from a tracing of a lithographed fac simile, in colors, in possession of Mr Thomas Wilson, whose courtesy in permitting the use of this rare map it is a pleasure to acknowledge.

† Photolithographed directly from a copy of the edition accompanying the "Geographiæ Cl. Ptolemæi," Romæ, 1508, now in the Library of Congress, through the kindness of Hon A. R. Spofford. The Ruysch map is of special interest as showing the Cabot discoveries of 1497 and as being the first map of the world engraved on copper.

On the Lenox globe, so called, made about the year 1510, now in the Lenox library in New York, South America is a large island, while North America is represented by a number of detached islands.

On the map attributed to Leonardo da Vinci, 1514, the name "America" appears for the first time, and is given to a large island on the equator. Florida is the name of another island northwest of "America."

On the Schöner globes of 1515 and 1520 North America and South America are two islands, while the southern part of "America" is separated by straits from an Antarctic continent, and on the globe of 1520 the city of Mexico is identified as the Quinsay of Marco Polo. On the Hauslab globe of 1516–1517 the name "America" is given to South America. Straits connecting the Atlantic and Pacific oceans separate North America from South America.

On the Maiollo map of 1527 South America, including the isthmus of Panama, appears an island separated by the "Straito Cubitoro" from North America. On the Münster map of 1532 South America is an island with a strait between it and Cuba, leading into the Pacific ocean, while on the Münster map of 1540 North America and South America are connected by an isthmus.

On the Paris gilt globe, about 1525, Greenland is an island, Labrador and "Terra Florida" form parts of Asia, while the gulf of Mexico is fairly delineated, with Cathay on its western shore. The Schöner globe of 1533 is much the same in the middle latitudes, while the Paris wooden globe, about 1535, represents Greenland, Labrador and Florida as belonging to Asia, the gulf of Mexico as the "M[are] Cathairum," and South America as a peninsular extension of the Asiatic mainland.*

On the map of Orontius Finæus, 1537, thirty years after the death of Columbus, Greenland is an island, Labrador and the coast of North America are attached to the northern part of Asia, Cathay appears on the gulf of Mexico, and South America is connected with the southeastern part of Asia. This map was made nearly twenty years after Magellan had circumnavigated the world.

On the Gastaldi carto marina of 1548 Greenland is connected with Norway on the east and Labrador with America on the

* "The Discovery of North America," by Henry Harrisse, 1892, pls. xvii, xxi, xxii.

west. North America and South America are connected, and the Austral continent is shown south of the straits of Magellan.

There was no map published until after the sixteenth century that gave a correct delineation of the seacoast of America. It is no wonder that Columbus never comprehended the nature or extent of his discoveries. The more we study the history and geography of the times, the influence of the church, the difficulty of determining longitude, the ignorance of the movements of the mariners' compass and of the distance to Cipango, the greater will be our admiration for Columbus. Yet a recent writer speaks of the discovery of Columbus as a blunder, and others say, as if in disparagement of his work, that he knew of the discoveries of the Northmen and was only following their track; that the chart of Toscanelli which Columbus took on his first voyage indicated clearly his route; that Columbus died in the belief that he had discovered Cipango and Cathay, never realizing that it was the new world, and that Americus Vespucius is entitled to the greater credit.

Let us hear the opinion of a contemporary of Columbus, Sebastian Cabot: "When news was brought that Don Christopher Colon, the Genoese, had discovered the coasts of India, whereof was great talke in all the court of King Henry the VII, who then reigned, all men with great admiration affirmed it to be a thing more divine than humane to saile by the west into the easte, where the spices growe, by a chart that was never before knowen."

It is very doubtful if Columbus knew anything of the voyages of the Northmen, nor would such knowledge have been of much value, for Greenland was then believed to be a part of Europe and joined to Norway. If Columbus had known of the discoveries and sought the countries they had found, he would have sailed northwestward instead of westward.

Many before Toscanelli and Columbus believed the world to be round, and that by sailing westward Asia might be reached. Columbus not only believed but proved it. He made no blunder, for he sought land the other side of the Atlantic, and he found it. Vespucius knew little more than Columbus of the new world, and never realized that North America and South America were one continent. The maps show that learned geographers long after the discoveries of Columbus, Vespucius, Cabot and Magellan did not understand the geography of the new world.

All voyages before that of Columbus had been coasting voyages, the sailors keeping in sight of land. Columbus pushed out into the unknown and trackless ocean, leaving the land far behind. Good seamen were unwilling to undertake so terrible a voyage, so convicts were obtained, liberated from prison on condition of sailing with Columbus. A brave, resolute and self-contained spirit was necessary to command such a crew on such an expedition. New wonders startled him each day. The magnetic needle, instead of pointing steadily northward, swerved toward the west. The wind for many days blew unvaryingly from the east, and the sailors thought it would prevent them from returning. The Saragossa sea puzzled them. They daily grew more timid as they sailed further and further into the ocean, though they had sailed much further than they supposed. No voyage like that was ever made before and none like it can ever be made again, for the great discoverer solved the problem and reached the east by sailing west.

How like a tragedy the life of Columbus! Twelve years of preparation and waiting, five in Portugal and seven at the court of Isabella; his demand; its rejection; his recall; his departure from Palos with three small vessels; his triumphant return after the discovery of America, admiral and governor; sent home in chains; his death, poor, unknown and forgotten. Contrast this with what has recently taken place at Palos. Last September (1892) the greatest war ships of the world from Spain, Italy, Germany, Great Britain and the United States, propelled by a power unknown to Columbus, escorted from the harbor of Palos three little ships, two without decks, fashioned after the ships of Columbus.

At the time of Columbus' death none to honor him; now all Europe and the new world unite in rendering him the greatest homage ever paid to man!

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THE

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# THE MOVEMENTS OF OUR POPULATION

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# THE MOVEMENTS OF OUR POPULATION

BY

HENRY GANNETT

(*Presented before the Society December 9, 1892*)

## THE TOTAL POPULATION.

By the movement of population is to be understood its numerical increase, its geographic distribution over the country, and its composition as regards sex, race and nativity, not only at present but in past times.

This is a broad subject, and in an attempt to compress it within the limits of a single paper it will be impossible to go deeply into details. I shall attempt only to develop the principal features and to bring out their mutual relations.

The first permanent settlement within the original area of the United States was made at Jamestown, Virginia, in 1607; the next at Plymouth in 1620. These were followed nine years later by the settlements at Salem and Boston. In 1623 the Dutch settled at New York. From 1631 to 1634 colonies were established on Kent island and Saint Marys, on the shore of Chesapeake bay, and in 1638 at Wilmington, Delaware. In 1664 settlements were established at Elizabeth, New Jersey, and on Cape Fear river, North Carolina, and six years later on Ashley river, North Carolina. The settlements in Pennsylvania began in 1681. It was not until 1733 that settlement was established in the present state of Georgia, in the neighborhood of what is now the city of Savannah.

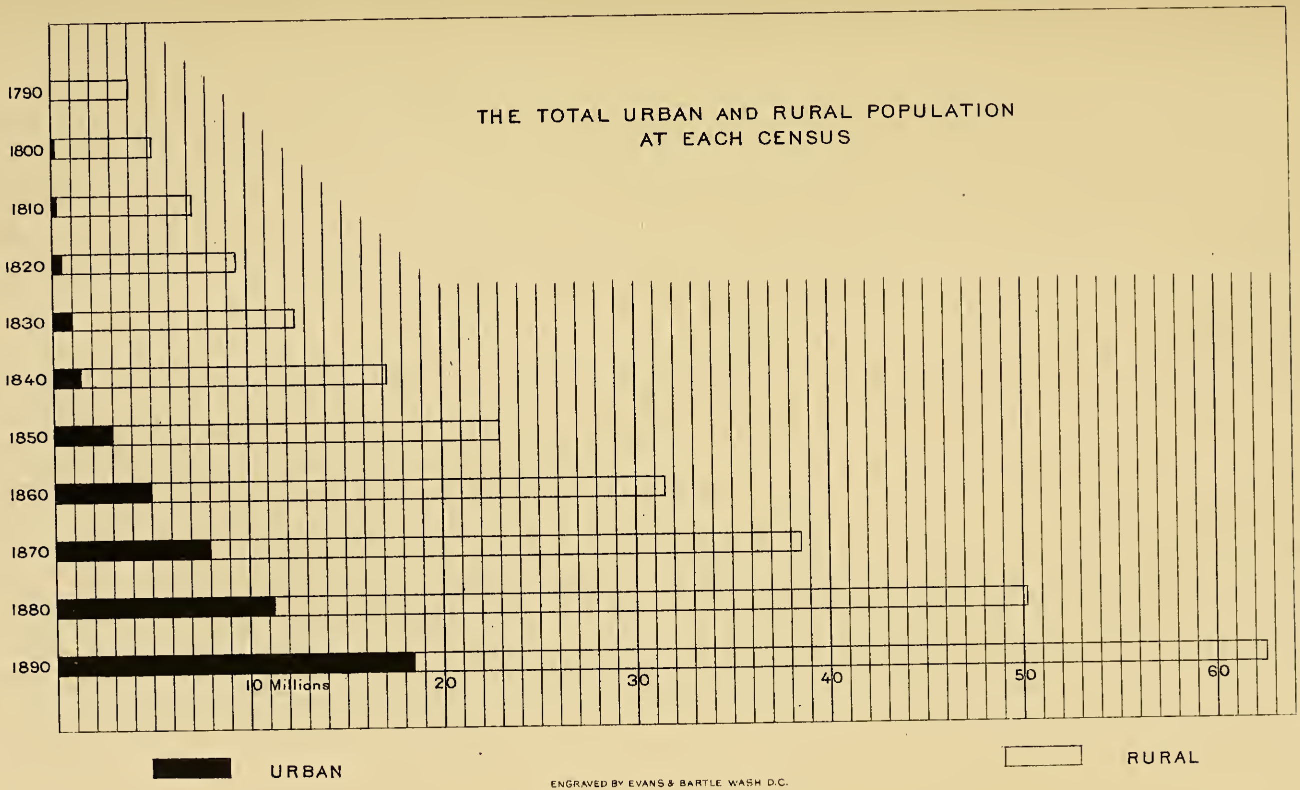
The early colonies suffered many hardships and dangers and grew but slowly. Bancroft estimates their people at approximately 200,000 in 1688, three-quarters of a century from the time of the first settlement. He estimates the population in 1750, nearly a century and a half after the first settlement, at 1,260,000. Ten years later, in 1760, it was 1,695,000; in 1770 it was 2,312,000, and in 1780, 2,945,000. Thus, at the outbreak of the Revolution the population of the colonies was probably not far from 2,500,000, of which it is estimated that 2,000,000 were whites and 500,000 blacks.

In 1790 the first census of the United States was taken. From that time to the present a census has been taken every ten years. For a century, therefore, we have a trustworthy record of our numbers. Starting a century ago, with 3,929,214 inhabitants, we have gone ahead by great leaps, as shown in the following table and diagram, until our country contains to-day 62,622,250 people:

*Population of the United States by Decades.*

| Census years. | Population. | Per cent of increase. |
|---|---|---|
| 1790 | 3,929,214 | .......... |
| 1800 | 5,308,483 | 35.10 |
| 1810 | 7,239,881 | 36.38 |
| 1820 | 9,633,822 | 33.06 |
| 1830 | 12,866,020 | 33.55 |
| 1840 | 17,069,453 | 32.67 |
| 1850 | 23,191,876 | 35.86 |
| 1860 | 31,443,321 | 35.57 |
| 1870 | 38,558,371 | 22.66 |
| 1880 | 50,155,783 | 30.07 |
| 1890 | 62,622,250 | 24.85 |

The diagram (plate 6) shows by the lengths of the bars the population as returned at each census, the difference between their absolute lengths representing the numerical increase from census to census, and their relative lengths the proportional increase. In the first twenty-five years the population doubled; in the second twenty-five years it doubled again, the population in 1840 being four times that in 1790. But in recent years the




ENGRAVED BY EVANS & BARTLE WASH D.C.

rate of increase has diminished. Instead of doubling in the last twenty-five years, as it did in the first half-century of our history, it has required thirty years, the population in 1890 being almost precisely double that in 1860.

In the early decades of our history the rate of increase ranged from 36 to 32 per cent. Between 1840 and 1850 it rose again suddenly to nearly 36 per cent, owing to the first rush of immigration. Between 1860 and 1870 the check due to the civil war is strongly emphasized.

The rates of increase shown by the figures are extremely large as compared with those of European nations; many times larger than that of France, several times larger than that of Great Britain, and greatly in excess of that of Germany. Indeed, in rapidity of growth no other civilized nation of history has ever approached this country. While in the past thirty years this country has doubled its population, France has increased but 3 per cent, Great Britain and Ireland 29 per cent, and Prussia 62 per cent. Since 1797 Prussia has increased in number from 8,700,000 to 30,000,000, while this country has increased from four or five millions to 62,622,250; nor is this tremendous increase due in any great degree to immigration, since in all probability, as shown later, the earlier rates of increase would have been nearly maintained by the excess of births over deaths had there been no immigration.

While in the United States as a whole the population has increased during the century at this marvelous rate, individual states show the widest possible range in their rates of increase. As a group, the thirteen original states have never gained so rapidly as the United States as a whole. Their rate of increase has always been smaller than that of the country. The reason for this is that throughout our history these states have furnished the brain and brawn for the settlement of the west. There has been a continuous stream of emigration from the Atlantic border to the Mississippi valley, the plains, the Rocky mountains, and the Pacific slope. Millions upon millions of young men and women of the east have left their homes to found empires in the west.

In the northeastern states this drain has since 1847 been in large part made up by foreign immigration, and thus has the character of the inhabitants of these states in great measure been changed from the pure English stock of Revolutionary times. In the south there has been no flood of immigration, and the losses which these states have sustained have been repaired only in part by the fecundity of the people.

On the other hand, in the newer states where settlement began since we became a nation, the rate of increase of population was at first extremely large and then diminished down to the present time; but it has not diminished uniformly or continuously, because of certain disturbing elements.

In the progress of settlement of this and perhaps other countries there is a certain order or sequence in the occupations followed by the majority of the people, an order which accompanies and is closely related to the increasing density of the population. After the pioneers, or hunters, trappers, etc, commonly follow herdsmen and ranchmen as the first settlers. The raising of cattle, which requires a wide range of country for pasturage, is the prominent industry of a newly opened territory. Then farmers come and gradually crowd the herdsmen out. The land is occupied in small parcels and affords sustenance to a much larger number, but the time ultimately arrives when the population becomes too dense for profitable farming, and a portion of the people, taking the hint given them by the increasing hardness of the times, enter other avocations; and so manufactures and commerce take their beginnings and gradually grow and multiply until the farmer finds himself in the minority. The body of people are engaged in making things instead of raising things. Now, when a nation or state approaches the limit in density of population of successful farming it does not pass easily and freely into a manufacturing community. There is more or less trouble. There are hard times and a depreciation of values for a while. It is a sort of dead-point in the machinery; but when the change is effected, or on the way to be effected, prosperity once more beams upon the community.

This is not an ideal case. We have before us in the states of Ohio, Indiana, Illinois and Iowa, and in parts of adjacent states examples of communities which are now passing through just such a crisis. The growth of population in these states is at present very slow. The farmers are getting crowded, while other industries are not sufficiently advanced to take their place. A quarter of a century ago southern New England was in that situation, but has now emerged from it, and having become a manufacturing section is exceedingly prosperous and the population is increasing again with great rapidity, the increase being essentially urban.

FIG. 1

SETTLED AREA IN 1790

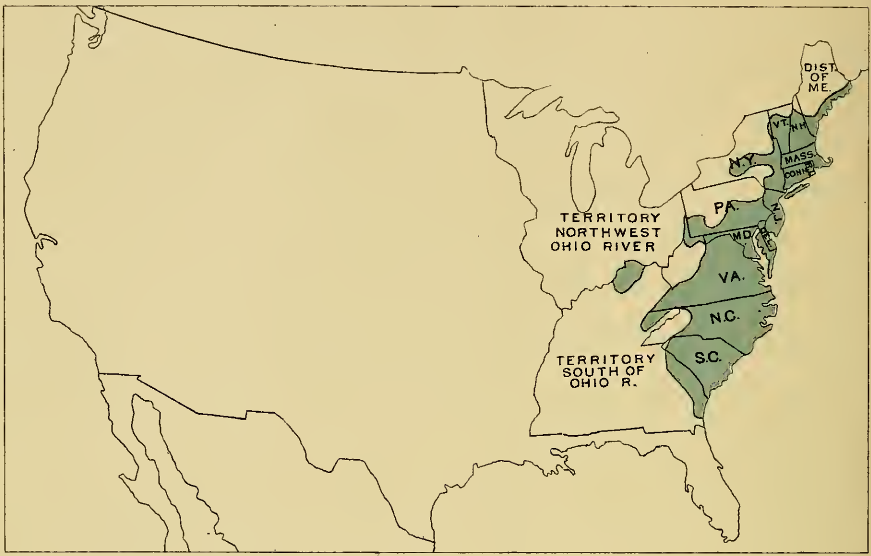
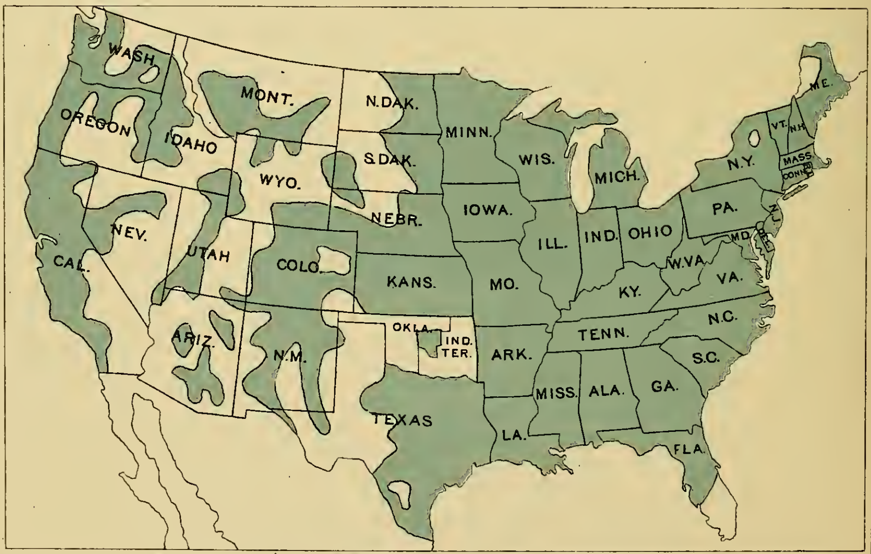



FIG. 2

SETTLED AREA IN 1890




SETTLED AREA OF THE UNITED STATES

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This change involves more than a mere change of avocations to these states. It involves a shrinkage of farm values, enormous in total amount, the gathering of the people together in cities and an enormous increase in values therein.

## The Settled Area.

Now, let us trace the spread of the population over our domain as it has increased in number. Its progress across the continent is indicated by the maps (plate 7) representing the status of settlement at the beginning and end of the century. The colored area on each map represents the settled area of the country at each date, it being understood that by the term "settled area" is meant all that country which contains two or more inhabitants to the square mile, anything less than that being regarded as unsettled.

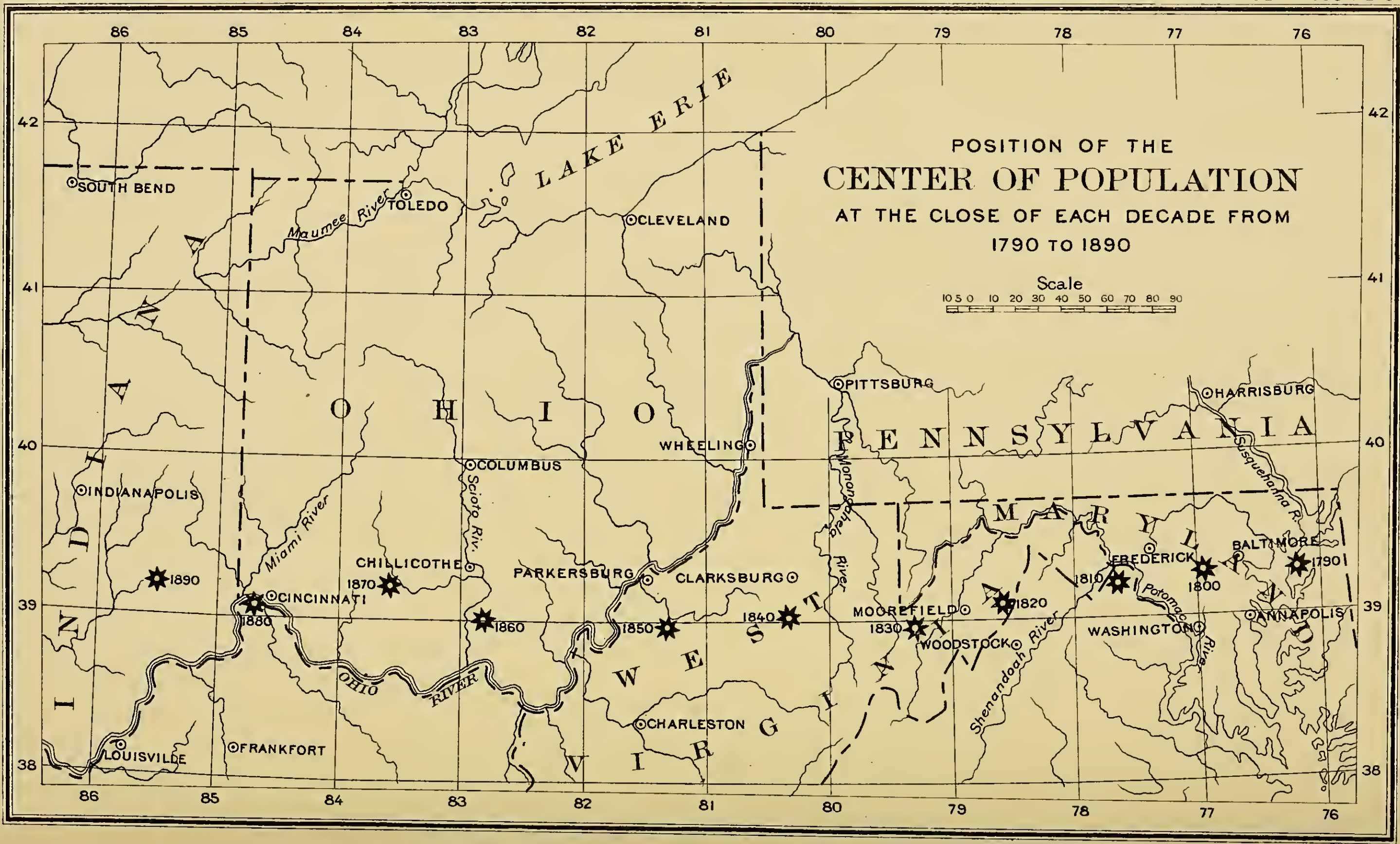
But first a word about our territorial limits. In 1790 our territory was limited on the west by the Mississippi river and on the south by the northern line of Florida. In 1803 the enormous territory of Louisiana was added by purchase, and shortly thereafter Oregon was acquired by prior settlement. In 1821 Florida was acquired from Spain. In 1845 Texas, having achieved its independence from Mexico, was admitted as a state. In 1848 the southwestern territories were acquired from Mexico by the treaty of Guadaloupe Hidalgo; and in 1853 the Gadsden purchase completed the territory of the United States as it exists at present, with the exception of the detached territory of Alaska.

In 1790 we find settlement stretching continuously along the Atlantic coast from Maine to Georgia, and occupying the greater part of the Atlantic plain. At several points it stretches feebly westward, up the Mohawk river in New York, crossing the mountains in Pennsylvania and Maryland, and stretching down the Appalachian valley in eastern Tennessee, while in northern Kentucky, in the neighborhood of Cincinnati, quite a body of settlement has appeared, isolated from the rest. Each succeeding decade has seen the frontier line pushed westward, crossing the Appalachians, stretching gradually across the great valley of the Mississippi, and climbing the plains. With every succeeding census we see new isolated bodies of settlement off beyond the frontier at points where the exceeding fertility of the soil, facilities for Indian trading, or valuable mines have attracted the pioneers. These centers have grown and spread until their margins have touched the main frontier line and they have become merged in the great body of population. In two or three instances bodies of population which have grown up under foreign powers have fallen under our jurisdiction by the acquisition of territory. Among these are the old French-Spanish settlements of southern Louisiana, the American-Spanish settlements in Texas, and the Spanish settlements of New Mexico, Arizona and California. In 1860 settlements of magnitude first appeared in the Rocky mountains and on the Pacific coast. Those in California consisted of gold-hunters and those in Utah of Mormons. In 1870 these settlements had spread widely. To the gold-hunters of California had been added thousands of farmers who were subduing the broad acres of the Sacramento valley. The Mormons had increased and multiplied, and gold-hunters had spread into Idaho and Montana.

The second of these maps (plate 7, figure 2), representing the status of settlement in 1890, marks an epoch in the history of our settlement. The frontier line has disappeared. The settlements in the far west have spread and joined one another. The settlements from the east have traveled up the plains and have joined those in the mountains at many points, so that the settled area has become the rule and the unoccupied places the exception. It will soon be useless to advise young men to go west and grow up with the country, for the country is rapidly growing up.

*Per cent of Increase of settled Area and of Population.*

| Census years. | Area. | Population. | Per cent of increase. | |
|---|---|---|---|---|
| | | | Area. | Population. |
| 1790 | 239,935 | 3,929,214 | .......... | .......... |
| 1800 | 305,708 | 5,308,483 | 27.41 | 35.10 |
| 1810 | 407,945 | 7,239,881 | 33.44 | 36.38 |
| 1820 | 508,717 | 9,633,822 | 24.70 | 33.07 |
| 1830 | 632,717 | 12,866,020 | 24.38 | 33.55 |
| 1840 | 807,292 | 17,069,453 | 27.59 | 32.67 |
| 1850 | 979,249 | 23,191,876 | 21.30 | 35.87 |
| 1860 | 1,194,754 | 31,443,321 | 22.01 | 35.58 |
| 1870 | 1,272,239 | 38,558,371 | 6.49 | 22.63 |
| 1880 | 1,569,570 | 50,155,783 | 23.37 | 30.08 |
| 1890 | 1,947,285 | 62,622,250 | 24.06 | 24.86 |

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The settled area at each census has been measured and the results compared one with another. The table presents the rates of increase of the settled area compared with one another, and also with the rate of increase of the population. It is seen that while the settled area has increased at a rapid rate the population has increased in each case still more rapidly.

### Center of Population.

The distribution of the population is summarized in the position of the center of population, and its movements are likewise summarized by the movements of this center. The center of population is the center of gravity of all the inhabitants of the country, computed under the assumption that each individual is of the same weight and presses downward with a force proportional to his distance from the center. In 1790 this center of population was located near Baltimore, in the northern part of Chesapeake bay. In the century which has elapsed this center has moved westward decade by decade, the stages ranging from 36 to 81 miles, with an average of about 50 miles per decade. Now it varies northward a trifle in its western course as the weight of settlement has been attracted northward, and again southward, perhaps by the addition of Texas with its body of Americo-Mexican people, but generally keeping a consistent course toward the setting sun. In one hundred years it has

*Position of the Center of Population in each Decade.*

| Census years. | North latitude. | West longitude. | Approximate location by important towns. | Westward movement during preceding decade. |
|---|---|---|---|---|
| 1790...... | 39° 16.5′ | 76° 11.2′ | 23 miles east of Baltimore, Maryland......... | |
| 1800...... | 39 16.1 | 76 56.5 | 18 miles west of Baltimore, Maryland ......... | 41 miles. |
| 1810...... | 39 11.5 | 77 37.2 | 40 miles northwest by west of Washington, District of Columbia. | 36 do. |
| 1820 .. . | 39 5.7 | 78 33.0 | 16 miles north of Woodstock, Virginia.. .... | 50 do. |
| 1830...... | 38 57 9 | 79 16.9 | 19 miles west-southwest of Moorfield, West Virginia. | 39 do. |
| 1840 ..... | 39 2.0 | 80 18.0 | 16 miles south of Clarksburg, West Virginia. | 55 do. |
| 1850...... | 38 59.0 | 81 19.0 | 23 miles southeast of Parkersburg, West Virginia. | 55 do. |
| 1860...... | 39 0.4 | 82 48.8 | 20 miles south of Chillicothe, Ohio.............. | 81 do. |
| 1870...... | 39 12.0 | 83 35.7 | 48 miles east by north of Cincinnati, Ohio.. | 42 do. |
| 1880 ..... | 39 4.1 | 84 39.7 | 8 miles west by south of Cincinnati, Ohio.. | 58 do. |
| 1890 ..... | 39 11.9 | 85 32.9 | 20 miles east of Columbus, Indiana............. | 48 do. |

moved westward 505 miles. In 1890 it rested for the time in the southern part of Indiana, near Greensburg, still far, however, indeed many degrees of longitude from the geographic center of the United States, which is in northern Kansas, midway between its eastern and western lines. It will doubtless be centuries before the center of population will approach the center of area of the country. The above table and plate 8 show the position and movement of the center of population during each decade.

## Density of Population.

The following table shows the density of the population or the average number of people to the square mile at each census:

*Density of Population by Decades.*

| Census years. | Area. | Density. |
|---|---|---|
| 1790 | 827,844 | 4.75 |
| 1800 | 827,844 | 6.41 |
| 1810 | 1,999,775 | 3.62 |
| 1820 | 1,999,775 | 4.82 |
| 1830 | 2,059,043 | 6.25 |
| 1840 | 2,059,043 | 8.29 |
| 1850 | 2,980,959 | 7.78 |
| 1860 | 3,026,500 | 10.39 |
| 1870 | 3,603,884 | 10.70 |
| 1880 | 3,603,884 | 13.92 |
| 1890 | 3,603,884 | 17.37 |

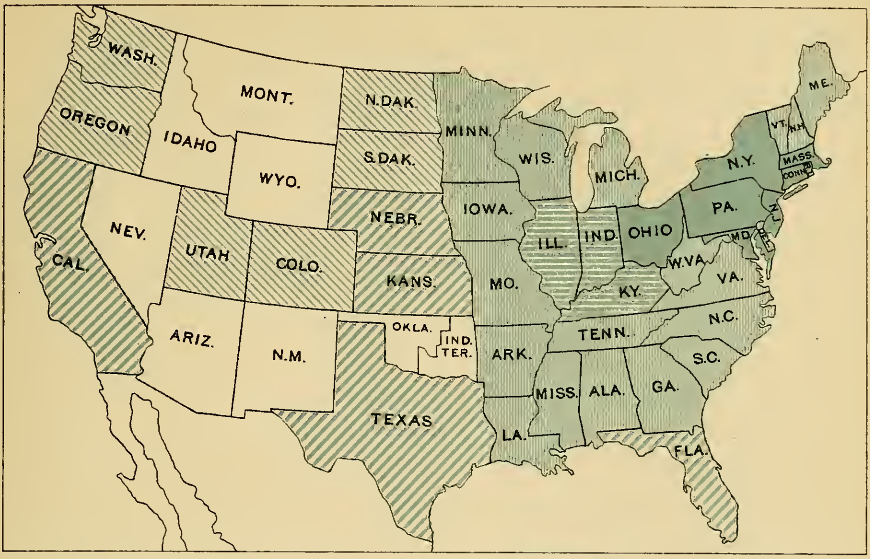
The map (plate 9, figure 1) shows the density of population in 1890 by states. In southern New England—that is, in Massachusetts, Rhode Island and Connecticut—the average density of population is as great as in many old European countries. Indeed, in Rhode Island there are 318 inhabitants to the square mile, in Massachusetts, 278, and in New Jersey, 193. These are all manufacturing states. In the agricultural states of the south the density ranges up as high as 41 in Virginia and 46 in Kentucky, while in the agricultural states of the Mississippi valley we find a density of 68 in the state of Illinois and 61 in Indiana, the average being in the neighborhood of 40 to the square mile.

## Urban Population.

In the term "urban population" the Census Office includes the inhabitants of all cities of 8,000 or more. Of course this definition is entirely arbitrary and it may well be that urban condi-

FIG. 1

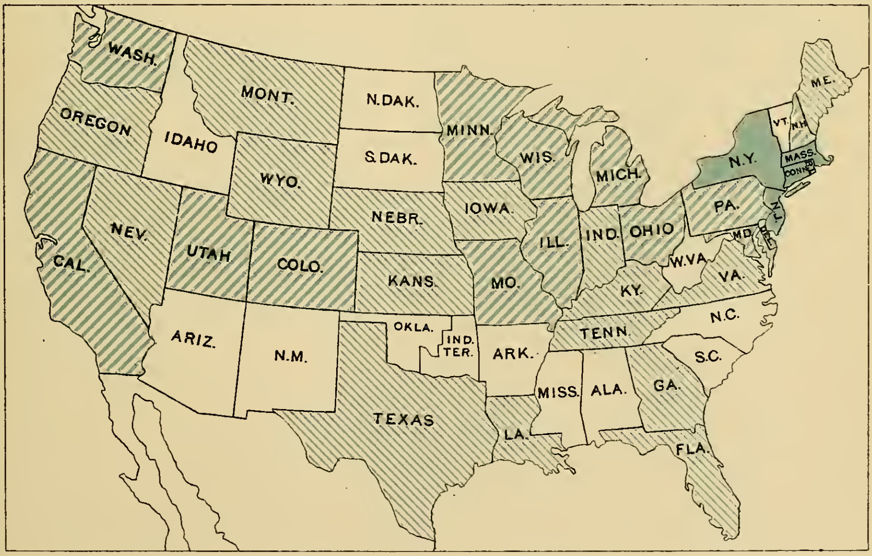
DENSITY OF TOTAL POPULATION




LESS THAN 2 TO A SQ.M.
2–6 " "
6–18 " "
18–45 TO A SQ.M.
45–90 " "
OVER 90 " "

FIG. 2

PROPORTION OF URBAN TO TOTAL POPULATION




LESS THAN 10 PER CENT
10–25 "
25–50 PER CENT
ABOVE 50 "

DENSITY OF POPULATION

tions exist in places much smaller than this. Still, whatever limit is adopted, the conclusions to be drawn from historical comparisons hold equally good. The following table shows the urban population and the proportion which this bears to the total population at each census:

| Census years. | Population of the United States. | Population of cities. | Inhabitants of cities in each 100 of the total population. |
|---|---|---|---|
| 1790 | 3,929,214 | 131,472 | 3.35 |
| 1800 | 5,308,483 | 210,873 | 3.97 |
| 1810 | 7,239,881 | 356,920 | 4.93 |
| 1820 | 9,633,822 | 475,135 | 4.93 |
| 1830 | 12,866,020 | 864,509 | 6.72 |
| 1840 | 17,069,453 | 1,453,994 | 8.52 |
| 1850 | 23,191,876 | 2,897,586 | 12.49 |
| 1860 | 31,443,321 | 5,072,256 | 16.13 |
| 1870 | 38,558,371 | 8,071,875 | 20.93 |
| 1880 | 50,155,783 | 11,318,547 | 22.57 |
| 1890 | 62,622,250 | 18,235,670 | 29.12 |

A century ago this country contained but six cities having a population of more than 8,000 each, and the urban population constituted but 3.35 per cent, or about one-thirty-third of the entire population of the country. To-day the number of such cities is 443 and their population eighteen and a quarter millions, which is 29 per cent, or not very much less than one-third of the entire population. The total population is about sixteen times as great as it was a hundred years ago, while the urban population is 139 times as great. It has grown eight times as fast as the total population.

This aggregation of the people in the cities is a natural and necessary result of the increasing density of population and of the consequent change in avocations, which was discussed above. It has gone on in this country at a constantly accelerating rate, and the acceleration will probably be in the future even more marked than in the past, as a greater part of our domain reaches and passes in density of population the limit of successful agriculture.

Referring to the map (plate 9, figure 2), which shows the proportion of urban to total population, it is seen that the urban population of the country is confined almost entirely to the Northern states, especially those on the Atlantic border. Indeed, in Massachusetts, Rhode Island, Connecticut, New York and New Jersey the urban element is in the majority, and in Rhode Island more than three-fourths of the people live in its cities, while, on the other hand, the proportion in North Carolina, Mississippi and Arkansas is but trifling, being less than 5 per cent in each case.

Now, if the urban element be subtracted from the total population there is left what may be broadly characterized as the rural element. Plate 6 shows by the total length of the bars the population of the United States at each census, the shaded portion of each bar representing the urban population at each date, while the unshaded portion remaining represents the rural population. This element, which in the early decades increased nearly as rapidly as the total population, has in later years increased much more slowly. Indeed, during the past ten years its rate of increase was not much more than half that of the total population; while in several states there has been an absolute loss of rural population during the past decade, and in many others the gain has been much less than the average gain of the country.

The increase of urban population has been more rapid during the past decade than at any previous time in the country's history, having in ten years increased from 22½ per cent up to 29 per cent. This great increase has in the main taken the form of additions to our larger cities, most of which have grown enormously.

The numerical increase in our urban population in the past decade is 6,900,000, of which fully 3,000,000 consists of additions to the 28 cities of 100,000 or more inhabitants. Chicago's half million in 1880 has become more than a million in 1890. St. Paul, Minneapolis, Omaha, Kansas City and Denver have doubled or tripled their population. Our greatest city, New York, has apparently enjoyed a comparatively slow growth; but this is only apparent. New York's charter limits include less than one-half of the people whose business and social interests lie in that metropolis. The great majority of the people who sleep within an hour's ride of New York's city hall are to all intents and purposes, except in name, citizens of New York; but, having their residence without its charter limits, they cannot be enumerated as its citizens. A close estimate of the people thus

FIG. I

AVERAGE SIZE OF FAMILIES

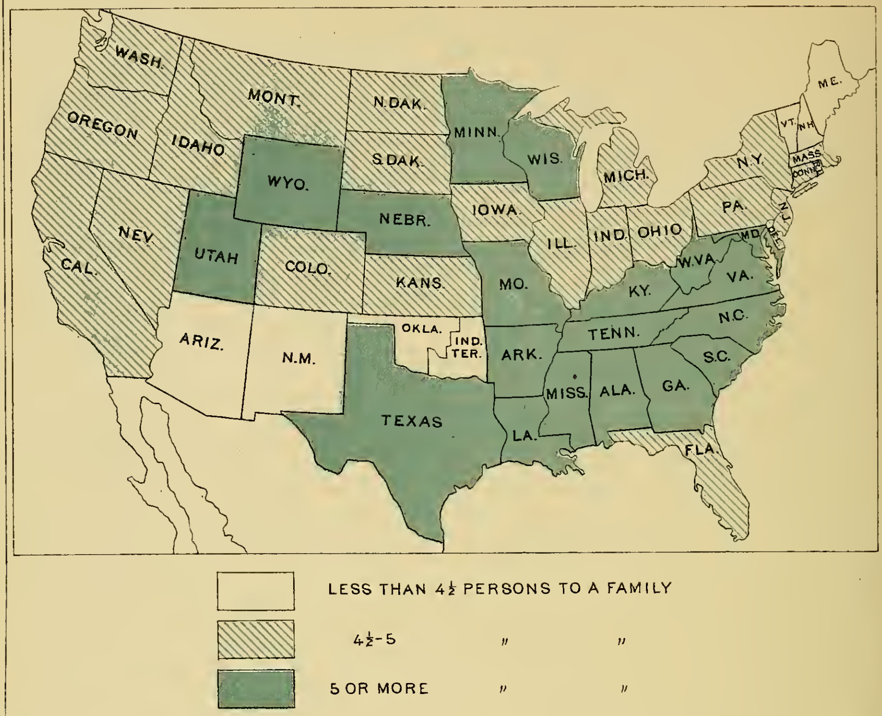
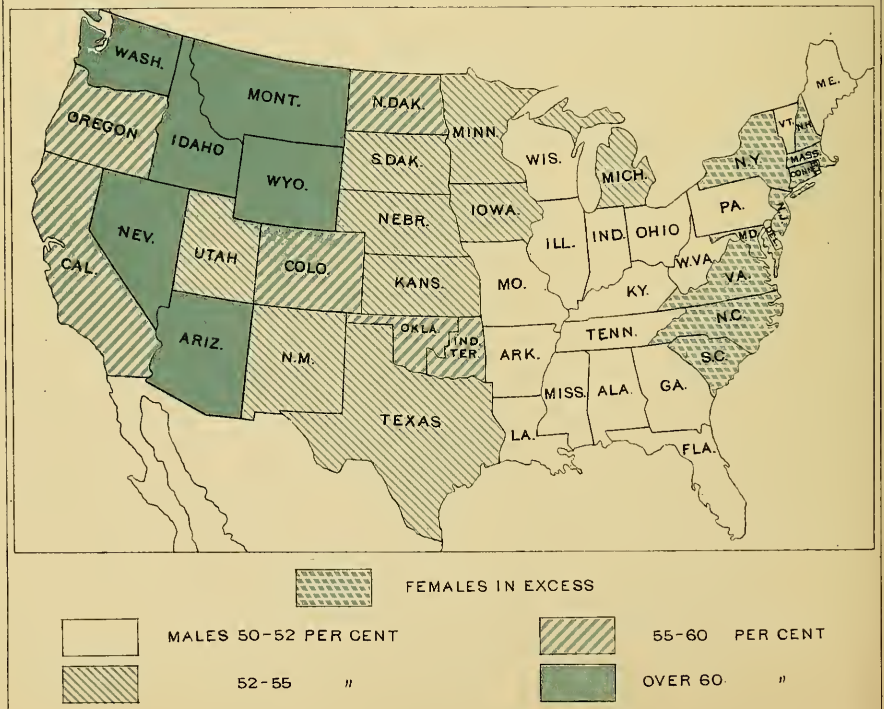



FIG. 2

DISTRIBUTION BY SEX




DISTRIBUTION BY FAMILIES AND SEX

connected with the metropolis places their number at 3,250,000, or second only to London in point of population.

This territory, tributary to but lying outside of the charter limits of New York, has increased in population at a tremendous rate during the past ten years, while the growth of the city proper has heen confined to the upper parts of Manhattan island and the portion of the city lying upon the mainland. The down-town parts of the city have diminished in population during the past ten years. This means simply that the ground formerly occupied by residences is being taken for business purposes; that the lower part of Manhattan island is becoming more and more devoted to business to the exclusion of residence.

A similar state of affairs has long existed in London. London consists essentially of a number of municipalities under various names, of which one, the corporation of London, occupies the center of the city, the neighborhood of Saint Paul's. In 1881 this corporation had a population of only 50,000, while in 1891 it had become reduced to 37,000, owing to the extension of business and the consequent reduction in residence.

The average size of families has diminished continuously since 1850, when statistics were first obtained, from 5.55 down to 4.93 in 1890. In that year the largest families were found in the south and the smallest in New England and in the frontier states, as shown on the map forming plate 10, figure 1.

## Sex.

The last five censuses—that is, since 1850—have classified the population by sex. At each census males have been slightly in excess of females, the proportion of males ranging from 50.56 up to 51.21 of the total population, as seen in the following table:

| Census years. | Sex. | |
|---|---|---|
| | Male. | Female. |
| | *Per cent.* | *Per cent.* |
| 1890 | 51.21 | 48.79 |
| 1880 | 50.88 | 49.12 |
| 1870 | 50.56 | 49.44 |
| 1860 | 51.16 | 48.84 |
| 1850 | 51.04 | 48.96 |

As a rule, the proportion of males has increased, owing to the increased proportion of the foreign born, which consists largely of males. In 1890 the proportion of males was greater than ever before, due to the fact that the proportion of the foreign born was greater than ever before.

In the civilized nations of the world generally a different condition of things prevails, females being usually slightly in excess of males, as is shown in nearly every country of Europe. In the United Kingdom, Germany, Austria, Scandinavia, the Netherlands and Spain females are at present in excess.

The sexes are distributed over the country in widely varying proportions, as is shown on the map, plate 10, figure 2. The states colored red are those in which females are in excess of males. They are all located on the Atlantic border and include most of the states of that part of the country. In the Mississippi valley generally males are slightly in excess, while in the newer states and territories of the Rocky mountain region males are largely in excess, owing, of course, to the fact that these are new regions in which society has not yet reached settled conditions.

## Race.

The population of our country is composed, as regards race, of about 55,000,000 whites, 7,500,000 of Africans or mixed bloods, a few hundred thousand Indians, and 150,000 Chinese and Japanese.

The natives of China and Japan are comparatively trifling in number, and since the Chinese exclusion act went into effect immigration has ceased, and except upon the Pacific coast, where nearly all of them are found, they form too trifling an element to require consideration.

The Indians, most of whom are confined to the areas classed as unsettled (plate 7, figure 2), will be left to the ethnologists.

The Africans present us with the spectacle of an inferior race existing in juxtaposition with the whites and, since the early part of the century, unaided by additions to their numbers from abroad. For seventy years this race existed in a state of slavery; for the last thirty, more or less, in a state of freedom. It is interesting to observe the progress of this race and compare it with that of the whites. This is presented in the following tables, the first of which gives the total number of each race, while the next

FIG. 1

RATE OF INCREASE
WHITE AND COLORED

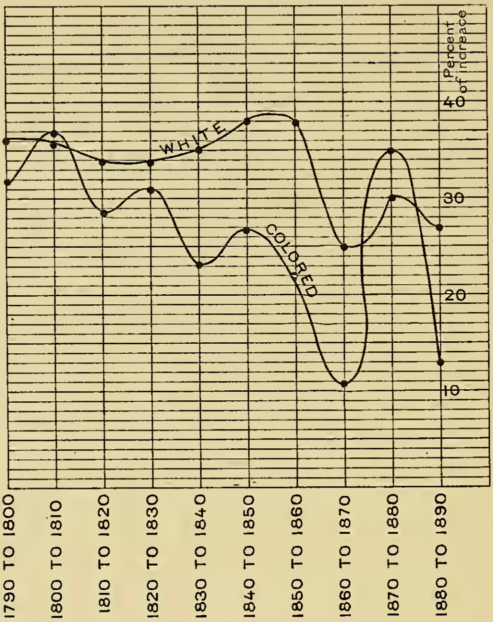
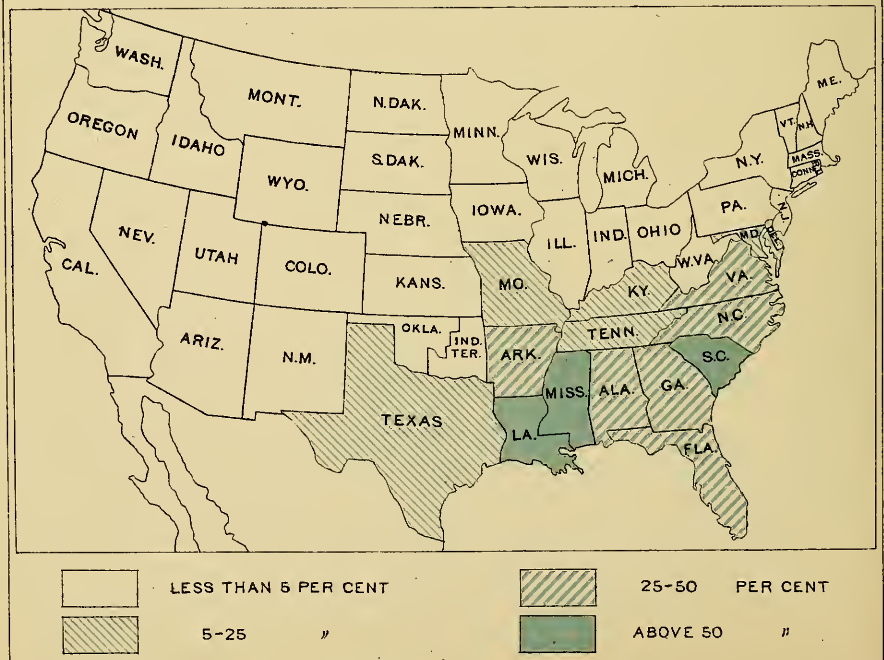



FIG. 2
PROPORTION OF COLORED TO TOTAL POPULATION




DISTRIBUTION BY COLOR

table shows the proportions of the two races, given in percentages of the total, at each census:

*White and colored Population by Decades.*

| Census years. | White. | Colored. |
|---|---|---|
| 1790 | 3,172,006 | 757,208 |
| 1800 | 4,306,446 | 1,002,037 |
| 1810 | 5,862,073 | 1,377,808 |
| 1820 | 7,862,166 | 1,771,656 |
| 1830 | 10,537,378 | 2,328,642 |
| 1840 | 14,195,805 | 2,873,648 |
| 1850 | 19,553,068 | 3,638,808 |
| 1860 | 26,922,537 | 4,441,830 |
| 1870 | 33,589,377 | 4,880,009 |
| 1880 | 43,402,970 | 6,580,793 |
| 1890 | 54,983,968 | 7,638,282 |

*Ratios of white and colored Population by Decades.*

| Census years. | White. | Colored. |
|---|---|---|
| 1790 | 80.73 | 19.27 |
| 1800 | 81.13 | 18.87 |
| 1810 | 80.97 | 19.03 |
| 1820 | 81.61 | 18.39 |
| 1830 | 81.90 | 18.10 |
| 1840 | 83.17 | 16.83 |
| 1850 | 84.31 | 15.69 |
| 1860 | 85.62 | 14.13 |
| 1870 | 87.11 | 12.65 |
| 1880 | 86.54 | 13.12 |
| 1890 | 87.80 | 12.20 |

In 1790 the first census showed that the colored race formed nearly one-fifth of the population. In 1840, after fifty years had elapsed, during which time the country had received practically no increase from immigration, the proportion of colored had fallen to about one-sixth of the whole. In the next half century, which closed in 1890, during which the white race has received great additions from immigration, that proportion had fallen to less than one-eighth of the whole population.

Summing it up, the colored race forms today less than two-thirds the proportion of the population which it formed a century ago.

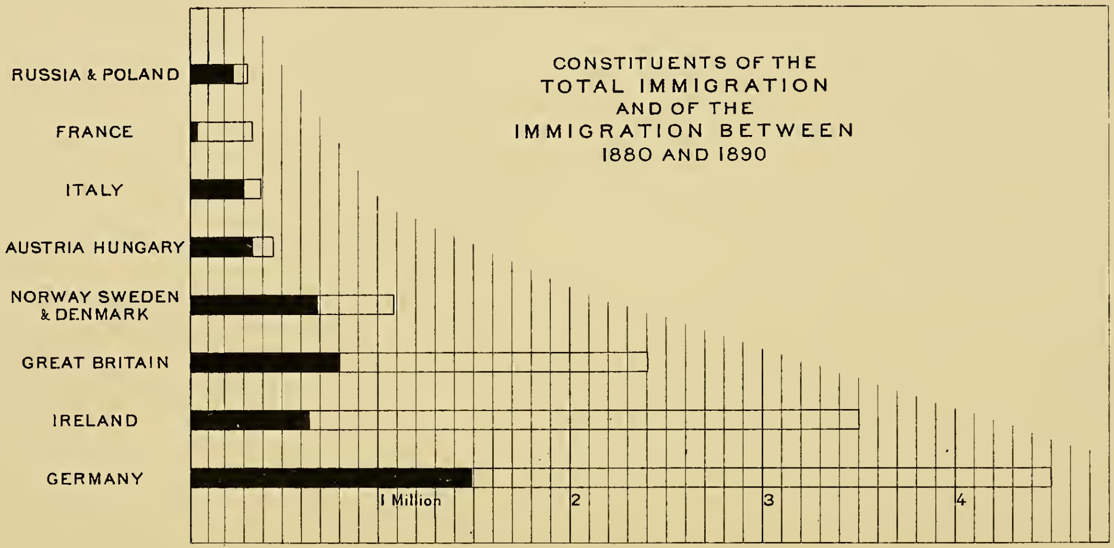
The following table and the diagram forming plate 11, figure 1, represent the rates of increase of the two races:

| Decades. | Percentage of increase. | |
|---|---|---|
| | White. | Colored. |
| 1790 to 1800 ........ | 35.76 | 32.38 |
| 1800 to 1810 ........ | 36.13 | 37.46 |
| 1810 to 1820 ........ | 34.12 | 28.57 |
| 1820 to 1830 ........ | 34.03 | 31.41 |
| 1830 to 1840 ........ | 34.72 | 23.28 |
| 1840 to 1850 ........ | 37.74 | 26.61 |
| 1850 to 1860 ........ | 37.69 | 22.06 |
| 1860 to 1870 ........ | 24.76 | 9.86 |
| 1870 to 1880 ........ | 29.91 | 34.85 |
| 1880 to 1890 ........ | 26.68 | 13.11 |

These rates of increase show that in only two decades of the century have the colored apparently increased more rapidly than the whites, the decades between 1800 and 1810 and between 1870 and 1880. The latter, however, is only an apparent excess, due to wholesale omissions in the enumeration of the colored people in 1870. The colored race has almost continuously lost ground in proportion to the white race throughout our history. Although the birth rate of the race is decidedly larger than that of the whites, its death rate, as is evidenced by the mortality records of large southern cities, is still greater, being not much less, on an average, than double the death rate of the whites.

Since the time of the first records the colored race has been practically confined to the southern states, as is shown by the map showing the distribution in 1890, where it has practically monopolized labor. There has never been any northward movement of this people of magnitude sufficient to be perceptible in census returns. Indeed, the only important movement among them is southward from the border states into those of the southern Atlantic and Gulf, from the tobacco states into the cotton states.

Plate 11, figure 2, shows the present distribution of the race. In the northern states the proportion is less than 5 per cent of the population, in the border states it is less than 25 per cent, while in the states along the Atlantic and Gulf from Virginia to Louisiana it exceeds 25 per cent, and in three states, South Carolina, Mississippi and Louisiana, more than half the popu-

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lation are colored. The highest proportion is found in the first of these states, namely, South Carolina, where three-fifths of the people are colored and but two-fifths white.

The question has been asked, "Has the condition of slavery or of freedom proved the more favorable to the numerical increase of the colored people?" The figures of the census give us a ready answer. The increase has been more rapid under conditions of freedom. In the thirty years preceding 1860 the colored increased 48 per cent, while in the following thirty years, during only twenty-seven of which they were free, and which included the disturbed period of the civil war and of reconstruction, they increased not less than 68 per cent.

### Nativity and Immigration.

It has often been stated that the strongest and most virile nations are the composite ones, those made up from a mixture of blood. If this be true, we are in a fair way to distance in this regard all other nations which ever existed. The blood of immigrants from all the nations of Europe, from the Mediterranean to the Arctic, to say nothing of the negroes, Chinese and Indians within our borders, threatens to make of us the most thoroughly composite nation the world has ever known.

During the first half of the century just passed we received practically no immigration; our numerical gain was produced almost entirely by natural increase. Indeed, immigration was not of importance until 1847 or 1848, when the famines in Ireland and the political troubles in Germany, occurring almost simultaneously, started immigration in this direction; but since that time there has been a migration of peoples across the Atlantic to these shores the equal of which the world has never seen. Within a generation and a half, 15,427,657 people have crossed the Atlantic and found homes in this country. The table shows the number of immigrants in each ten-year period since 1820:

*Immigrants by Decades.*

| | |
|---|---|
| 1821–'30 | 143,439 |
| 1831–'40 | 599,125 |
| 1841–'50 | 1,713,251 |
| 1851–'60 | 2,598,214 |
| 1861–'70 | 2,314,824 |
| 1871–'80 | 2,812,191 |
| 1881–'90 | 5,246,613 |

In the first of these periods the number was trifling; between 1830 and 1840 it rose to nearly 600,000; in the next decade it nearly tripled, and between 1850 and 1860 reached 2,580,000. Between 1860 and 1870 the number diminished, owing to our internal troubles; but in the next decade it rose again higher than ever before, approaching three millions, and in 1880 to 1890 it reached the enormous number of 5,250,000, more than one-third of the whole immigration, almost double the number which came in the preceding decade, and more than double the number which arrived in any other decade. The following table shows the principal constituents of the immigration during each decade, from which it appears that the Irish, British and Germans have constituted the bulk of the immigration. Indeed, down to 1860 other elements were trifling in amount. Between 1860 and 1870 Scandinavians and Canadians commenced to appear and have increased with great rapidity. Other elements, and much less desirable ones, such as Hungarians, Bohemians, Italians and Poles, appear first in considerable number so recently as between 1870 and 1880, and, indeed, it is only within the last decade that any considerable numbers of them have come over. The danger to be apprehended from them is not from the numbers which have already arrived, for they are inconsiderable, but from the fact that the immigration is increasing at a tremendous rate, so that if continued for a quarter of a century they will become of considerable numerical importance.

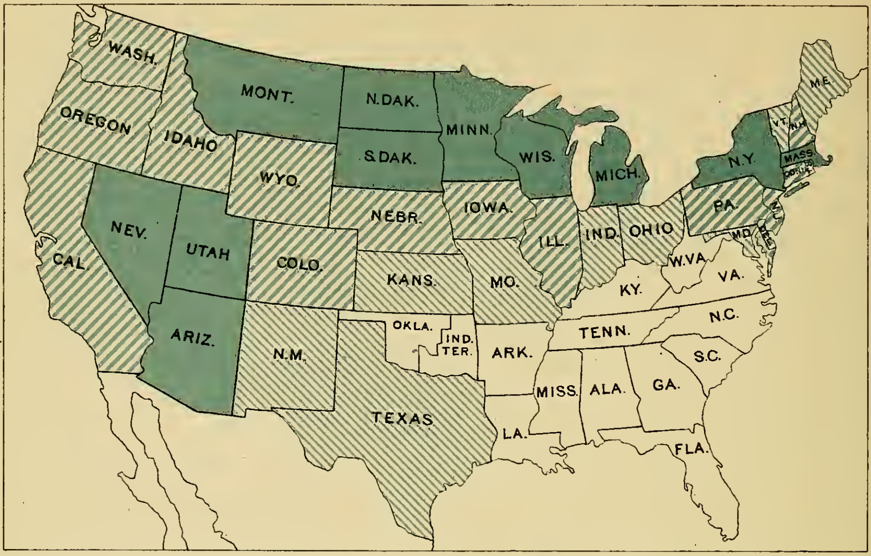
*Principal Constituents of the Immigration.*

| Nationality. | 1821 to 1830. | 1831 to 1840. | 1841 to 1850. | 1851 to 1860. | 1861 to 1870. | 1871 to 1880. | 1881 to 1890. |
|---|---|---|---|---|---|---|---|
| Canada | 2,277 | 13,624 | 41,723 | 59,309 | 153,872 | 383,269 | 392,802* |
| Ireland | 50,724 | 207,381 | 780,719 | 914,119 | 435,778 | 436,871 | 655,482 |
| England and Wales | 14,225 | 7,796 | 33,353 | 253,444 | 226,570 | 444,337 | 657,280 |
| Scotland | 2,912 | 2,667 | 3,712 | 38,331 | 38,769 | 87,564 | 149,869 |
| Norway and Sweden | 91 | 1,201 | 13,903 | 20,931 | 109,298 | 211,245 | 568,362 |
| Denmark | 169 | 1,003 | 539 | 3,749 | 17,094 | 31,771 | 88,132 |
| Russia and Poland | 91 | 646 | 656 | 1,621 | 4,539 | 52,260 | 265,088 |
| Hungary | ........ | ........ | ........ | ........ | 7,800 | 72,969 | 353,719 |
| Italy | 408 | 2,253 | 1,870 | 9,231 | 11,725 | 55,759 | 307,309 |
| Germany | 6,761 | 152,454 | 434,626 | 951,667 | 787,468 | 718,182 | 1,452,970 |
| France | 8,497 | 45,575 | 77,262 | 76,358 | 35,986 | 72,206 | 50,464 |
| Netherlands | 1,078 | 1,412 | 8,251 | 10,789 | 9,102 | 16,541 | 53,701 |

* Five years only.

In recent years the character of the immigration has changed for the worse not only by this increase of these undesirable

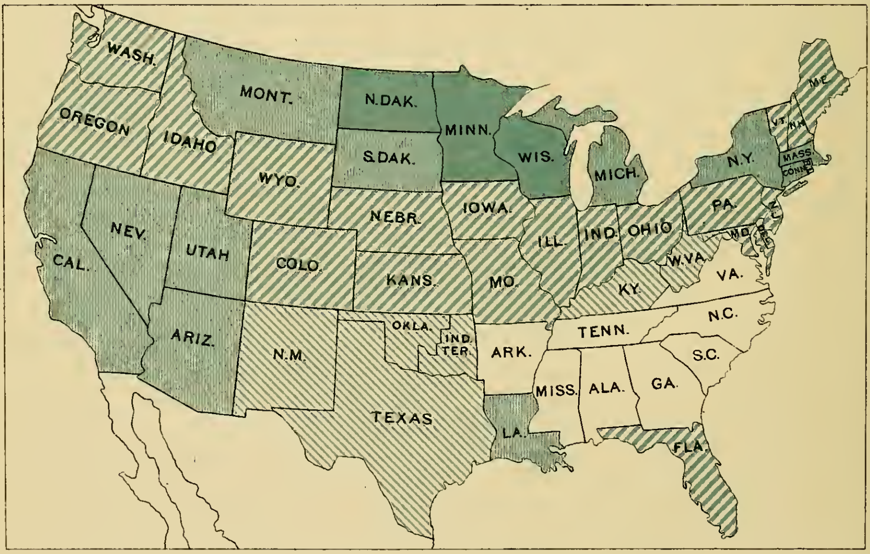
PROPORTION OF FOREIGN BORN TO TOTAL POPULATION




| | |
|---|---|
| LESS THAN 5 PER CENT | 15–25 PER CENT |
| 5–15 " | MORE THAN 25 " |

FIG. 2

PROPORTION WHICH NATIVE WHITES OF NATIVE PARENTAGE BEAR TO ALL WHITES




| | |
|---|---|
| MORE THAN 95 PER CENT | 50–80 PER CENT |
| 80–95 " | 30–50 " |
| LESS THAN 30 PER CENT | |

DISTRIBUTION BY NATIVITY

ENGRAVED BY EVANS & BARTLE WASH D.C.

nationalities, but in the fact that the character of the immigration from other countries is lower than heretofore in respect to wealth, education and morality. Altogether the changes which the character of the immigration has taken on in the past ten or fifteen years have tended to lower the standard of American citizenship and press upon us the question whether it is not wise to take steps for limiting immigration.

Of the entire body of immigrants who have joined us, 4,504,128 or 28 per cent are Germans; 5,911,454 have come from the United Kingdom, 3,481,074 of which are Irish. The United Kingdom and Germany together have supplied two-thirds of the entire immigration. Norway, Sweden and Denmark have furnished 1,067,548, while the contingent from other European countries has been comparatively small in amount. The constituents of the total immigration and of the immigration during the last decade are shown graphically in plate 12.

### The foreign born.

What effect has the flood of immigration had upon the constitution of our population? In 1840 all our people were of native birth, with the exception of 600,000 newly arrived immigrants. In 1850 those of foreign birth constituted between 9 and 10 per cent of our population. In 1860 this proportion had risen to 13 per cent, and in 1870 to nearly 14½ per cent. In 1880 it suffered a slight reduction, being about 13½ per cent, but in 1890 it had risen to 14¾ per cent, while the foreign born found in the country in that year numbered no fewer than 9,250,000. These facts are set forth in the following table:

*Increase of the foreign born.*

| Census years. | Native. | Native white. | Foreign. |
|---|---|---|---|
| 1850 | 20,912,612 | 17,273,804 | 2,244,602 |
| 1860 | 27,304,624 | 22,862,794 | 4,138,697 |
| 1870 | 32,991,142 | 28,111,133 | 5,567,229 |
| 1880 | 43,475,846 | 36,895,047 | 6,679,943 |
| 1890 | 53,373,703 | 45,863,008 | 9,248,547 |

The following table shows the proportion which the native and foreign born bore to the total population at each census since the distinction was first made, and the maps in plate 13 show where the foreign born are located.

*Ratio of Increase of the foreign born.*

| Census years. | Native. | Foreign. |
|---|---|---|
| 1850.............. | 90.30 | 9.68 |
| 1860.............. | 86.84 | 13.16 |
| 1870.............. | 85.56 | 14.44 |
| 1880.............. | 86.68 | 14.32 |
| 1890.............. | 85.23 | 14.77 |

The maps show their distribution over the country expressed in percentages of the total population, state by state. From this it is seen that the home of the foreign element is in the north and west. The foreign born have never invaded the south to compete in labor with the colored element. Indeed, in the northern and western states there are found no less than 96 per cent of the entire foreign-born element of the country.

Now, a glance at the constituents of the foreign element. They repeat in a broad way the composition of the immigration. Plate 14, figure 1, presents the constituents of the foreign-born population of 1890, showing that the Germans are in excess of all others, numbering 2,785,000, followed by the Irish, 1,871,000, the British, 1,251,000, the Canadians, 980,000, and the Scandinavians, 933,000. These five nationalities comprise nearly nine-tenths of the whole foreign element. The Italians and Russians each number less than 200,000; the Poles only 150,000, and the Hungarians and Bohemians but a trifle over 100,000 each.

How are these different nationalities distributed over the country? The series of maps forming plates 14 to 16 show this expressed in the form of a proportion between their numbers and the total population of the various states. From them it is seen that the Canadians are found mainly in northern New England, Michigan, Minnesota and North Dakota, closely hugging the northern border. The Irish are found mainly in New England and New York, comparatively few having wandered westward. The Germans are found from New York westward, and in the greatest body in Illinois, Michigan and Wisconsin. The Scandinavians have settled as far north as they could and yet remain within our jurisdiction, being found principally in Wisconsin,

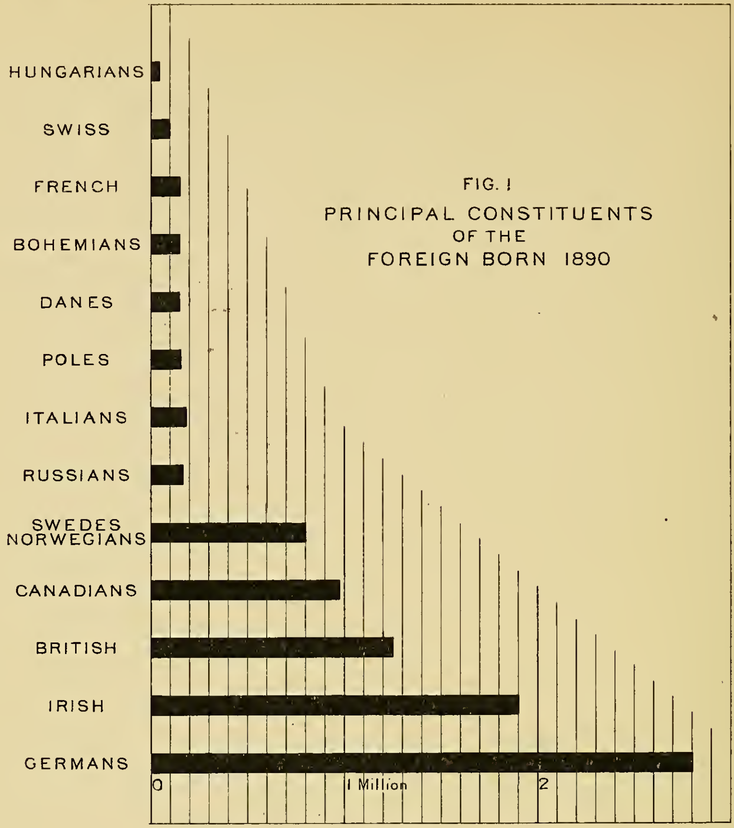
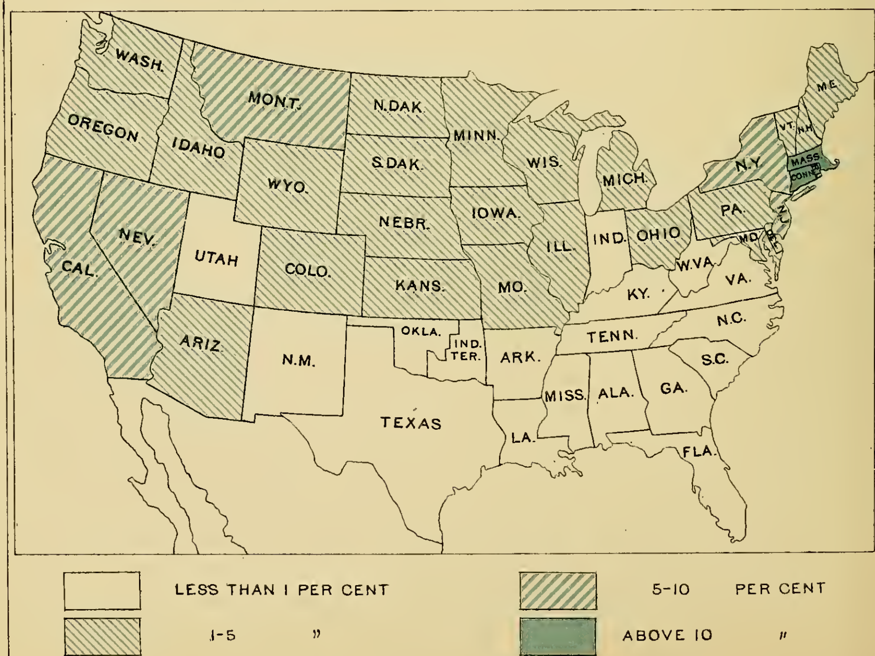



FIG. 1
PRINCIPAL CONSTITUENTS OF THE FOREIGN BORN 1890

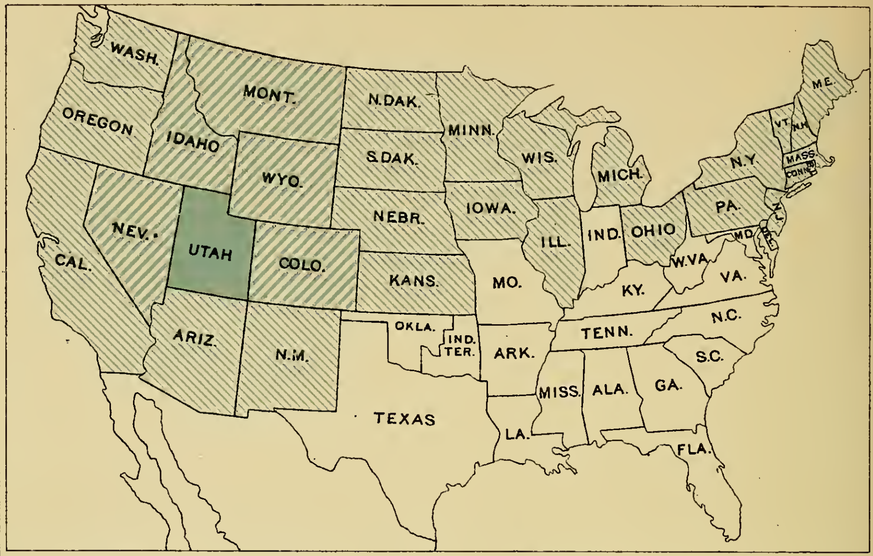
FIG 2
PROPORTION OF IRISH TO TOTAL POPULATION




DISTRIBUTION OF THE FOREIGN BORN

FIG. 1

PROPORTION OF BRITISH TO TOTAL POPULATION




LESS THAN 1 PER CENT

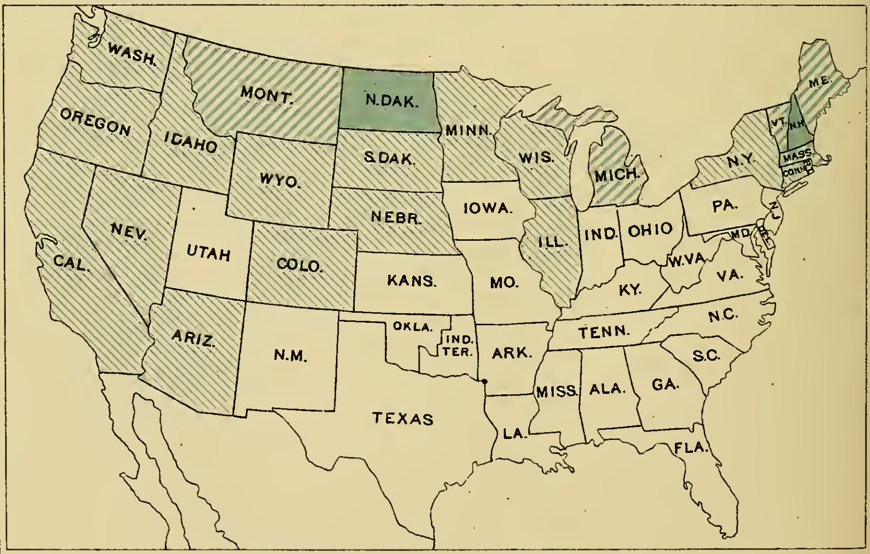
1-5 "

5-10 PER CENT

ABOVE 10 "

FIG. 2

PROPORTION OF CANADIANS TO TOTAL POPULATION




LESS THAN 1 PER CENT

1-5 "

5-10 PER CENT

ABOVE 10 "

DISTRIBUTION OF THE FOREIGN BORN

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Minnesota and the Dakotas, while the British are found scattered widely over the northern states.

These people are guided largely by temperature in the selection of their homes. Those from northern Europe and Canada settle in the far north. The Germans, coming from a more temperate climate, have settled mainly south of them, as have also the Irish.

What is the distribution of this foreign element as between urban and rural life? As a rule, the Irish prefer urban life; the great proportion of them settling in the cities. The same is also true in an almost equal degree with the British. The Germans are somewhat less disposed toward urban life, but still a large part of them, far beyond their due proportion, are found in our large cities. The same is the case with the French-Canadians, while the Norwegians and Swedes are much more disposed toward rural life, and the great body of them are found away from the centers of population. As a rule, however, the foreign population flocks to the cities in far greater proportion than the native element does. In 1890 the twenty-eight largest cities of the country contained a population of 9,700,000, or about 15 per cent of the population of the country. Now the foreign-born element of these cities comprises a little over 3,000,000, or almost exactly one-third of the total foreign born of the country. Putting it in another way, nearly one-third of the population of these cities is foreign born, while in the country at large only about one-sixth of it is foreign born. These cities contain, therefore, double their quota of the foreign-born element (plate 17).

As to occupations, it may be stated broadly that the foreign-born element is engaged in avocations lower in character than the native element, principally in those involving skilled and unskilled labor, while the proportion of them in the learned professions is much less, relative to their numbers, than among the native element. While in 1880 the foreign born constituted about one-seventh of the population, it was found that of lawyers, clergymen, physicians and teachers there were about 11 native born to one foreign born. On the other hand, among servants there was one foreign born to little more than three native born. Among unskilled laborers the foreign born were in the proportion of one to two native born, while in skilled labor, such as blacksmiths, shoemakers and carpenters, the proportion was also as one to two, and foreign-born miners exceeded in total number the native born.

This flood of immigration has produced other results in our population beyond the mere additions to our numbers and the admixture of blood. It has lowered the average intelligence and morality of the community. The illiterate of the northern states are mainly foreign born, the proportion of illiterates among them being four times as great as among the native born. Again, the criminals of foreign birth in the northern states are double their due proportion as compared with the native born.

Another result of importance has been produced. It is a well-known law of population that in a broad, general way as the population increases the rate of increase diminishes. It is an illustration of the Malthusian doctrine. Now, it matters not in the least how this density of population is brought about, whether it be by natural increase or by immigration, the result is the same; the rate of natural increase is reduced thereby.

I have made a comparison between the rates of increase of the native white elements of the northern and the southern states to ascertain approximately the effect of immigration upon our rate of increase, and the results are presented in plate 18. The southern states, including in that designation all of the states east of the plains and south of Mason and Dixon's line, the Ohio river and the southern boundary of Missouri and Kansas, have received practically no immigration. The states north of this line and east of the plains contain 86 per cent of the foreign element, the remainder being mainly in the states and territories of the far west.

The rates of increase found among the whites of the southern states, which are not complicated by immigration, are represented by the dotted line of the diagram, and while they exhibit some oscillations they show a general but not a great diminution from the beginning of our history to the end. Between 1790 and 1840 the white population of these states increased 239 per cent. In other words, the population of 1840 was 3.39 times that of 1790. In the succeeding fifty years the population of these states increased 204 per cent—that is, the population of these states in 1890 was 3.04 times as great as in 1840, the rate having thus diminished by only 35 per cent. On the other hand, how is it with the northern states? In the first fifty years, during which there was practically no immigration, the rate of increase in each decade was considerably greater than in the southern states, and altogether during this half century the white pop-

FIG. 1

PROPORTION OF GERMANS TO TOTAL POPULATION

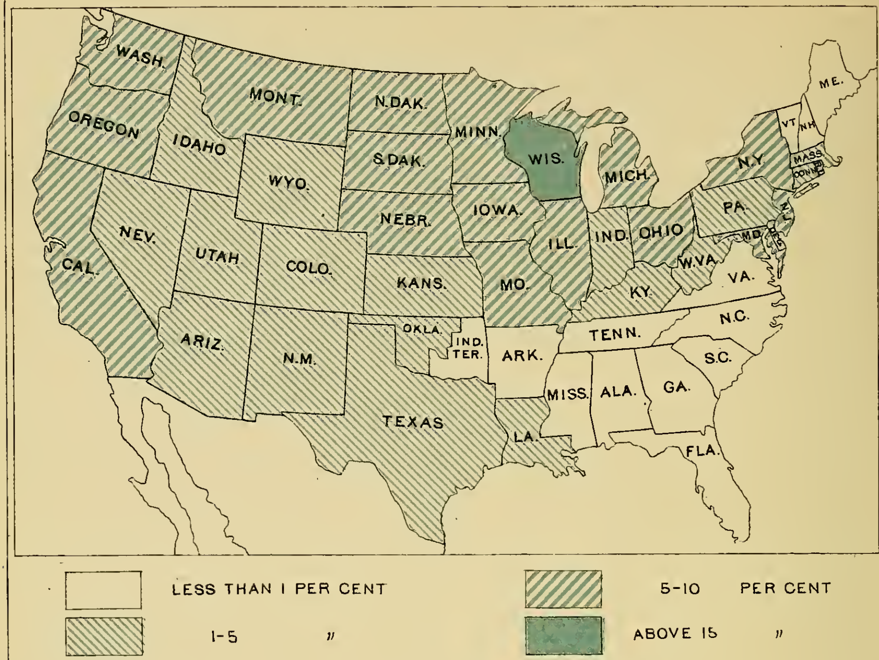
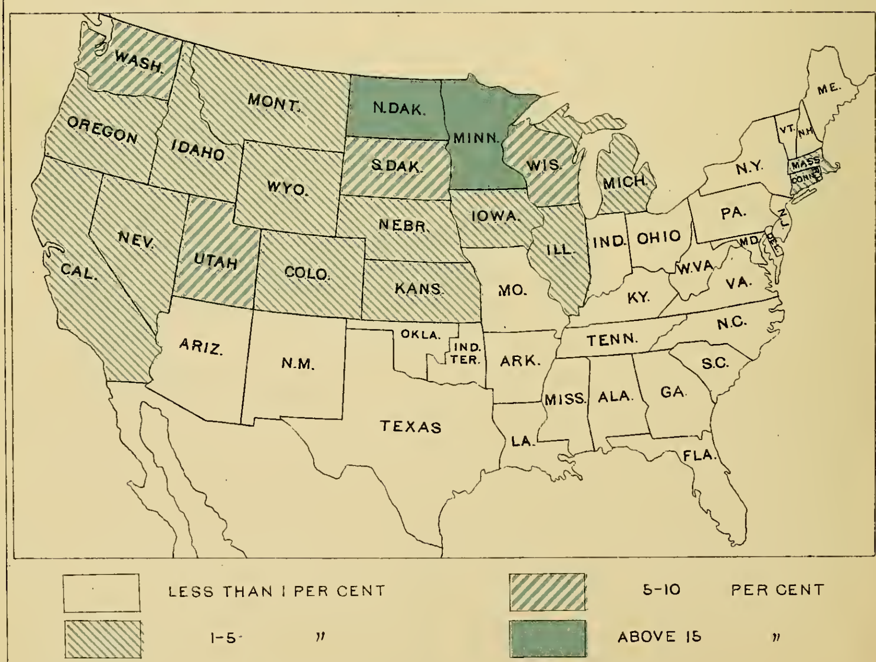
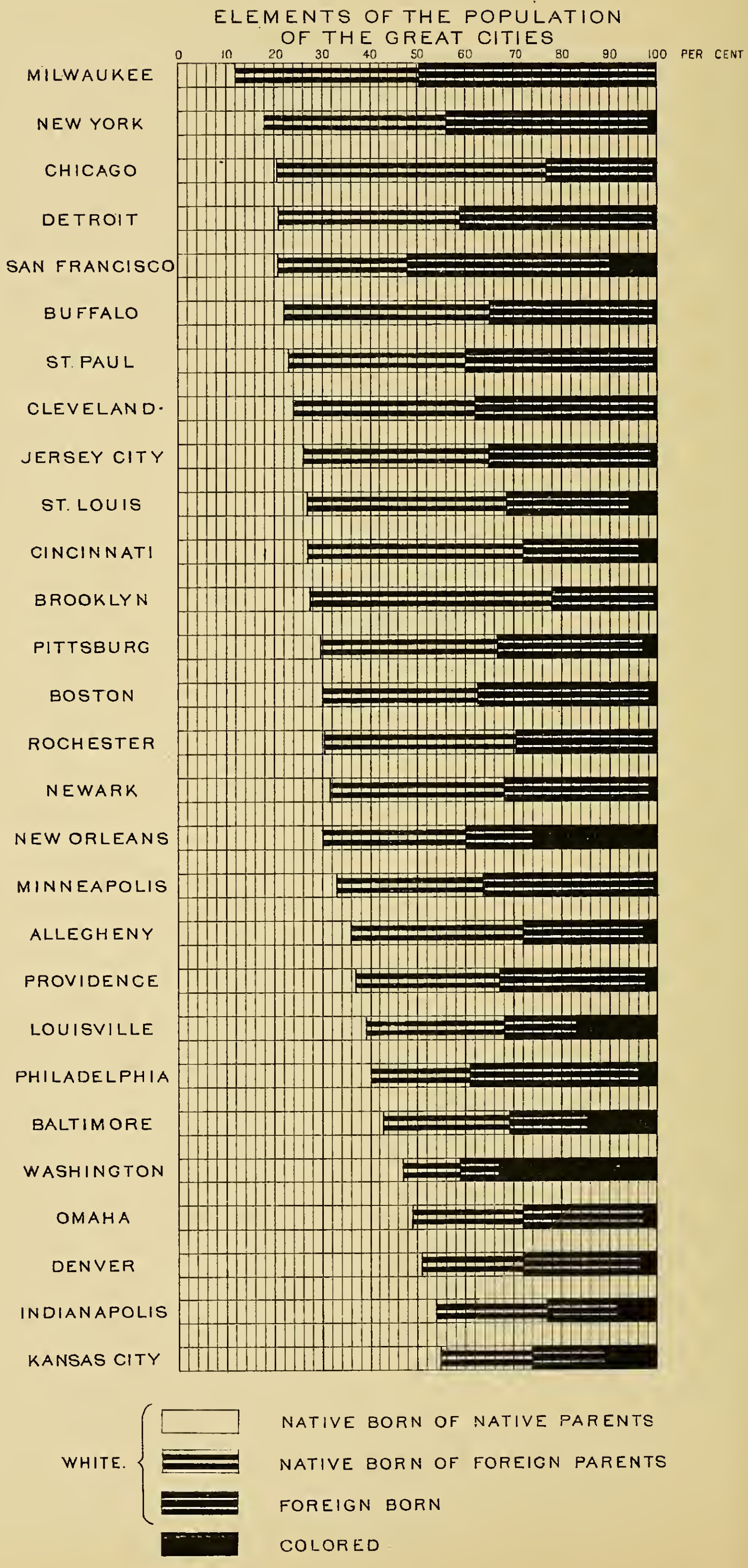



FIG. 2

PROPORTION OF SCANDINAVIANS TO TOTAL POPULATION




DISTRIBUTION OF THE FOREIGN BORN

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ulation of these northern states increased 389 per cent—that is, in 1840 the population was 4.89 times as great as in 1790. Between 1840 and 1890, after separating from the white population of these states the immigrants and their natural increase, and thus leaving only the native element, the rate of increase of the latter is seen to diminish remarkably. Instead of ranging from 34 up to 41 per cent, as it did in the first half-century, the rates of increase by decades become 23, 20, 15, 16 and 10, while the rate of increase for this entire half-century was but 112 per cent, the native population in 1890 being but 2.12 times as great as that of 1840. This sudden and astonishingly rapid reduction of the rate in the north, following closely the appearance of the flood of immigration, can be attributed to no other cause.

The rate of increase of the north is shown by the full line, the broken line, which commences at 1840 and runs up to 1890, being the rate of increase of the native element alone, while the full line, continuing on to 1890, represents the rate of increase of the entire population of the north, including the foreign element. It is an interesting coincidence that this rate of increase during the last decade was almost exactly the same as that of the south. I firmly believe, therefore, that the rate of our natural increase has been greatly reduced by the flood of immigration. By allowing the poor and oppressed of Europe homes in this country we have substituted them for our own flesh and blood. I believe that if there had been no immigration the rate of natural increase which prevailed before immigration commenced would have been much more nearly maintained, and our numbers would be nearly as great as at present. The sudden and rapid reduction of the rate of natural increase of the north during the past forty years I believe to be due to this flood of immigration, and it is a question whether we have gained by this substitution of a mixture of European for American blood.

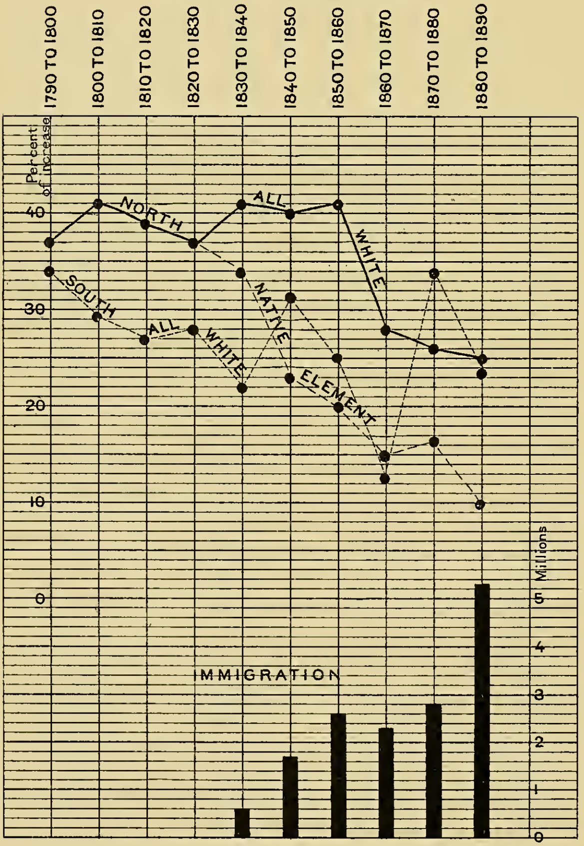
There is another result produced by immigration which is not so apparent, but which, it seems to me, is of great and far-reaching importance in connection with this question. As has been stated, the immigration consists, as a rule, of the lower classes, mainly of skilled and unskilled labor, and these millions of mechanics and laborers have filled and practically monopolized the lower classes of avocations in the north. In this way they have forced the native American element into the higher walks of life. The head-work of the country is practically in the hands of Americans almost as fully as half a century ago. Our industrial enterprises of all sorts are under the management of Americans and the hewing of wood and the drawing of water have been assumed by the immigrant. The fact that the native is still the ruling element probably accounts for the fact that the foreign element, in spite of its great numerical importance, has thus far exerted but a trifling influence upon our political, industrial and social life.

### The Element of foreign Extraction.

The effects of immigration on our population are not confined by any means to the foreign born. Although to some extent Americanized, the children of the Irish, Germans and Scandinavians retain many of their parents' characteristics; measurably they are Irish, Germans and Scandinavians still. It is interesting, therefore, to note to what extent our population is composed, not only of the foreign born but of the children of the foreign born, and this information was obtained both in 1870 and 1890. Moreover, in 1870 practically all the foreign blood in the country must have been accounted for by the enumeration of the foreign born and their children, since immigration had commenced on a large scale only twenty-two years earlier, and it is not possible that there was any considerable number of children of the second generation in the country. The element of foreign extraction in the United States in 1870 numbered by this enumeration 10,892,000, and comprised about one-third of the entire white population of the country. In 1890 those born of foreign parents, including the foreign born, numbered 20,626,000, and constituted 37 per cent of the entire white population of the country. To this large number are yet to be added probably four or five millions in the second generation to complete the tale of foreign blood.

The distribution of the foreign born and their children is illustrated in plate 17, the highest proportion being in New England and the northwestern states. Indeed, in the northern states east of the plains 45 per cent, or nearly one-half of the inhabitants, are foreign born or the children of foreigners. In Massachusetts there are 56 per cent; in Rhode Island, 58; in Connecticut, 50; in New York, 56, and in New Jersey, 48 per cent; but the heaviest proportion is found in the northwestern states. In Wisconsin and Minnesota three-fourths of the people are foreign

RATES OF INCREASE OF ALL WHITES
AND OF THE
NATIVE ELEMENT OF THE NORTH
AND OF ALL
WHITES OF THE SOUTH

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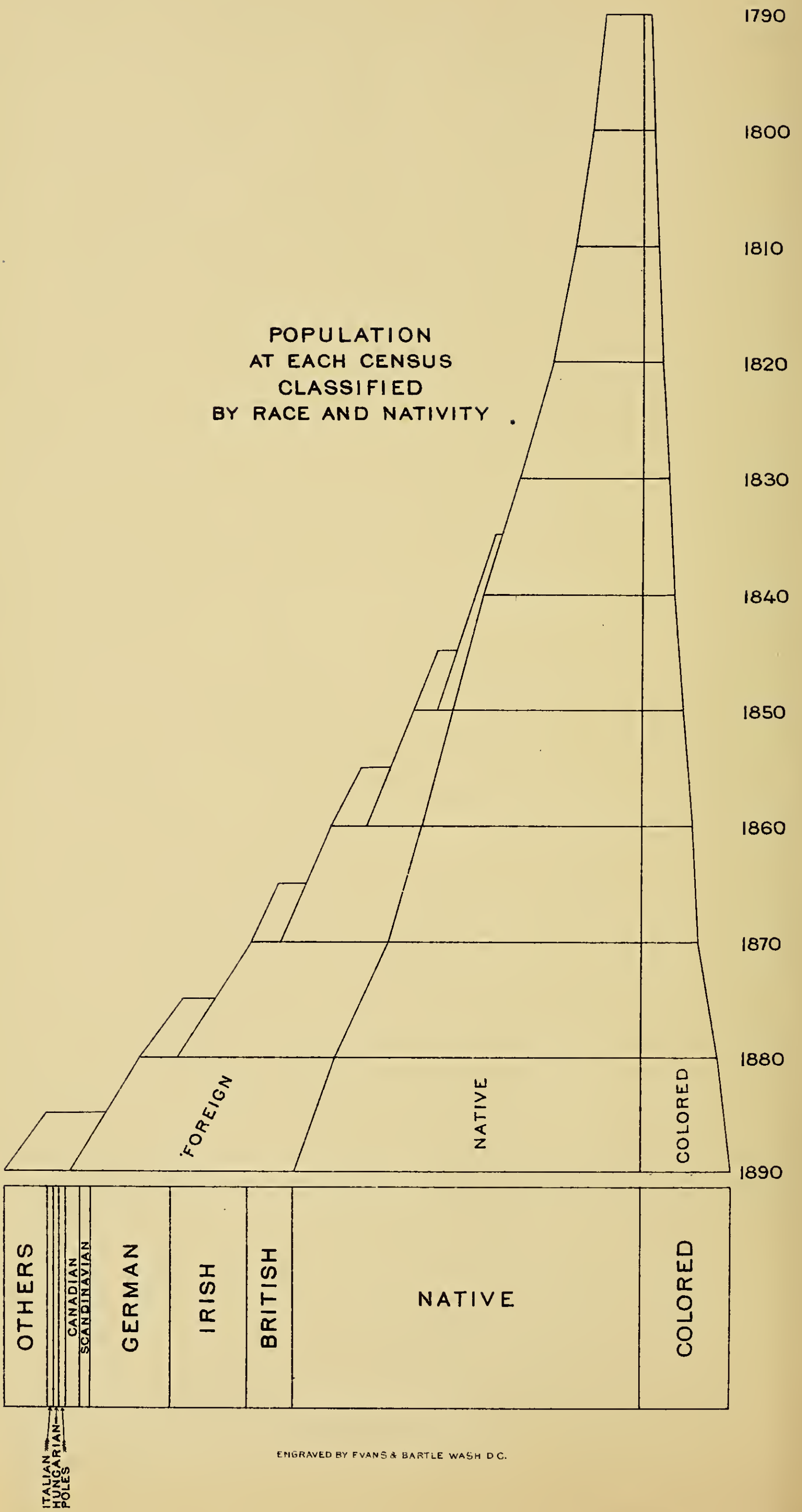


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born or children of foreign born, and in the new state of North Dakota four-fifths of the people are of immediate foreign extraction, while only one-fifth of the inhabitants are of American stock.

In our great cities the situation is even more startling. Thus, in Boston the native element constitutes but 30 per cent; in Brooklyn, 28, and in Buffalo, 22; while New York, with only 18 per cent, is practically a foreign city, so far as its population is concerned. Chicago contains a native element of but 20 per cent and Detroit of 21, while among these great cities Milwaukee stands at the head, or foot, as you please, with a native element of but 13 per cent. These are presented graphically in the accompanying plate 17.

The most extreme case which has fallen under my notice, however, is that of the little city of Ishpeming, in the heart of the iron region of Michigan, a city of some 11,000 people, of which only 6 per cent are native born of native parents, the remainder, 94 per cent, being foreign born or the children of the foreign born.

## Summary.

I have attempted to sum up in a diagram (plate 19) a part of the substance of this paper. This is an attempt to show the growth of each element of the population for a century, with its status at the end of the century.

The breadth of the diagram opposite the years is proportional to the population at that date, and the breadth of the various subdivisions is proportional to the numbers of the three elements, colored, native and foreign. The immigration of each decade is indicated by the additions between the dates. The separation between the elements of native and foreign blood is, of course, only an approximation. A tentative separation was made under the assumption that the rate of natural increase of the foreign element was equal to that of the native element. Under this assumption the separation was carried forward to 1870, where, as explained above, a definite separation was made by the census enumeration. This gave a correction which showed that the natural increase of the foreign element had been more rapid than that of the native element. Accordingly the earlier results were corrected and the rates of increase of the foreign and of the native elements thus deduced were projected forward to 1890. The diagram at the bottom shows the present status of the population as regards colored, native and foreign blood, classifying the last by the leading nationalities.

From this it appears that the present composition of the population is somewhat as follows:

| | |
|---|---|
| Colored | 7,500,000 |
| White of native extraction | 30,000,000 |
| White of foreign extraction | 25,000,000 |

The principal elements of the latter are:

| | |
|---|---|
| British | 4,000,000 |
| Irish | 6,500,000 |
| German | 6,800,000 |
| Swedes and Norwegians | 1,000,000 |
| Hungarians | 500,000 |
| Italians | 500,000 |
| Canadians | 1,600,000 |

The remainder of the 25,000,000 are distributed among various nationalities in small numbers. The white element of native extraction is apparently in the minority today in this country, being exceeded in number by the sum of the foreign element and the colored. British blood is, however, still largely in the ascendant, for if we add to the white native element the 4,000,000 of British and 6,500,000 of Irish we get 40,500,000, about two-thirds of the entire population and three-fourths of the entire white population.

VOL. V, PP. 45-58, PL. 20 APRIL 29, 1893

THE

NATIONAL GEOGRAPHIC MAGAZINE

# RAINFALL TYPES

OF THE

# UNITED STATES

## ANNUAL REPORT BY VICE-PRESIDENT

GENERAL A. W. GREELY

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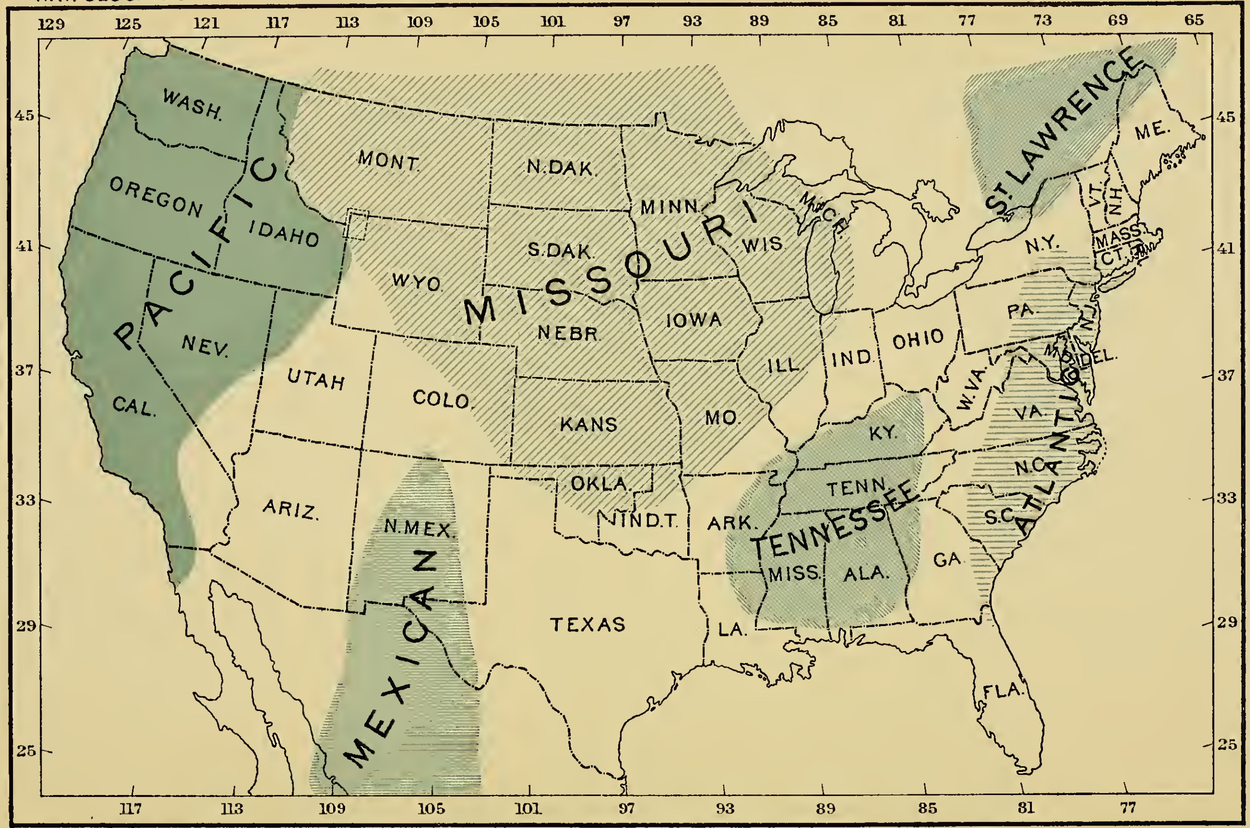


SIMPLE TYPES OF RAIN FALL DISTRIBUTION

Vol. V, pp. 45-58, pl. 20 April 29, 1893

THE

NATIONAL GEOGRAPHIC MAGAZINE

# RAINFALL TYPES OF THE UNITED STATES

Annual Report by Vice-President

GENERAL A. W. GREELY

*(Presented before the Society January 6, 1893)*

In carrying out the announced policy of the National Geographic Society with regard to annual contributions from its vice-presidents in their respective domains of geographic science, it has seemed advisable for the vice-president of the "Geography of the Air" to place before the Society this year a special paper.

The subject selected is the typical distribution of rainfall in the United States and contiguous territory, and an attempt has been made to treat the subject in such a manner that it may be a permanent contribution to the physical geography of the United States. It goes without saying that a paper covering twenty minutes' reading cannot go much into detail, but it is hoped that the treatment, while general, is yet such as to give definite and clear ideas on the subject treated.

This paper does not consider the distribution of rain from the standpoint of the mean annual precipitation, does not dwell on the variability or unequal amounts in consecutive years, omits to discuss the distribution from the standpoint of varying elevations, and is silent on the question of distribution with reference to frequency or absence of excessive rains of periodic or accidental occurrence. It confines itself to a question of great and sometimes vital importance, to the characteristic distribution of precipitation throughout the year, and, as is believed, presents a successful analysis of the average fluctuations from month to month, so that for the first time a satisfactory presentation is possible of all the simple rainfall types and of most of the composite types which obtain over the broad expanse of the inhabited portions of North America.

The necessity of careful and scientific study of climatic conditions in connection with prospective enterprises, whether pertaining to agriculture, commerce, navigation, or to special industries, has become obvious the past few years through the spur of competition. Among such conditions, this of rainfall distribution throughout the year is one of the most important. With relation to agriculture, it is essential to know whether precipitation comes at such seasons as to be a benefit or a detriment to the proposed crop. In the initiation of irrigation enterprises not only are the questions of guarding against extensive and torrential rainfalls on one hand and of tiding over temporary droughts on the other of importance, but, further, whether the most copious precipitation occurs in such months as to afford water at seasonable periods, or the rain comes at such times that it must be stored for many months with consequent loss from seepage and evaporation. Similarly, this question of distribution of rain throughout the year affects most potently other business interests of importance.

That these questions are of current and practical value is evident to every thoughtful man, and that their earlier elucidation and the publication of results would have been an extended benefit cannot be questioned. Take agriculture, for instance, which in eastern Colorado is pursued under difficult conditions wherever irrigation is impracticable. Failure of crops very frequently resulted until observation showed that a scanty rainfall in June is the rule in that section, and that by planting at a certain season the injurious effects of the June drought could be mitigated.

Nor is the necessity of a definite and accurate determination of the typical forms of annual precipitation in the eastern part of the United States less obvious, since the latest text-book on meteorology in use in the United States, that of Loomis, contains the statement that "Throughout most of the United States east of the Rocky mountains the rain is pretty equally distributed through the different months of the year, but the rain of summer is *everywhere* somewhat greater than that of winter, including melted snow."

In reality the whole section of country, about 200,000 square miles in extent, dominated by the Tennessee type of rainfall experiences a larger precipitation in winter than in summer, the excess averaging in northern Alabama and southern Kentucky about 10 per cent, in western Georgia and in Tennessee over 20 per cent, and in southeastern Arkansas and northern Louisiana from 40 to 50 per cent (plate 20).

I have pointed out elsewhere the vital importance of a favorable distribution of rainfall to certain sections of the country, where this favoring type of precipitation has proved to be one of the great bases on which rests the national prosperity of this great republic. Allusion is made to the great grain-producing sections throughout the water-sheds of the upper Mississippi, the Missouri, the Red river of the North, comprising the Dakotas, Minnesota, Kansas, Nebraska, Iowa, Missouri, Wisconsin and Illinois. Over the greater part of this immense area the annual rainfall is very materially less than that of the regions to the eastward or southward, but, most fortunately for the country, about three-fifths of the rainfall for the entire year occurs opportunely through the period when it is most beneficial to crops, from April to July, inclusive. A less favorable type of rainfall, the Mexican or the Saint Lawrence, for example, would render growing of grain unprofitable throughout the whole of this favored region.

It remains to briefly indicate the few types of simple rainfall with the localities to which they refer, and to the composite types occurring through the overlapping and interference of simple types.

Composite types must prevail where two simple types are not separated by high mountain ranges, and thus gradually shade or merge into each other. One dividing line, the Rocky mountain range, separates by its crest, if not absolutely, yet quite sharply and definitely, the Missouri type in Montana and Wyoming from the Pacific type in Idaho and Washington.

The term *simple* has been applied to those rainfall types which can be graphically expressed by a curve with a single bend or inflection. The average monthly amounts pass from the single maximum to the single minimum through uninterruptedly diminishing quantities, and thence rise with unbroken increases to the maximum. The *composite* types are those in which the graphic expression would be shown by two inflections, from a primary maximum through the minimum to a secondary maximum and secondary minimum.

In general terms it may be said that each simple type of rainfall in the United States appertains to a single body of water for its resulting precipitation; thus the Pacific type comes directly from the Pacific ocean, the Mexican type from the gulf of California, the Tennessee type from the gulf of Mexico, and the Atlantic type from the Atlantic ocean. In the Missouri type, however, two sources are evident—primarily the gulf of Mexico, and secondarily, and to a much larger degree than has been usually advanced, Hudson bay and the chain of great American lakes.

In treating the fluctuations of rainfall throughout the year it is evident that the unequal lengths of the different months affect somewhat the accuracy of direct inter-comparisons of normal monthly rainfalls. There fell under my observation lately a curve showing such inter-comparisons which proved misleading, as it showed a decrease of rain from January to February and an increase from February to March, when in reality, as shown by the average amount daily for each month, the rainfall became more copious from January to February and from February to March.

In this discussion the rule has been followed of obtaining the normal daily rainfall by dividing the normal yearly rainfall by 365.25. In like manner the average daily rainfall of February has been found by using 28.25 as a divisor, and the longest months by using 31. In this paper, for the sake of brevity and in order to avoid repetition, it is to be explained that the term "normal daily rainfall" is applied to the mean determined from the annual precipitation, and that the terms "January rainfall, March rainfall," etc, unless otherwise explicitly stated, mean the average daily amount determined for the month in question by the methods above indicated.

The best defined type of rainfall within the limits of the United States is that which dominates the Pacific coast region; hence the specific name "Pacific" herein applied. In general terms it may be said to dominate British Columbia, Washington, Idaho, Oregon, California, Nevada and western Utah; in other words, the great interior basin and the entire Pacific water-shed from British Columbia to Lower California, excluding the section draining into the gulf of California. The characteristic features are very heavy precipitation during midwinter, and an almost total absence of rain during the late summer.

The infrequency of summer rain is marked in British Columbia, and thence southward it becomes steadily more pronounced, passing through the gradations of a single rainless month in northern California, then two and three to its culmination of four rainless months in a considerable part of southern California and western Nevada. There is a tendency in the upper half of the San Joaquin valley and thence southward into the western part of San Diego county for rain to cease about a month earlier and to remain absent a month later than over the rest of the Pacific coast region, the dry season being from June to September, inclusive, and being usually unbroken even by a passing shower.

Eastern Nevada appears to share freedom from rain during July, but the autumnal rains appear in September or earlier, under the influence in the southern part of that state of the Mexican type projecting northward. The marked tendency of the winter rains to continue into spring is evident in Washington, whence it shades with diminishing persistency to northern California and northwestern Nevada.

It may be remarked that in the Pacific coast regions the amounts of rain vary very greatly, according to the topography of the section and the distance from the ocean; so that the interior depressions, such as the Sacramento, San Joaquin and other valleys, particularly those parallel with the coast, have a scantier rainfall than either the coast itself or the Sierra Nevada and other mountain ranges to the eastward.

These variations in the total rainfall do not, however, affect the distribution throughout the year, which is typically Pacific throughout the whole region.

As might be expected where the rainfall is very small, a single month of excessive precipitation occasionally increases the rainfall so as to be misleading. For instance, it is apparent from inspection that the greatest normal precipitation is that of December at both San Diego, California, and Halleck, Nevada; yet excessive rainfalls of 9.05 inches in February, 1884, at the former place, and 4.00 inches in February, 1870, at the latter, throw the February daily precipitation slightly above that of December. Of the following examples of the Pacific type, five are drawn from the interior, viz, Spokane, Washington, records of 12 years; Delano, California, 15 years; Boisé City, Idaho, 22 years; Promontory, Utah, 21 years; Halleck, Nevada, 21 years; and three from coast stations, viz, Astoria, Oregon, 29 years; San Diego and San Francisco, California, each 41 years.

*Normal daily Rainfall and monthly Departures therefrom.*

*(Values are in fractions of an inch.)*

STATIONS.

| | Astoria, Oregon (normal daily rainfall for 29 years, .207). | San Francisco, Cal. (normal daily rainfall for 41 years, .066). | San Diego, Cal. (normal daily rainfall for 41 years, .027). | Delano, Cal. (normal daily rainfall for 15 years, .017). | Spokane, Wash'n (normal daily rainfall for 12 years, .055). | Boisé City, Idaho (normal daily rainfall for 22 years, .040). | Halleck, Nev. (normal daily rainfall for 21 years, .020). | Promontory, Utah (normal daily rainfall for 21 years, .021). |
|---|---|---|---|---|---|---|---|---|
| DEPARTURES. | | | | | | | | |
| January | .208 | .099 | .027 | .010 | .034 | .040 | .012 | .015 |
| February | .094 | .060 | .044 | .029 | .055 | .014 | .020 | .008 |
| March | .109 | .039 | .015 | .013 | — .010 | .019 | .002 | .004 |
| April | — .035 | — .002 | — .003 | .015 | — .015 | .016 | .001 | .005 |
| May | — .092 | — .064 | — .016 | .000 | — .013 | .005 | .010 | .000 |
| June | — .114 | — .066 | — .027 | — .017 | .009 | — .014 | — .008 | — .008 |
| July | — .169 | — .066 | — .027 | — .017 | — .032 | — .033 | — .018 | — .014 |
| August | — .166 | — .066 | — .027 | — .017 | — .042 | — .034 | — .016 | — .009 |
| September | — .099 | — .061 | — .027 | — .017 | — .020 | — .028 | — .016 | — .002 |
| October | — .050 | — .034 | — .016 | — .007 | .006 | — .013 | — .001 | — .002 |
| November | .131 | — .030 | — .008 | .009 | — .006 | .003 | — .001 | — .003 |
| December | .187 | .106 | — .042 | .011 | .033 | .028 | .013 | .009 |

Another simple type of rainfall is that which in a previous paper I designated as the "Trans-Pecos," from the fact that it dominates extreme western Texas beyond the Pecos river. On further investigation it proved to prevail in the province of

Chihuahua, and now later data shows the great probability that it dominates far the greater part of Mexico; hence it is now called the "Mexican" type.

The characteristics of the Mexican type are very heavy precipitation after the summer solstice and a very dry period after the vernal equinox. August is the month of greatest rainfall and, with July and September, furnishes over 75 per cent of the year's precipitation at Mazatlan, about 87 per cent at Topolobampo, 58 per cent at El Paso, Texas, fort Davis, Texas, and fort Union, New Mexico. On the other hand, the months of February, March and April are marked by an almost entire absence of precipitation, aggregating for this period only 1 to 2 per cent of the year's rain on the western coast of Mexico, and about 8 per cent at Chihuahua, Mexico, the city of Mexico, El Paso, Texas, fort Davis, Texas, and fort Union, New Mexico (34 years).

This type dominates New Mexico, save the small drainage basins of the Gila and San Juan, the trans-Pecos region of Texas, and probably all of Mexico, except the eastern coast and possibly the southern part of that country. The proof of its prevalence in Mexico rests on about ten years' observations at the city of Mexico, ten at Pueblo (where, however, the type is composite and the maximum falls in July, conforming to the rainfall regime of Vera Cruz as given by Loomis), six years at Mazatlan, seven at Leon de Aldemas, five at Chihuahua and four at Topolobampo.

While the Mexican type of rainfall does not absolutely obtain in Arizona, yet, taken as a whole, its influence is more potent than that of the Pacific type. The Arizona rainfall is of a composite type, the result of interference between the Pacific and Mexican. The primary maximum, closely following the Mexican type, occurs from July to August, while most generally the second maximum falls with the Pacific type in December. Interference of the types, however, brings about the principal minimum in October and the secondary minimum in May or June.

The following shows the departures from the daily normal rainfall of .028 inch at fort McDowell, deduced from the longest record (24 years) in Arizona: January, .006 inch; February, .015; March, —.004; April, —.010; May, —.024; June, —.024; July, —.012; August, .019; September, .003; October, —.014;

November, —.001, and December, .028. Similarly Colorado and a portion of Texas to the eastward of the Pecos water-shed experience a composite type of rainfall arising from interference of the Mexican type from the westward and the Missouri type from the eastward.

Colorado has its principal rainfall maximum in July or August and its principal minimum in January, while the secondary maximum occurs in April or May and a secondary minimum in June. It is hardly necessary to state that certain localities, according to their contiguity either to the simple Mexican or the simple Missouri type in their rainfall, reverse in order of importance the primary and secondary maxima and minima here mentioned.

Utah has a great diversity of rainfall fluctuations, resulting from its being so situated that it is more or less influenced from different quarters by the Pacific, Mexican, and even the Missouri type, the first named being most potent, especially in the western and extreme northern part of the territory.

The "Missouri" type of rainfall is the most important in the United States, both from the vast area over which it obtains and also from its extremely favorable bearing on agriculture. This type dominates the water-sheds of the Arkansas, Missouri, and upper Mississippi rivers and of lakes Ontario and Michigan, as well as over Oklahoma and the greater part of northern Texas, thus covering Montana, the Dakotas, Minnesota, Nebraska, Kansas, Iowa, Missouri, Oklahoma, Wisconsin and Illinois, together with parts of Arkansas, Texas, Michigan, Indiana and Indian territory.

The Missouri type indicates a very light winter precipitation, followed in late spring and early summer by the major quantity of the yearly rain. The area of country covered by this type is so large that certain slight modifications could be anticipated. For instance, while the June rainfall is as a rule the most abundant, yet along the eastern slope of the Rocky mountains the May rainfall is somewhat greater than that of the following month. Again, while January is usually the month of least precipitation, yet in some localities the minimum has a tendency to occur in December and in others to delay itself until February.

As examples of the Missouri type, there are here presented rainfall data from Riley, Illinois, record of 39 years; Muscatine, Iowa, 45; Bismarck, North Dakota, 18; Fort Randall, South Dakota, 32; Fort Ripley, Minnesota, 27; Fort Riley, Kansas, 36; Miami, Missouri, 43; Fort Shaw, Montana, 19; Omaha, Nebraska, 24, and Madison, Wisconsin, 24 years:

*Normal daily Rainfall and Departures therefrom.*

(*Values are in fractions of an inch.*)

STATIONS.

| | Fort Shaw, Mont. (normal daily rainfall for 19 years, .028). | Bismarck, N. Dak. (normal daily rainfall for 18 years, .052). | Fort Randall, S. Dak. (normal daily rainfall for 32 years, .056). | Fort Ripley, Minn. (normal daily rainfall for 27 years, .074). | Madison, Wis. (normal daily rainfall for 24 years, .097). | Omaha, Neb. (normal daily rainfall for 24 years, .091). | Fort Riley, Kans. (normal daily rainfall for 36 years, .069). | Muscatine, Iowa (normal daily rainfall for 45 years, .107). | Miami, Mo. (normal daily rainfall for 43 years, .096). | Riley, Ill. (normal daily rainfall for 39 years, .108). |
|---|---|---|---|---|---|---|---|---|---|---|
| | DEPARTURES. | | | | | | | | | |
| Jan..... | —.016 | —.037 | —.043 | —.047 | —.036 | —.069 | —.049 | —.045 | —.044 | —.023 |
| Feb.... | —.014 | —.029 | —.036 | —.041 | —.036 | —.065 | —.038 | —.033 | —.035 | —.034 |
| Mar.... | —.013 | —.018 | —.023 | —.024 | —.011 | —.044 | —.041 | —.020 | —.021 | —.023 |
| April... | —.005 | .022 | .002 | —.020 | .049 | .013 | —.004 | .005 | .001 | —.011 |
| May ... | .037 | .032 | .058 | .023 | .019 | .054 | .036 | .035 | .034 | .014 |
| June... | .037 | .068 | .053 | .071 | .043 | .097 | .060 | .052 | .074 | .030 |
| July ... | .007 | .026 | .031 | .057 | .042 | .075 | .053 | .020 | .037 | .016 |
| Aug.... | .002 | .019 | .027 | .032 | .009 | .019 | .045 | .035 | .021 | .022 |
| Sept.... | .000 | —.013 | .011 | .036 | .013 | .021 | .029 | .020 | .020 | .015 |
| Oct..... | —.011 | —.014 | —.014 | —.022 | —.005 | —.002 | —.014 | —.009 | .002 | —.022 |
| Nov.... | —.013 | —.032 | —.040 | —.017 | —.030 | —.050 | —.026 | —.022 | —.027 | —.031 |
| Dec..... | —.011 | —.028 | —.029 | —.045 | —.033 | —.058 | —.045 | —.031 | —.033 | —.042 |

The general character of the Missouri type is, perhaps, satisfactorily illustrated by the rainfall of Nebraska, this state being central, as regarding this type. In Nebraska only about 6 per cent of the year's precipitation occurs from December to February, inclusive. In April, however, the percentage of the entire annual rainfall is 11, in May 17, in June 16 and July 16, making about 60 per cent for these four months. In other words, three-fifths of the yearly rainfall occurs most opportunely during the period when it is most beneficial to the growing crops. It is well known that the annual rainfall is small, yet eastern Nebraska receives during these four months, April to July, inclusive, a larger amount of rainfall than the interior portions of the eastern states from Maine to Virginia; and western Nebraska receives only a slightly lesser amount. While the rain precipitation of the year diminishes to the northward and westward of Nebraska, yet the same favorable type of distribution prevails.

The Missouri type changes by interference with the Mexican type in the southwest, the Tennessee type to the southeast, and the Saint Lawrence to the northeast.

The "Tennessee" type, although not covering a very extended region, is well marked, the highest rainfalls occurring the last of winter or the first of spring, while the minimum is in mid-autumn.

The Tennessee type obtains over Tennessee, Arkansas, Mississippi, eastern Kentucky, western Georgia and, except on the immediate gulf coast, in Alabama and Louisiana. In some localities (western Kentucky and Tennessee and adjacent parts of Arkansas) the rain of February slightly exceeds that of March, the usual month of maximum, while in northern Louisiana and adjacent regions, the tendency is toward slightly greater rainfalls in April than in March.

It is also to be noted that in some cases there is a tendency toward the minimum rainfall in August or September rather than October, in which month the minimum occurs for the greater portion of the area.

Montgomery, Alabama; Atlanta, Georgia; Chattanooga and Memphis, Tennessee, are examples of the Tennessee type of precipitation.

*Normal daily Rainfall and Departures therefrom.*

(*Values are in fractions of an inch.*)

STATIONS.

| | Atlanta, Ga. (normal daily rainfall for 26 years, .143). | Knoxville, Tenn. (normal daily rainfall for 20 years, .146). | Memphis, Tenn. (normal daily rainfall for 20 years, .148). | Montgomery, Ala. (normal daily rainfall for 20 years, .147). |
|---|---|---|---|---|
| DEPARTURES. | | | | |
| January | .022 | .040 | .041 | .014 |
| February | .042 | .043 | .052 | .049 |
| March | .044 | .037 | .037 | .049 |
| April | .007 | .023 | .037 | .031 |
| May | —.021 | —.023 | —.011 | —.010 |
| June | —.002 | —.003 | .019 | .014 |
| July | —.020 | —.007 | —.046 | —.010 |
| August | .002 | —.007 | —.025 | —.024 |
| September | —.010 | —.042 | —.035 | —.041 |
| October | —.060 | —.044 | —.047 | —.062 |
| November | —.013 | —.009 | .012 | —.026 |
| December | .015 | —.012 | .025 | .015 |

Except in New England the entire water-shed of the Atlantic coast experiences a type of rainfall distribution which extends to the drainage basin of the upper Ohio river. This type is called the "Atlantic," and is one wherein the distribution throughout the year is nearly uniform. The rainfall of Philadelphia, record of 73 years, shows that the minimum daily rainfall of October and January is 73 per cent of the maximum daily fall in August. The most copious precipitation occurs after the summer solstice, while the minimum rainfall is, as a rule, during the mid or late autumn, the increases until early spring being very small and irregular. Generally, it may be said that a well marked tendency obtains along the coast toward August as the month of maximum rainfall. With increasing distance from the Atlantic ocean, and probably owing to influence of the trans-Appalachian types, the time of greatest precipitation generally shifts to July, while the minimum rainfall, which occurs during November from Florida to western New York, gradually changes to October along the slope of the Appalachian range and the upper Ohio valley, as shown in both phases by the records of Augusta, Georgia, and Pittsburg, Pennsylvania.

The effect of interference of the Saint Lawrence type extending southward is evident at Troy, New York, in its minimum of February and March, and even as far as Philadelphia it exercises a very slight influence.

*Normal daily Rainfall and Departures therefrom.*

*(Values are in fractions of an inch.)*

STATIONS.

| | Charleston, S. C. (normal daily rainfall for 62 years, .133). | Fort Monroe, Va. (normal daily rainfall for 55 years, .117). | Philadelphia, Pa. (normal daily rainfall for 63 years, .117). | Newark, N. J. (normal daily rainfall for 44 years, .126). | Augusta, Ga. (normal daily rainfall for 22 years, .130). | Pittsburg, Pa. (normal daily rainfall for 22 years, .103). | Troy, N. Y. (normal daily rainfall for 60 years, .099). | New York city (normal daily rainfall for 53 years, .126). |
|---|---|---|---|---|---|---|---|---|
| DEPARTURES. | | | | | | | | |
| January | —.038 | —.018 | —.012 | —.008 | .014 | .000 | —.020 | —.010 |
| February | —.030 | —.011 | —.009 | .001 | .010 | —.001 | —.023 | —.002 |
| March | —.019 | —.002 | —.007 | —.004 | —.003 | —.010 | —.022 | —.006 |
| April | —.050 | —.013 | —.001 | —.008 | —.005 | —.012 | —.007 | —.008 |
| May | —.014 | .001 | .004 | .002 | —.019 | .006 | .003 | .007 |
| June | .020 | .006 | .015 | —.007 | .011 | .019 | .030 | .006 |
| July | .075 | .032 | .013 | .012 | .035 | .054 | .032 | .003 |
| August | .097 | .037 | .026 | .038 | .024 | .007 | .011 | .025 |
| September | .050 | -.005 | .000 | —.001 | .003 | —.015 | .004 | —.004 |
| October | —.026 | —.020 | —.012 | —.011 | —.044 | —.019 | .012 | —.011 |
| November | —.052 | —.018 | —.006 | —.005 | —.018 | —.016 | —.001 | .000 |
| December | —.031 | —.005 | —.006 | —003 | —.012 | —.014 | —.017 | —.003 |

In New England the Atlantic type is seriously modified and the character of the distribution, difficult to determine with exactness owing to the slight variations, is possibly affected by the interference of the Saint Lawrence type. In consequence, we find in New England a composite type in which the August maximum of the Atlantic type is generally primary, and a November maximum secondary, though in some localities these maxima are reversed in order of their importance. The Atlantic November minimum is replaced by a June primary minimum, while a secondary minimum falls in some localities in September and in others in April.

*Normal daily Rainfall and Departures therefrom.*

(*Values are in fractions of an inch.*)

STATIONS.

| | Waltham, Mass. (normal daily rainfall for 64 years, .115). | Amherst, Mass. (normal daily rainfall for 52 years, .122). | Lowell, Mass. (normal daily rainfall for 62 years, .125). | New Bedford, Mass. (normal daily rainfall for 75 years, .127). | Hanover, N. H. (normal daily rainfall for 50 years, .100). | Lunenburg, Vt. (normal daily rainfall for 40 years, .110). | Gardiner, Me. (normal daily rainfall for 50 years, .121). | Boston, Mass. (normal daily rainfall for 74 years, .129). |
|---|---|---|---|---|---|---|---|---|
| DEPARTURES. | | | | | | | | |
| January | — .016 | — .014 | — .017 | — .001 | — .006 | — .013 | — .009 | — .001 |
| February | — .019 | — .009 | — .013 | .008 | — .017 | — .008 | .007 | .005 |
| March | — .003 | — .011 | — .003 | .008 | — .024 | — .005 | .006 | .012 |
| April | .010 | — .016 | .005 | .005 | — .021 | — .021 | — .008 | .006 |
| May | .000 | .003 | .004 | .000 | .006 | .005 | .001 | — .007 |
| June | — .010 | .003 | — .003 | — .022 | .015 | .022 | — .014 | — .020 |
| July | .005 | .022 | .001 | — .019 | .012 | .018 | — .013 | — .009 |
| August | .031 | .021 | .028 | — .011 | .018 | .009 | .000 | .013 |
| September | — .004 | — .007 | — .007 | — .011 | .000 | .001 | — .012 | — .011 |
| October | .003 | .003 | .003 | .000 | .010 | .004 | .023 | — .005 |
| November | .021 | .006 | .016 | .017 | .027 | — .003 | .022 | .015 |
| December | — .018 | — .006 | — .010 | .006 | — .019 | — .015 | .001 | — .001 |

The distribution of rain through the Saint Lawrence valley, although of composite type, probably merits from its peculiarity to be designated separately as the "Saint Lawrence" type. The characteristics are scarcity of precipitation during the spring months, April being very decidedly the month of least rainfall followed by October, and a heavy rainfall during the late summer and late autumn months with the maximum precipitation in November and nearly as heavy rain in July or August. The heavy rainfalls of the Saint Lawrence valley during November are the more remarkable in view of the fact that in this month the minimum precipitation occurs from northern Florida to central New York.

Detailed data regarding this type is not at hand, but Professor Charles Carpmael, chief of the meteorological service of the Dominion of Canada, is authority for the statement that the minimum precipitation occurs in April at Kingston, Rockliffe, Montreal, Quebec, Father point, Saugeen, and Parry sound, as well as throughout the province of New Brunswick. It is interesting to note that in the composite rainfall types of Newfoundland and New Brunswick, as well as along the greater part of the Massachusetts and Maine coasts, the November maximum obtains, and is as a rule the principal maximum, with March as the month of secondary maximum, although in some localities these maxima are reversed in order of importance.

There may possibly be added a Gulf type, so called from its prevalence along the northern shores of the gulf of Mexico, where the maximum rain falls in September and the minimum in the early spring. Western Florida and the Texas coasts are the only sections in which this obtains. The normal daily rainfall at Key West, Florida, of 47 years, is .107 inch, with departures as follows: January, — .038; February, — .050; March, — .062; April, — .064; May, — .006; June, .044; July, .022; August, .055; September, .111; October, .053; November, — .038, and December, — .043 inch.

It is not within the scope of this paper to discuss the special causes which produce these differing types of rainfall distribution in North America. It may be said, however, that there is no doubt in my mind that the maxima and minima phases of precipitation are simply the result of the fluctuation throughout the year of atmospheric pressure over North America and its contiguous waters, thus affecting the relative positions of high and low areas and consequently causing winds, either favorable or unfavorable to precipitation, according to season and locality.

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CONTENTS

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THE

NATIONAL GEOGRAPHIC MAGAZINE

# THE NATURAL BRIDGE OF VIRGINIA

BY

CHARLES D. WALCOTT

The Natural Bridge of Virginia is one of those striking geographic features of America which, like Niagara falls and many other natural features, will in time disappear under the action of the agencies of erosion. The same forces that created, will ultimately destroy them. In the case of Niagara, the rate of wear of the platform over which the water rushes has been measured, and the rate of retreat of the falls of the stream is known. Natural bridge is slowly but surely wearing away; and it appears to be desirable to record by photographs and notes the present condition of the bridge as a means of determining in the future the changes that occur from time to time. For this purpose a set of photographs, with notes taken in 1891, have been placed in the library of the United States Geological Survey.

The present article includes a few observations on the origin and the present condition of the bridge. The accompanying view (forming plate 21) is one looking northward through the arch, and it accurately represents the condition of the bridge and canyon at the time it was taken. It may be that a more detailed description, with a full series of views, will be published in the future.

During the field season of 1891 I studied the rocks exposed along the channel of Cedar creek, a small tributary of the James river in Rockbridge county, Virginia. The first strata met with in passing up from the river are highly inclined limestones and shales of middle or upper Cambrian age. These are succeeded by the massive Knox dolomites, which are nearly vertical or inclined slightly westward. A few hundred feet below Natural bridge the westward dip decreases very rapidly, and at the bridge the beds are nearly horizontal, while a short distance above they are rising westward and dipping eastward toward the bridge at an angle of 5° to 10°. This increases to 20° to 25° higher up the stream.

A diagramatic section of the rocks cut through in the canyon of Cedar creek gives the outline shown in figure 1. The bridge is at *A*, Lace falls at *B*, and James river at *C*. No attempt is made to show the depth of the canyon or gorge through which Cedar creek flows.

It is not supposed that the present Cedar creek began to wear its channel across the edges of the upturned beds from *B* to *C* when the present topographic features were established; on the contrary, it began its work long before, under conditions

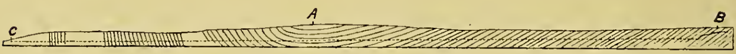


FIGURE 1.—*Attitude of Strata at Natural Bridge.*

and in rocks that have since disappeared in the general erosion of the surrounding country. The course of the stream was determined by circumstances connected with the life history of James river. When the latter obtained a new lease of active life and lowered its channel through the Blue ridge, Cedar creek began to cut down its bed in the peneplain and to prepare the way for the possibility of the existence of an arch over its channel.

The general mode of formation has long been described for this and other natural rock bridges. In this case in detail it is considered to be as follows: Cedar creek was engaged for a considerable period in excavating the gorge from the James river to a point not far below the present site of the bridge, where a fall appears to have existed, the summit of which was not far if at all below the present level of the top of the bridge. About this time the water found a subterranean passage in the limestone further up the stream than the present site of the bridge, and through this it flowed and discharged beneath the brink of the falls.

The passage gradually enlarged until all the waters of the creek passed through it and the bridge began its existence. What the length of this subterranean passage was is a matter of conjecture; it may have been one hundred or several hundred feet. All of its roof has disappeared except the narrow span of the bridge, and the abutting walls have been worn back by erosion until the gorge or canyon is much wider than at the bridge. The bridge is massive and strong, and the supporting walls rise in solid, almost unbroken, mural faces to the spring of the arch, nearly 200 feet above the bed of Cedar creek, as clearly shown in the accompanying plate (which is reproduced mechanically from a photograph taken by the author).

The position of the massive layers of limestone at the center of the low synclinal gives them power to resist erosion to a much greater extent than the upturned strata above and below the bridge. The condition of the latter favors rapid disintegration, and the result is shown in the widening of the gorge. The retreating lower level of the stream is now at Lace falls, nearly a mile above the bridge. The gorge below the bridge widens out more rapidly, owing partly to the erosion caused by a small brook that enters from the north, partly to the greater period of erosion to which it has been subjected.

On the northern side, opposite Pulpit rock, about twenty feet west of the public road, the summit of the bridge is 236 feet above the water, and this part of the arch has a thickness of 44 feet and a span of from 45 to 60 feet. The western edge is about ten feet higher, and the eastern edge about ten feet lower than the central point.

The massive layers of limestone forming the bridge are gradually wearing away on the outer edges from the action of water and frost. If water-breaks were arranged so that the water could not flow in upon the bridge and about it from the southwestern side, and if a shed with water-tight roof were built over the arch, disintegration and destruction would be indefinitely postponed. As it is, it will be many centuries before the natural processes of erosion now at work upon and within the arch will completely break it down.

Since the preceding was written, an article has appeared in the *New York Tribune* of May 15, 1893, in which an account is given of the discovery of a passage in the limestones near Natural bridge that extends from the plain above down to the stream below. It is described as follows:

"The passage was probably created by a stream of water finding a crevice in the limestone mountain, and by the gnawing of gases, the same causes that created the natural bridge. But it has all the appearance of design and purpose. A brief description by one who has recently seen it in the light of hundreds of candles shows at the entrance a room about twenty feet by ten, with a ceiling sixty feet in height, then a low, arched doorway into a room narrower than the former and extending forty or fifty feet up a steep flight of steps. The arches here are from fifteen to twenty feet in height, and their color a liquid blue. There are a few stalactities from the ceiling and many crystal forms on the wall. Turning here from a direct course through another arched doorway, beautifully decorated, about six feet in height, there is a round room, twenty feet in diameter and perhaps fifty feet from pit to dome. Out of the side of this springs a stone cascade, perfect as any waterfall, transparent at the lower edge, about ten feet in length and eight in breadth. As the light is thrown upon this it has all the appearance of a living waterfall. A passage under this, over a bridge, leads to a labyrinth barely wide enough for one to pass. The arch is about fifteen feet in height and the walls glisten like polished marble. These windings extend about thirty feet and open into a well-shaped room not at any point more fifteen feet in diameter and opening, about thirty feet above, to the sky."

From the description it is evident that the passage was worn by percolating waters that found their way from the plain above to the baselevel cut by the stream below, along some previously existing crevices. This process of erosion may be seen at the "Underground river" between Natural bridge and Lace falls, where a strong current of water flows through a channel in the limestone that is about ten feet above the level of Cedar creek and only exposed to view for a few feet of its length. All of the phenomena observed at Natural bridge and in the canyon of Cedar creek are repeated in many limestone regions. Sometimes they give rise to underground caverns, as at Mammoth cave, and more rarely to canyons and natural bridges. The illustration at the natural bridge is one of the finest known, and worthy of study by any one interested in geologic phenomena or the beautiful in nature.

# THE GEOGRAPHICAL POSITION AND HEIGHT OF MOUNT SAINT ELIAS

BY

DR T. C. MENDENHALL

(*Presented before the Society April 28, 1893*)

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In connection with the survey of the boundary line between Alaska and the British Northwest Territory it became necessary to determine the geographical position of mount Saint Elias.

Previous approximate determinations had shown that the peak of this mountain must be very near the 141st meridian, which constitutes the greater part of this boundary line, and that its distance from the seacoast must be very nearly ten marine leagues, which by treaty is to determine the position of the line in the absence of a range of mountains parallel to the windings of the coast.

It thus appeared that this peak is likely to prove of very great value as a corner-stone in this great boundary line, being at the junction of the 141st meridian and that part of the line which is so vaguely defined in the treaty.

The execution of the work in the immediate vicinity of the mountain was intrusted to assistants J. E. McGrath and J. Henry Turner, whose previous explorations and long residence in the interior of Alaska in connection with the determination of the 141st meridian are well known to the members of this Society.*

The complete reduction of the observations made has not yet been accomplished, but enough has been done to show the geographical position of the mountain peak within a very small error, and the Society will probably be interested in the preliminary results of this work, which are not likely to be modified sensibly by the completed calculations.

The fieldwork was executed during the summer of 1892.

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*An account of their work appears in Nat. Geog. Mag., vol. iv, 1892, pp. 177–197.

The party was carried to the working ground by the Coast Survey Steamer *Hassler*, in command of Captain Harber, who personally took great interest in the work and facilitated its successful performance very much, taking a very important part, in fact, in the determination of the difference of longitude between Sitka and the astronomical station at Yakutat bay. In the absence of telegraphic connection with any of these points, a series of chronometric journeys was made between Tacoma, which is near one of the telegraph longitude stations of the great system of the United States Coast and Geodetic Survey, and Sitka, which has been fixed as the base of the longitude work throughout the territory of Alaska.

Contemporaneously a series of journeys was made between Sitka and the astronomical station at Yakutat bay by the Coast Survey Steamer *Hassler*, and by these two loops the longitude of the stations was connected with that of the telegraphic system of the United States. Time observations at Tacoma and the comparison of chronometers at that point were under the direction of assistant J. F. Pratt. Six complete chronometer tours from Tacoma to Sitka and return were made on board of the Steamer *Queen*, the chronometers being in charge of Mr. T. D. Davidson, of San Francisco; this link having also been taken in by the *Hassler* chronometers on her way to and from the field, seven complete journeys are available between Tacoma and Sitka. Six complete journeys between Sitka and the astronomical station at Yakutat bay were made. An astronomical station was established at Sitka under the direction of sub-assistant Fremont Morse, who had charge of time-observations and the comparison of both sets of chronometers on reaching that point. Seven chronometers made the journeys between Tacoma and Sitka, and the same number between Sitka and Yakutat bay. The astronomical station at the latter place was in charge of assistant J. Henry Turner. The connection of this station trigonometrically with the summit of mount Saint Elias was under the direction of assistant J. E. McGrath. The astronomical station was on the southern side of Yakutat bay, and the measured base line from which the triangulation was developed was on the northern side. The length of this line was a little less than 7,000 metres, or about four and a half miles. The scheme of triangulation is shown on the accompanying sketch (figure 2). The latitude of the astronomical station was determined by vertical circle observations of the sun's limb by the method of circum-meridian altitudes and also by the use of a meridian telescope and the Talcott differential method. The vertical circle used was ten inches in diameter and read to five seconds by means of four verniers. The latitude here given depends on, these observations, as those made by the meridian telescope have not yet been reduced.

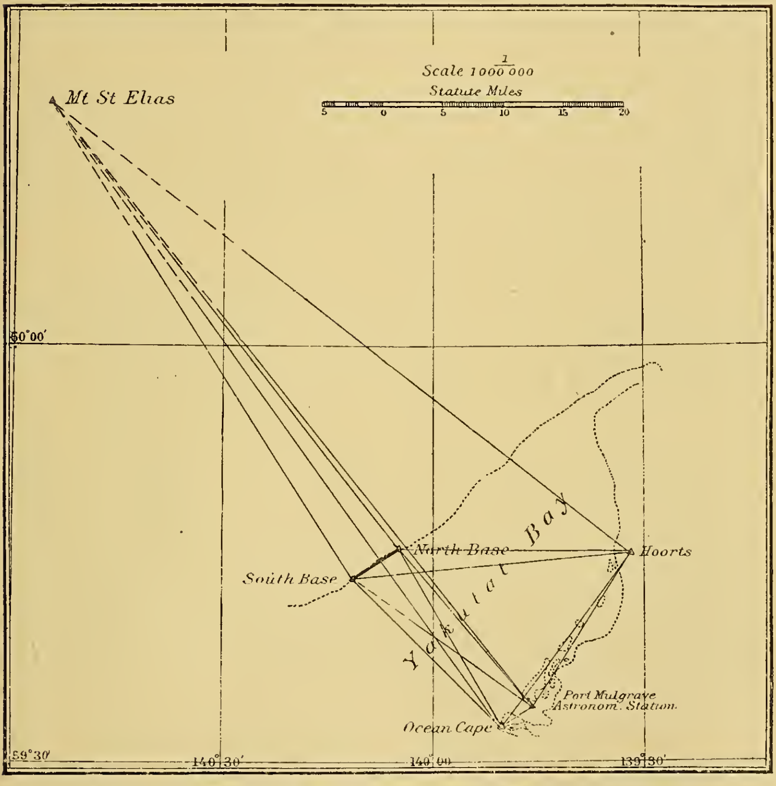


FIGURE 2.—*Triangulation in the vicinity of Mount Saint Elias.*

Of the six chronometric tours between Sitka and Yakutat bay three only have been reduced, and the results are as follows:

First trip, June 8 to 13; difference of longitude, 17 m. 48.17 sec.
Second trip, June 24 to 29; " " " 17 " 48.31 "
Third trip, July 9 to 14; " " " 17 " 48.16 "
Of which the indiscriminate mean is 17 m. 48.21 sec.

A preliminary reduction of a portion of the chronometric comparisons between Tacoma and Sitka gives for the longitude of Sitka 9 hours 1 minute 20.5 seconds, from which we have the adopted longitude of Yakutat astronomical station 9 hours 19 minutes 8.7 seconds. The latitude of this station from circum-meridian observations on the sun's limb, consisting of sixteen pointings on the sun near culmination on August 1, 1892, was 59° 33′ 51.8″, and on August 11, 1892, from twenty pointings, the result was 59° 33′ 48.2″, the mean of which is 59° 33′ 50″, which is accepted as the latitude of this station, subject, of course, to further small correction from the reduction of the results obtained from the meridian telescope work. Extending these coördinates to the summit of mount Saint Elias by means of the scheme of triangulation as shown in the sketch, the latitude of the summit is found to be 60° 17′ 35″, and the longitude 140° 55′ 21.5″.

The principal base for the determination of the position of the summit of the mountain was a line connecting mount Hoorts and South base. The length of this line was a little less than 38,000 metres, or about 23½ miles, and the angle which is subtended at mount Saint Elias was about 20°.

Incidentally in connection with this work, the height of the summit of the mountain was determined. A series of zenith distance measurements was executed from five stations, namely: North base, South base, mount Hoorts, Ocean cape, and the astronomical station. At the latter point observations were made on fourteen different days. The result for each day is the mean of three sets of six repetitions each, and the series is as follows, the observations being made near noon:

ZENITH DISTANCE OF MOUNT SAINT ELIAS.

| | |
|---|---|
| June 11, 1892 | 87° 20′ 50.3″ |
| " 18, " | 87° 20′ 64.2″ |
| " 27, " | 87° 20′ 51.8″ |
| " 28, " | 87° 20′ 51.3″ |
| July 9, " | 87° 20′ 57.1″ |
| " 10, " | 87° 20′ 49.8″ |
| " 11, " | 87° 20′ 44.8″ |
| " 13, " | 87° 20′ 40.6″ |
| " 23, " | 87° 20′ 59.8″ |
| " 29, " | 87° 20′ 36.1″ |

| | | |
|---|---|---|
| Aug. | 1, 1892 | 8.° 20′ 53.6″ |
| " | 11, " | 87° 20′ 52.0″ |
| " | 17, " | 87° 20′ 50.8″ |
| " | 18, " | 87° 20′ 41.2″ |
| | Mean of 14 days | 87° 20′ 50.2″ |

It will be seen that in the total fourteen days of observation the range of variability in vertical angles amounted to but 28″, indicating remarkable steadiness in atmospheric conditions.

The observations for height at other stations, although less numerous, are extremely satisfactory. The great uniformity of the final results for the height of the mountain as computed from observations at the five different stations is exhibited in the following table. The remarkably close agreement of these figures is satisfactory evidence that this determination of the height of the mountain is such as to leave little to be desired.

SUMMARY OF HEIGHT AND POSITION.

Mount Saint Elias from—

| | |
|---|---|
| North base | 18,014 feet. |
| South base | 18,012 " |
| Mount Hoorts | 18,017 " |
| Ocean cape | 18,012 " |
| Astronomical station | 18,000 " |
| Height, adopted mean | 18,010 " |
| Latitude | 60° 17′ 35″ |
| Longitude | 140° 55′ 21.5″ |

It is interesting to note that in the light of the information of the last year or two, it can no longer be claimed that mount Saint Elias is the highest peak upon the continent. This distinction seems to belong to mount Orizaba, in Mexico, which has recently been measured by means of railroad levels and trigonometrically by Dr J. T. Scoville, of Terre Haute, Indiana. The height of this mountain, as obtained by Dr Scoville, is 18,314 feet. The character of the observations is such that it does not seem likely that this result will be found to be very many feet in error. It therefore appears to be entirely safe to say that Orizaba is the highest peak in North America, and that its altitude exceeds by two or three hundred feet that of mount Saint Elias. A detailed report on the latter mountain, together with the results of revised and complete calculations, will be published in due time.

# THE IMPROVEMENT OF GEOGRAPHICAL TEACHING

BY

PROFESSOR WILLIAM MORRIS DAVIS

(*Presented before the Society February 3, 1893*)

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The improvements needed in teaching geography in our schools involve a fuller investigation of the facts of the subject, a better knowledge of these facts by teachers, and a more skilful use of them in the processes of teaching. As a society, we are less concerned with the last two necessities than with the first, but I may briefly state my belief that skilful teaching goes along closely with fullness of knowledge. The third need will therefore be largely cared for when the second is supplied; but fullness of knowledge cannot be expected of a teacher while her understanding of the geographical features of the world and of our own country and of the home state in particular is gained only from the impoverished statements of the ordinary text-books, and while the original sources in which she may seek additional information are generally so few, so inaccessible, and so far below the standards of modern geographical research. It might truly be said that even if better sources of information were within reach little use could be made of them; for we must recognize the great difficulties under which the teachers in our public schools labor: the variety of subjects that they have to teach, the overlarge number of scholars in their classes, the restrictions that tend to smother their individuality, the fatigue following many tiresome duties, the smallness of salary by which freedom of action toward large opportunities is hampered. Would that some means of overcoming these difficulties might be devised! But at present it does not seem so practical to turn our action as a society in this direction as to look to remedying the fundamental need—the need of a fuller investigation of the facts.

It may not be generally recognized by our members that there is still great need of exploration close at home. It is not only in the further corners of the world that discoveries are to be made. Nearly every state in our country must be much more carefully studied than it yet has been before its physical features will be made known to us. The geographical descriptions now accessible in print would be very gently characterized if only called "old fashioned." Where newer material has been published, it is generally fragmentary, brief, and imperfectly illustrated. The first elements of geographical study, the physical features of the earth—especially of its surface—still call for devoted investigation.

It is not simply a description of the forms of the land that is wanted. It is a recognition of the forms as dependent on structure and sculpture, and a comparison of like and unlike forms in a systematic manner. This requires special study, precisely as petrography does, and the desired end will not be gained until the work is placed in the hands of men especially trained for it. Having found this study an absorbing interest for several years past, I shall try to make my meaning clearer by introducing specific illustrations from New England.

Southern New England consists essentially of a gently inclined plateau, rising to 1,400 or 1,600 feet above sea level in the rolling uplands of western Massachusetts * and southwestern New Hampshire, and thence descending gradually southward and eastward to sea level at the coast. This inclined plateau is nothing more than a slightly tilted lowland of denudation, the product of long-continued destructive action of the atmosphere by which a once larger mass was worn down to a surface of moderate relief close to the baselevel of its time. The southeastern extension of the old lowland was depressed beneath the sea at the same time that its interior portion was elevated to form our New England plateau; the present coast line therefore lies roughly midway on the surface of old New England.

The continuity of the plateau-like uplands is interrupted in two ways; isolated mountains rise above it, and branching valleys sink below it. Mount Monadnock is a typical example of the former, with its bold summit more than a thousand feet above the surrounding plateau. When seen from a distance to the southwest, it rises in symmetrical triangular outline above the level skyline of its base. It is not a mountain of local construction, raised by upheaval above the mass of the plateau; it

* Nearly all the districts thus referred to in the address were illustrated by lantern slides.

is simply an unconsumed remnant of the greater mass of unknown dimensions and form, from which the old lowland was carved. When the lowland was uplifted, Monadnock and its fellows were raised with it. In my teaching, Monadnock has come to be recognized as an example of a distinct group of forms, and its name is used as having a generic value. A long paragraph of explanation is packed away when describing some other mountain as a " monadnock " of greater or less height.

The valleys by which the plateau is dissected have all been excavated since the uplift of the old lowland. Where the plateau is high the valleys are sunk deep below it. The Deerfield valley in northwestern Massachusetts is a full thousand feet deep. Where the uplift was small near the coast, the valleys are shallow. Where the rocks are hard, as is generally the case, the valleys are narrow, like that of the Deerfield above named. Where the rocks are soft, the valleys are wider; illustrating the general principle that mature and old forms are more rapidly developed on soft than on hard rocks. The Berkshire valley, excavated in limestone between crystalline rocks and schists, is six or more miles wide. The Connecticut valley, excavated in weak sandstones, is even wider, forming a valley lowland ten or fifteen miles from side to side and broadly dividing the plateau into eastern and western portions. Occasional beds of hard rocks, chiefly ancient lava flows, occur in the sandstone belt, and are much less eroded; they form ridges rising far above the lowland, and indeed still retain nearly the height of the adjacent plateaus.

Mount Holyoke, opposite Northampton, is a type of these ridges. It holds essentially the same relation to the lowland that Monadnock holds to the plateau. Both are residual mountains of harder rocks; but the two manifestly belong to different generations of geographical development.

It appears from this brief outline that our New England geography is of composite quality. The uplands with their residual mountains represent the closing stages of one generation or " cycle " of development; the valleys represent the more or less advanced beginning of another cycle. The distribution of our villages and our occupations, the lines of travel, and the movements of population may all be shown to depend largely on the topographic forms thus classified.

By following some plan of treatment such as this, it becomes possible to make just comparisons between different regions—

for example, a close correspondence may be found between our dissected New England plateau and the Hunsrück-Taunus plateau, through which the Rhine has cut its famous gorge below Bingen.* Here we find an even upland, with occasional eminences rising above it, and with deep valleys sunk below it. The eminences on the plateau are there, as with us, residuals of a once much greater mass, rising moderately above a baselevelled surface; the valleys are the work of a later cycle of development, inaugurated when the old baselevelled surface was uplifted to its present altitude. In all this, southern New England and the plateau of the middle Rhine are thoroughly homologous, but certain significant differences between the two regions should be noted: The plateau of the middle Rhine is so extremely flat-topped that it must be conceived as having advanced further in its first cycle of denudation than New England; indeed, it is the best illustration of a smoothly baselevelled area that I have found, and serves me as a type of such a form. On the other hand, its valleys are much narrower than ours; hence its second cycle must be regarded as less advanced than ours. Both regions possess composite topography, including similar elements; but the stages in the two cycles of development represented in each case do not precisely agree.

I cannot now delay to illustrate other elements of our New England topography, even in so brief a manner as the plateau, with its residual mountains and its initiated valleys, has been treated; but I may record my conviction, based on experience with scholars of different ages and with teachers in schools of various grades, that all our geographical features, when studied out in a manner similar to that outlined above, become luminous in comparison with the obscurity of the conventional accounts in our school books. The drowned valleys that form our bays, the drowned rivers that form our estuaries, at once gain a new meaning when thus explained; and it is not a little remarkable to see how little recognition there is in general teaching of the control exerted by depression of the land on the form of its coast line. Look at Narragansett bay, the fiord of the Thames at Norwich, of the Connecticut above Saybrook, of the Housatonic towards Birmingham, of the Hudson even up to Albany—all "drownded," like Pegotty's brothers at old Yarmouth; yet

* Excellent lantern slides of this picturesque region may be had from dealers; much better, in fact, than can be found for our scenery at home, although the latter is much the more important for our schools.

what school boy ever hears our coastal rivers thus simply and rationally characterized? Look at the sprawling outline of Greece, and ask our classical scholars if they describe it as a rugged mountainous region standing in the Mediterranean up to its knees; and yet how effective is the homely comparison!

It is the same with the results of glacial action. The text books of geography are practically silent on this important topic; yet many features of glacial origin must be known in fact to every boy who has rambled through the woods on his half holidays. Our gravel ridges and mounds and our sand plains may be reckoned as characteristic of our home geography as Lowell's "Bigelow Papers" are of Yankee dialect. It is a pity that they are not duly mentioned in our schools and compared with that suggestive fund of fresh material brought by Russell from Alaska and so honorably associated with the name of our society. The comparison that may be drawn here is as fair as that instituted already between New England and the plateau of the middle Rhine, but the two comparisons are of different kinds. The comparison of the two plateaus associates distant regions that are now alike. The comparison of New England and Alaska employs the present of the latter region to illustrate the past of the former; and this style of comparison is extremely suggestive in geographic study.

For several years past, some of my more advanced students have chosen as subjects for their theses the physical geography of various states with which they were more or less familiar from residence or field observation, or with which they wished to become familiar. They have thus had occasion to search the literature of each state for accounts of its physical features, and the search has generally been without large reward. The practice has been useful, but the product has not been great. It is this want of material that convinces me that nothing less than the direct exploration of our home country, with the single object of investigating its topographical development, will secure the facts that are now needed in geographical teaching; and thus we return to the general question that was laid aside while southern New England was before us.

It is of course impossible in the limits of this address to give a full statement of the scheme of systematic geography, the appreciation of which seems to me essential in the desired exploration and investigation; but there are two leading principles which I may outline, since without them no progress can be made: The first is that every land form passes through a comparatively systematic series of changes from its youth, when its form is defined chiefly by constructional processes, past its maturity, when the processes of sub-aerial sculpture have carved a great variety of mouldings and channellings, toward its old age, in which the accomplishment of the full measure of denudation reduces the mass essentially to baselevel, however high it may have been originally. I have become accustomed to call this unmeasured time a geographical cycle. It may be long for a structure of hard rocks, or shorter for a structure of weak rocks; but in both the sequence of immature, mature, and senile forms is essential. The particular expression of these forms varies with the structure of the mass concerned; but for every structure there is an appropriate sequence of young, mature, and old features.

It is therefore important to determine in accordance with this fundamental principle the stage in which any given area stands in its life's journey. The standard descriptions of many of our states gives no such account of their topographic forms, and the student or teacher who seeks it has little reward. The account is needed not only because the reader can gather from it a better understanding of the relations of a region to the rest of the world, but also because such an account enables him to appreciate much more closely and more easily the actual forms of the region itself.

A second important principle is in a measure a corollary of the first: At any time during a geographical cycle a land area may be disturbed by depression or elevation. A new relation is then established with the baselevel of drainage, and a new cycle of denudation is introduced. The forms developed by denudation in the first incomplete cycle then become, as it were, the constructional forms of the new cycle, and from those as a beginning the forces of denudation go on anew. The combination of the topographic features developed in the two cycles produces what I have called "composite topography," and this is of extremely common occurrence—for an example, we may refer again to the dissected plateau of southern New England. The upland with its residual mountains is the product of an earlier cycle; the valleys are the work of a later cycle; the glacial features may be referred merely to a short-lived climatic episode late in the second cycle, so brief was the occupation of the country with ice compared to the time required for the excavation of the valleys in the uplifted plateau.

Geographical descriptions and the appreciation of them are greatly advanced by a recognition of these principles; they are essentially simple conceptions, but the variety of their application is infinite. The work of more than two cycles may not infrequently be recognized. Thus, in Pennsylvania the crest lines of the Appalachian ridges are remnants of an uplifted and almost consumed plateau of Cretaceous denudation, of which only the hardest parts now remain; the open valley lowlands between the ridges are the product of Tertiary excavation in the uplifted plateau; the narrow trenches, in which the rivers traverse the lowlands, are of post-Tertiary origin. Many points of view may be selected on the Susquehanna, where these three elements of the landscape stand out with much distinctness, and the pleasure of their contemplation is greatly increased by the recognition of their distinct conditions of origin in successive geographical cycles or during successive uplifts of the land.

What is the most effective way in which we can promote the advance of geographic investigation and secure accounts and illustrations of our home country in accordance with a systematic and scientific method? It has seemed to me that appeal might be profitably made for the coöperation of the directors of the various state geological surveys.

I therefore propose to ask the directors of our various state geological surveys to devote annually a part of their funds to the study of the physical features of their domains in the light of modern geographical science, provided that the terms of their appropriation bills will allow them to cover this side of the geological field; and if not, I shall hope that special appropriations of moderate amount may be made for this particular purpose. Experts should be employed for this work, as they are now in paleontology and petrography. The results thus gained would appear in successive annual reports, brief at first, increasing in scope as opportunity offers, and setting forth the larger and smaller elements of the topography in such simple style and with such comparisons and illustrations as should be of immediate value to teachers in grammar schools and high schools. The state boards of education might secure special reprints of these geographical chapters at very moderate cost for distribution as state products to all public libraries and to all public schools of the higher grades; much in the same way as the energetic commissioners of the topographic survey of Rhode Island have secured the distribution of their state map free to all their public schools and libraries. The legislature would soon see, from the employment of these geographical chapters year after year by thousands of teachers, the appreciation that this hitherto undeveloped economic field might receive from those occupied with the advance of public education, and assured support would then be given to the work, even on enlarged scale. By some such practical steps we may secure a material advance in the quality of geographical instruction.

During the past year, I have had many illustrations of the need of material of geographical of the kind here referred to. Teachers in our public schools are well aware that they have not now the fuller account of the facts that they would enjoy; and yet they know not where to turn to find what they need. Many teachers, principals, and superintendents with whom I have spoken admit at once that the books to which they now have access are quite insufficient to satisfy their wants, and they listen gladly to any feasible plan that will provide a more extended and more scientific description and explanation of the facts of geography near at home, with which they have to deal from their earliest to their latest teaching. Geologists or geographers who are already acquainted with our local geography from personal experience can perform a grateful service to the schools by preparing elementary accounts of the regions with which they are familiar, and such books as these should be greatly multiplied; but, so far as I have been able to learn, it is only the smaller part of our country that is now known well enough to those who can be prevailed on to write elementary books, and hence the importance of actual geographical exploration in order to supply our teachers with what they need. If some such plan as the one proposed above were put in operation, it might come to pass in a decade or two that the graduates of our common schools would not be so blinded as they now are to the facts of their home geography.

HARVARD UNIVERSITY, CAMBRIDGE, MASS.

# AN UNDISCOVERED ISLAND OFF THE NORTHERN COAST OF ALASKA

(*Presented before the Society April 28, 1893*)

## I—BY MARCUS BAKER

On a map of the polar regions published in Gotha eleven years ago, land is indicated as existing about 150 miles north-northeastward from point Barrow, the northernmost point of Alaska. The position of this land is latitude 73½° N. and longitude 153½° W. of Greenwich. I have not succeeded in finding this land indicated on any other map, neither have I found any published statement respecting it.

In the summer of 1849, Kellett and Moore. in the Arctic search vessels *Herald* and *Plover*, cruised in the Arctic ocean, between point Barrow and Herald island, searching for Sir John Franklin. It was during this cruise that Herald island was discovered and landed upon, and the high peaks of what we now know to be Wrangell island were seen to the westward. In the map accompanying their report* an "appearance of land" is shown in latitude 72½° N., longitude 161½° W. of Greenwich, being about 130 miles northwest of point Barrow. On a small map accompanying Osborn's "Stray Leaves from an Arctic Journal," land is indicated in the same locality, as also on an undated map published by Longman in London in 1850 or 1851.

Russian hydrographic chart number 1495, published in 1854, also shows land here, with the note "Indications of land according to report of the English sloop *Plover* in 1849."

These four maps are the only ones, out of a considerable number examined by me, which show this appearance of land, and they are all obviously derived from the same authority, viz, Kellett and Moore.

In Kellett's narrative the only reference to this appearance of land is the following statement at p. 14:

*Additional papers relative to the Arctic expedition, etc, presented to both Houses of Parliament by command of Her Majesty. Folio. London, 1852. Pl. 15, *ad fin.*

"This was our most northern position, lat. 72° 51′ N., long. 168° W. The ice, as far as it could be seen from the mast-head, trended away W. S. W. (compass), Commander Moore and the ice-master reporting a water sky to the north of the pack, and a strong ice-blink to the S. W."

It appears obvious from this statement that the evidence of land existing here is very slight. The appearance of land is omitted from all the late maps. It does not appear on the British Admiralty charts, nor on the charts of our own Hydrographic Office or Coast Survey. Indeed, on hydrographic chart 68, a sounding of 54 fathoms, muddy bottom, is shown in this place. It is clear, I think, that land does not exist here.

Now, on the circumpolar map first mentioned the land shown north-northeast of point Barrow is about 150 miles northeast of the place where Kellett's "appearance of land" is shown. I had supposed before examination that these indications referred to the same thing, but, having made an examination, I am of opinion that the indication of land shown on the circumpolar map is not derived from Kellett and Moore, but from some unpublished source of information.

That there is an undiscovered or rather unvisited land somewhere north and east of point Barrow is a matter of common talk among the whalers who annually visit this region. Captain John Keenan, of Troy, New York, master of the whaling bark *Stamboul*, of New Bedford, reports that he and all his crew saw it while on a whaling voyage some time during the seventies. The Eskimos have traditions of this land and of a visit to it by their fathers "long ago."

The known facts respecting this hypothetical (or should we not say real?) land are exceedingly meager and all unpublished. It has therefore seemed to me desirable to put these few facts on record, and that no place was more suitable than the journal of a society devoted to the increase and diffusion of geographic knowledge.

The facts have all come to me through my old friend Captain E. P. Herendeen, who, at my request, has written the account to which these remarks are intended merely as an introduction. Captain Herendeen, a native of Woods Holl, Massachusetts, has been for many years engaged in whaling, having entered the Arctic in pursuit of whales as early as 1850, and has since then made more than a score of voyages to this region. I have had the pleasure of making three voyages to the northern Pacific and

Arctic oceans in his company. In 1882–'83 he was a member of the United States Signal Service party stationed at point Barrow. He is well acquainted with all the natives on the Arctic coast from the East cape of Asia eastward to the mouth of the Mackenzie river. He speaks their language and is universally known to the natives of that region under the name of "Heretic." From the natives and through Captain Keenan of the whaling fleet he has obtained the following information, which he has kindly written out for the National Geographic Society.

I beg to suggest the desirability of calling this very little-known land *Keenan island.*

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## II—BY CAPTAIN EDWARD PERRY HERENDEEN

Among the many traditions of the point Barrow Eskimo the following is not without geographic interest:

Since no account is kept by them of the lapse of time, it is impossible to fix a date to any story related by them previous to the life of their father or grandfather. Their simple answer to any question regarding the date of these occurrences is always the same, "eidrárnee" (long ago). Our story is this: An Eskimo was out on a whale hunt with his umiak and crew (in April or May). Venturing much farther than their companions and being encompassed by ice, they were carried away to the north and east by the moving pack until at last they came in sight of a strange land. After many hardships and the death of most of the crew, some at last reached the mainland, their own beloved "Nunah," greatly exhausted, and related their adventures to wondering listeners. They told of times when starvation grimly threatened and when the timely catching of a seal or killing of a bear saved them from a dreadful fate, and the skins furnished material to repair their worn garments.

These tales, by whomsoever related, seem to bear testimony to one point, viz, of land somewhere to the north and east of point Barrow, which has been seen by some of these people under such circumstances of hardship, distress and loss of life as to have fixed the event in their minds and been related by father to son for perhaps many generations. It is often told that natives wintering between Harrison and Camden bays have seen land to the north in the bright, clear days of spring.

In the winter of 1886–'87, Uzharlu, an enterprising Eskimo of Ootkeavie, was very anxious for me to get some captain to take him the following summer, with his family, canoe and outfit, to the northeast as far as the ship went, and then he would try to find this mysterious land of which he had heard so much; but no one cared to bother with this venturesome Eskimo explorer. So confident was this man of the truth of these reports that he was eager to sail away into the unknown, like another Columbus, in search of an Eskimo paradise.

In the winter of 1887 several of the most intelligent of the cape Smyth Eskimo came to me about dusk of the evening of February 15 and reported that three strange men had come up from the southwest along the shore ice, and appeared very weary, but on coming opposite the village (which could not have been seen by the travelers before) they quickened their pace, turned abruptly off shore, and disappeared in the ice-pack. It was just as the sun was setting, and the strangers could be seen distinctly, but not until they had gotten into the rough ice did it occur to these people standing on the bank that these three wanderers were strangers indeed; and the more they talked the matter over the more wonderful it seemed that any tired hunter should pass their village without stopping for rest and refreshment. It was evident that they turned away in fear when they saw the village and the people standing on the bank. Who could these men be who turned away from their hospitable village, where food and a warm welcome awaited them? They reasoned that every man on the coast from point Hope to point Barrow was known to all the others, and knew he would be welcome to food and shelter. The more they talked, the stranger it seemed, until the conclusion was reached that these were "inu tumuktua," (lost people,) and of course their home must be the mysterious land of their fathers' tradition. As a proof of this they said these three men wore white clothing, which was most likely made of white bear skins, while the Eskimo of the coast wear brown clothing made of reindeer skins.

Another point in favor of their assertion was that these men had no guns, which fact was noted before they turned off shore into the pack. They had spears and a coil of seal line, and used the spears as walking-sticks as they plodded wearily along.

The circumstance was most strange. Every man in the village of Ootkeavie gave an account of himself that evening, and I took the trouble to send to point Barrow the next morning, but none of them had been in that vicinity or were able to throw any light on the subject. From my knowledge of the Eskimo, I am sure no one acquainted would have passed a village without stopping. It was near night, yet these men in evident alarm turned off shore into the ice pack and were never seen again.

I made arrangements to go out in the morning and trace these men and solve the mystery; but the morning dawned with a fierce blizzard, causing the abandonment of the search, and left us wondering whence they came and whither they went.

The only report of land having been seen by civilized man in this vicinity was made by Captain John Keenan, of Troy, New York, in the seventies. He was at that time in command of the whaling bark *Stamboul*, of New Bedford. Captain Keenan said that after taking several whales the weather became thick, and he stood to the north under easy sail, and was busily engaged in trying out and stowing down the oil taken. When the fog cleared off, land was distinctly seen to the north by him and all the men of his crew; but, as he was not on a voyage of discovery and there were no whales in sight, he was obliged to give the order to keep away to the south in search of them. The success of his voyage depended on keeping among whales.

This fact was often discussed among the whalemen on the return of the fleet to San Francisco in the fall. The position of Captain Keenan's ship at the time land was seen has passed from my mind, except that it was between Harrison and Camden bays.

A letter addressed to Captain Keenan by the writer in February, asking for more definite information as to date and position of his ship and other points of interest, failed to reach him and was returned.

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## III—BY GENERAL A. W. GREELY

Mr Baker's notes on "An undiscovered island off the northern coast of Alaska" are extremely interesting. I am, however, unable to agree with Mr Baker in the belief that land exists in the polar sea between point Barrow and Melville island.

On my attention being called to the paper and German map of 1882, I did not at first recall that I had before seen charts marked with the signs of land referred to. On later consideration I remembered maps containing this knowledge, and have since examined all maps of arctic America from 1844 to 1858 in my private collection and one or two others accessible elsewhere.

It is interesting to note to what extent these signs of land were credited by map-makers of that period. For many years chart number 260 of the hydrographic office of the royal navy was the standard map of the polar regions. So far as I have learned, there were but two such charts between 1835 and 1886, one being that of 1835, the other bearing date of December 24, 1855. The chart of 1835 had no such land upon it, nor did the *first* edition (see Scoresby's "Search for Franklin," London, 1852), which bore the note, "corrected to 1849," and such land disappeared from the corrected chart of 1855. It appears that corrections were constantly made on this chart of 1849, some, even of the most important character, without additional foot-notes. This is strikingly illustrated by a copy of the chart published in the Parliamentary Blue Book referred to by Mr Baker (folio, London, 1852, plate 15). Although the chart has the engraved note, "corrected to 1849," yet there appear thereon the important discoveries of Admiral Inglefield made in Smith sound during the summer of 1852, which were not known in Great Britain until his return in November of that year. It is probable that these discoveries were added to the chart in the final revise, just as the report was going to press. Sir John Barrow, the great authority on Arctic discoveries, in his polar chart of 1846 ("Voyages to the Arctic Regions," London, 1847) enters no note regarding the new land. The land referred to, so far as I know, first appeared on the polar map in Richardson's "Arctic Searching Expedition: A Boat Voyage through Ruperts Land," Longman, London, 1851, this probably being the Longman undated chart of Mr Baker. Later, in chronologic order, it appeared in Osborn's "Stray Leaves from an Arctic Journal," London, 1852; "Additional Papers Relative to the Arctic Expedition," etc, London, 1852 (evidently printed after November 1, 1852), both quoted by Baker.

In the *Revue Britanique* of December, 1853, (Paris,) was published a map of the polar regions, with the legend "land seen" in 72° 30′ N. 161° W. To the southwest of this land is a dotted line marking the limits of the polar ice in 1849. This evidently is the line of ice charted by the *Plover* in 1849. Then follows the Russian hydrographic chart number 1495, 1854, quoted by Baker, with the note, "Indications of land according to the report of the English sloop *Plover* in 1849." With Mr Baker I have searched in vain for corroboration of this entry.

The *Herald* was in company with the *Plover*, and the parliamentary report finds confirmation in Seeman's "Voyage of the *Herald*," London, 1853, vol. ii, page 106:

"It was a fine, clear night. * * * At midnight the latitude was obtained by the inferior passage of the sun, 72° 10′ 30″ N. * * * (29 July, 1849.) * * * Our soundings had gradually increased to thirty-five fathoms of soft blue mud. * * * This position was our most northern one, latitude 72° 51′ N., longitude 163° W. * * * Commander Moore (of the *Plover*) and the ice-master reporting a water sky to the north of the pack, and a strong ice-blink to the southwest."

The evident incorrectness of the land charted is shown by the experience of Collinson in 1850, when the general line of the heavy pack-ice was somewhat farther northward, extending from southeast to northwest from 73° N. in 160° W. to 72° 40′ N. in 165° W. Collinson, on August 26, 1850, was in 73° 23′ N., 164° W., and on August 28 was in 72° 35′ N., 161° W., thus having passed directly over the position of the land charted as above. On the 17th he was in 72° 45′ N., 159° W.; August 22 in 72° 25′ N., 158° W.; August 21 in 72° 10′ N., 153° W. Collinson says:

"August 17 (1850). * * * The fog cleared away at 1 p. m., and we found ourselves in a lane of clear water ten miles wide, with a clear sea to the N. E. * * * Our observations placed us 100 miles N. W. by N. from point Barrow, and we found 45 fathoms of water, muddy bottom."

"21.—Had traced pack from 72° 45′ N. in 159° W. for 275 miles to S. E., to 71° 42′ N., 154° 30′ W."

"Aug. 28.—Here we reached our furthest point north in 73° 23′ N. and longitude 164° W. In the afternoon, the pack edge trending more to the southward, we got much encumbered by endeavoring to get through it to the *eastward*, straining our eyes in that direction in the hope of seeing either *land* or water."

On August 18, 1850, McClure was in 70° 48′ N., 138° W., with no sign of land.

The weight of opinion in the following few years was decidedly against there being such land, as shown by its omission from the charts of arctic America in the following-named works:

Scoresby's Search for Franklin, London, 1851.

Hooper's The Tents of the Tuski, London, 1852.

Mangle's Arctic Searching Expedition, 2d edition, London, 1852, where Peterman's Search Map is reproduced (there being no map of the first edition, London, 1851).

Sutherland's Voyage to Baffin's Bay and Barrow Strait (Peterman's map), London, 1852.

Further Correspondence and Proceedings Connected with the Arctic Expedition, presented to Parliament, London, 1852 (Peterman's map).

Lieutenant S. Gurney Cresswell's map, dated May 15, 1854.

Brande's Sir John Franklin, map by Langes, Berlin, 1854.

Armstrong's Northwest Passage, London, 1857.

Osborn's McClure Discovery of the Northwest Passage, London, 1856.*
McDougall's Eventful Voyage of H. M. S. *Resolute*, London, 1857.
Brown's Northwest Passage, 2d edition, London, 1860, which contains a map by Arrowsmith, 1858.

It thus appears that the "*Plover*" land is a myth, Mr Baker agreeing with me on this point.

The Keenan land lies, however, somewhat east of the mythical land already disposed of, being indefinitely located between Harrison and Camden bay, north of the 72d parallel. The uncertainty of position of whalers is well known, as no care is given to longitude or other astronomical observations.

Since definite data are lacking, the subject can be approached from another standpoint, that of the depths of the adjacent seas. It will be recalled by those familiar with the Arctic ocean to the north of Bering strait region that it is a very shallow sea. In one direction only does it deepen, and, unfortunately for Keenan island, it is in that particular quarter.

In my opinion, the great improbability of land in the region mentioned appears from an examination of the soundings of the sea from the northwest to east of point Barrow, which are as follows, the position being approximate: 172° W. longitude, 73° 5′ N. latitude, 78 fathoms; 159° W., 72° 6′ N., 133 x (x indicates no bottom); 155° W., 72° N., 145 x; 140° W., 70° 5′ N., 190 x; 139° W., 70° 3′ N., 145 x; 126° W., 70° 5′ N.. 110, and 124° W., 74° 5′ N. (on the very coast of Banks land), 45 fathoms.

The above observations show that the parts of the Arctic ocean passed over and most nearly adjacent gradually and interruptedly increase in depth from the west, from the south and southeast toward the reported land, attaining in its neighborhood the greatest known depth of water to the northward of Bering strait. That this condition of depth is not strictly local but extends uninterruptedly northward is proved conclusively by the very heavy ice met with by Collinson and McClure between point Barrow and Banks land, which ran upward of 200 feet in thickness. As this thick ice is unquestionably of land origin, from an ice-capped country of considerable extent, there must be deep water for its transition. It is possible, but not probable, that the southern edge of this land lies so close to arctic America.

* This omission is striking, inasmuch as Osborn inserted it in his "Stray Leaves from an Arctic Journal," 1852.

# THE GEOLOGIST AT BLUE MOUNTAIN, MARYLAND

BY

CHARLES D. WALCOTT

Most of the summer visitors at Blue mountain, Maryland, give little thought to the origin of the mountain, nor how it came to be a ridge rising so boldly on the west from the Cumberland valley and on the east overlooking the mountain valley to the foot of the Catoctin ridge, which rises above the plain stretching thence southeastward to Washington.

During the summer of 1892 the writer discovered that the rocks forming the crest of the Blue ridge belong among the oldest formations deposited in the Appalachian trough, since they carry types of life occurring in the most ancient fossiliferous rocks on the North American continent that are distinguished by a recognizable fauna; the geologic structure also shows that these rocks rest upon the ancient sea-bed of the Appalachian trough, and that they are of the same relative geologic age as the Cambrian rocks that occupy an equivalent stratigraphic position in Vermont, New Jersey, New York, Virginia and Tennessee.

The recent work of Dr G. H. Williams demonstrates that, with one partial exception, the older crystalline rocks underlying the Cambrian strata have hitherto been misinterpreted and misunderstood by the geologists who have studied them. Instead of being sedimentary formations originally deposited in the sea-bed, they are volcanic rocks and almost identical with the lavas found in Nevada, Wyoming and in many portions of the Rocky mountain region. This discovery proves that the laboratory of nature produced a certain type of volcanic rock almost at the beginning of the evolution of the North American continent, and again produced the same type many millions of years afterward on the western side of the continent.

The broad mountain crossing the Pennsylvania-Maryland line includes eastern and western border ridges and an intervening valley. On the western or Blue Ridge side it is built up of sedimentary rocks originally deposited in the sea on the bottom and, it may be, the side of the Appalachian trough. In the intervening valley it consists to a considerable extent of eruptive rocks, which poured out as flows the ancient land surface prior to the existence of the Appalachian trough and before the deposition of the stratified rocks which so largely form the North American continent within the limits of the United States. The elevated eastern side forms the Catoctin ridge, which is capped by a compressed fold of the old shales and quartzites. Both ridges continue south of the Maryland line toward Harpers Ferry and far into Virginia as compressed synclinal folds of the Cambrian rocks, resting on the rocks of the ancient Appalachian trough, the older rocks and the more recent rocks having been involved in the same series of folding. In addition to this folding, numerous thrusts of one mass of rocks upon another are to be found all along the Blue ridge, especially north of the Pennsylvania-Maryland line, in the northern extension of Blue mountain, or the South mountain of Pennsylvania. In some instances the ancient eruptive rocks have been thrust westward, so as to rest upon and above the more recent sandstones and shales which were originally deposited upon them in the bottom and along the shore of the Appalachian trough. Often the pressure has cleaved the massive lavas and formed slates and shales that appear like those deposited in quiet waters. The result of this has been to complicate the geologic structure and topography of South mountain and the Blue ridge, and to make the region one of great interest to both professional and amateur geologists. Erosion has aided their study by cutting away thousands of feet of strata from above the present mountain area and adjacent valleys, and thus laying bare a portion of the ancient shoreline of the Atlantic coast area of Cambrian time and of the foundation upon which much of the present continent is built.

The history of the Blue ridge and its rocks as now interpreted is essentially as follows:* It began long after the first known primitive rocks of the earth were raised into plateaus and ridges to form the platforms of the present continents. At the close of the periods in which the earlier crystalline rocks of the continent were formed, and also the great masses of bedded rocks beneath those containing the Cambrian or oldest known fauna,

*See Am. Journ. Sci., vol. xliv, 1892, pp. —.

that portion of the North American continent then above the sea is thought to have consisted of (1) a large part of what is now the British possessions; (2) a long, broad mountain area (Atlantic) extended southwestward from Newfoundland to the present site of the Gulf of Mexico and it may be the West Indian archipelago, (3) and one or more areas (Pacific) on the western side of the continental plateau, on the line of the present Rocky mountain and Sierra Nevada ranges.* The eastern or Atlantic area and the bed of the interior sea toward the west, in what may be called the Appalachian trough, were then formed of variouss kind of rock, including granite, schists of various kinds, crystalline and unaltered sedimentary rocks and, in some localities, of great masses of volcanic material that had been poured out over the surface in very much the same manner as were the relatively recent lavas found in the vicinity of the Yellowstone National Park and in various parts of the Rocky mountain region.

The waves of the interior sea wore away from the western shore of the Atlantic land area various rock materials and deposited them along with that brought in by the brooks and rivers as layers of sand and gravel on the sea-bed all the way from the present site of the Saint Lawrence river to Alabama. In these deposits fragments of the volcanic rocks, schists, etc, were mingled, and spread out in sheets. At times the supply of material was very fine and formed thin layers of mud that afterward consolidated into shales and slates. After a deposition of several thousand feet of this character of materials the water deepened, probably by the subsidence of the bed of the sea, and calcareous muds were deposited during a great interval of time until in places they reached the thickness of several thousand feet. These now form the limestones found in the Cumberland and Shenandoah valleys and their extensions northward to Canada and southward to Alabama. All along this ancient coast line, from Labrador to Alabama, various forms of marine life existed, and their hard parts, such as shells of crustaceans (allied to the living king crab) and other organisms, were buried in the mud and sand.

The deposition of sediments in the sea, immediately west of the Atlantic area, continued until from 12,000 to 40,000 feet in thickness were piled over the ancient sea-bottom, layer upon

*See article on the North American Continent during Cambrian Time, in Twelfth Ann. Rep. U. S. Geol. Survey, 1892, pp. —.

layer, sometimes of one kind of sediment and sometimes of another. These are now found as layers of sandstone, limestone, coal, shale, slate and various combinations of sandstone, shale, etc. With the close of the first great age (Paleozoic) in sedimentation in the Appalachian trough, the earth's forces again became active, and sufficient pressure was exerted from the Atlantic coast side of the continent to raise this great mass of sediments above the sea and to fold it in ridges and hollows, very much as layers of paper or cloth would fold from pressure applied to the edges of the layers if they were partially confined above and below. This was varied, however, in the great rock-masses by the frequent shearing on the line of the folds and the thrusting of masses of rock one over the other, as cards shift over each other under pressure. One of these folds, with minor folds within it, has by subsequent agencies been carved into the Blue ridge.

The epoch of folding was several millions of years ago; so long since that sufficient time has elapsed for thousands of feet of sediments to be deposited in the interior lakes and seas of the North American continent and for animal life to develop from the then highest types of fish and reptile to the higher mammals, at the head of which man stands today.

During the thousands of centuries since the first great Appalachian uplift, the rain, frost, and snow have been at work sculpturing the old land surface and slowly working out the mountains, valleys, and plains. It is not improbable that the process of mountain uplift and that of wearing away the mountains to a relatively level area (baselevel of erosion) may have taken place several times, the intervals of rest between the wearing away of the highland and mountains and the succeeding epoch of uplift being of long duration—so long, in fact, that centuries might pass without effecting a marked change in the relations of the land and sea.

It was not far back, geologically speaking, that the Blue ridge was a part of, and not distinct from, a great plain that was broken by low hills and valleys and drained by streams flowing into a river that occupied relatively the same position that the Potomac does now. The continent was then at a lower level in relation to the sea, and it was not until it became elevated that the Potomac began to cut down into its bed in the old plain and carry out to the ocean the material which filled the areas now represented by the Cumberland and Shenandoah valleys. As this process continued and the river lowered its channel the Blue ridge began to take shape as a distinct feature in the landscape. Slowly but surely the softer beds were broken up, dissolved and carried away, and the harder beds of rock began to project above the ancient plateau. It was only the question of which beds of rock could the longer resist the forces of rain and frost to determine the location of mountains and valleys.

We have thus hastily sketched the evolution of a portion of the continent and the evolution of one of its topographic features as shown by the Blue ridge. This evolution has gone on everywhere. Every ridge, however small; every valley, whether shallow or deep, narrow or broad; every stream-channel all over the surface of the continent, has its history back in the past, and it is by the studies of the geologists that we learn something of that history. It is now nearly forty years since William B. and H. D. Rogers discovered many elements of the structure of the Appalachian mountains; but it was not until within the last few years that the means of correlating and thus interpreting more accurately the structure of the various mountains formed by the lower and oldest series of the sedimentary rocks have been obtained.

During the deposition of the 40,000 feet of sediments in the Appalachian trough many millions of invertebrate animals lived and died along the shore and on the sea-bed. Those that lived in the earlier epochs became extinct and new forms succeeded them, and these in turn were succeeded many times during the vast interval between the first deposit and the closing one before the epoch of the last Appalachian uplift and folding. The remains of the various groups of life now afford the data by which the geologist correlates the various disturbed and often separated masses and determines what were their original relations to each other.

There are hundreds of local details yet to be studied and interpreted, and the work will be done by those who love to study the record of creation in the fragmentary book of nature, where all is written that we know of the past before barbaric man began his imperfect record by myth and legend.

# THE GREAT POPULOUS CENTERS OF THE WORLD

BY

GENERAL A. W. GREELY

The astonishing growth of urban population in the United States during the past decade induced the writer to cursorily examine the tendencies of other countries in this direction, which developed facts indicating very clearly that it is a general and not local migration.

In conducting the research, lists were made of the five hundred or more cities in which the population exceeds fifty thousand, in which doubtless live one-fifth of the fourteen hundred and eighty millions which make up the population of the world. From this list have been selected the hundred cities having the greatest number of inhabitants, and, with one exception (Canton,) no place has been included unless its population has been determined by census. In general, the figures here given agree with those in that most excellent publication, "The Statesman's Year Book." The census year is not uniform, and as it may be said that the growth of cities outside of the United States lies, in general, between one and two per cent annually, the order of rank here given is not absolute.

Of the five hundred cities with a population above fifty thousand, the countries having the greatest number are: United States, 85 India, 76; Great Britain, 72; Germany, 47; Russia, 34; France, 33; Japan, 17; Spain, 16; Austria-Hungary, 15; Italy, 14. Four-fifths of all are situated in these ten countries and one-sixth in the United States. No less than three of the ten cities having a million of inhabitants are in the United States, and also four of the sixteen great population centers of the world. This last designation is here given to cities of more than three-fourths of a million, this dividing line in rank being at once apparent, as there are practically no cities with population between half a million and three-fourths of a million.

*List of the most populous Cities by last Census.*

| Rank. | Census year. | | Population. |
|---|---|---|---|
| | 1891 | "Greater London," England (outer ring)... | 5,633,332 |
| 1 | 1891 | London, England (registration)........... | 4,211,056 |
| | | London, England (central area)........... | 1,022,529 |
| 2 | 1891 | Paris, France.............................. | 2,447,957 |
| 3 | 1890 | "Greater New York," United States*..... | 3,250,000 |
| | 1892 | New York, United States................. | 1,801,639 |
| 4 | .... | Canton, China (estimated).......... ..... | 1,600,000 |
| 5 | 1890 | Berlin, Germany.......................... | 1,579,244 |
| 6 | 1891 | Vienna, Austria.......................... | 1,389,684 |
| | 1891 | Vienna, Austria.......................... | † 1,364,548 |
| 7 | 1891 | Tokio, Japan............................. | 1,161,800 |
| 8 | 1890 | Chicago, United States.................. | 1,099,850 |
| 9 | 1890 | Philadelphia, United States.............. | 1,046,964 |
| 10 | 1889 | Saint Petersburg, Russia (in winter)....... | 1,003,315 |
| | 1889 | Saint Petersburg, Russia (in summer)...... | 845,315 |
| 11 | 1892 | Brooklyn, United States.................. | 957,163 |
| 12 | 1885 | Constantinople, Turkey.................. | 873,565 |
| 13 | 1891 | Calcutta, India (excluding Howrah, 129,800). | 840,130 |
| 14 | 1891 | Bombay, India........................... | 804,470 |
| 15 | 1891 | Glasgow, Scotland..................... ... | 792,728 |
| | | Glasgow, Scotland ...................... | † 565,714 |
| 16 | 1884 | Moscow, Russia......................... | 753,469 |
| 17 | 1891 | Buenos Ayres, Argentine Republic........ | 561,160 |
| 18 | 1891 | Liverpool, England....................... | 517,591 |
| 19 | 1890 | Budapest, Hungary ...................... | 506,384 |
| 20 | 1891 | Manchester, England..................... | 505,343 |
| 21 | 1891 | Melbourne, Victoria...................... | 491,378 |
| 22 | 1891 | Osaka, Japan............................ | 483,609 |
| 23 | 1891 | Brussels, Belgium .... .............. ... | 482,268 |
| 24 | 1887 | Madrid, Spain ........................... | 472,228 |
| 25 | 1891 | Warsaw, Russia......................... | 465,272 |
| 26 | 1881 | Naples, Italy............................ | 463,172 |
| 27 | 1890 | Saint Louis, United States............... | 451,770 |
| 28 | 1891 | Madras, India ........................... | 449,950 |
| 29 | 1890 | Boston, United States ................... | 448,477 |
| 30 | 1890 | Baltimore, United States................. | 434,439 |
| 31 | 1891 | Birmingham, England.... ............... | 429,171 |
| 32 | 1890 | Amsterdam, Netherlands. ....... ....... | 417,539 |
| 33 | 1891 | Lyons, France........................... | 416,029 |
| 34 | 1891 | Marseilles, France ...................... | 403,749 |
| 35 | 1891 | Sydney, New South Wales ............... | 386,400 |
| 36 | 1891 | Copenhagen, Denmark.................. | 375,251 |
| | | Copenhagen, Denmark................... | † 312,387 |
| 37 | 1882 | Cairo, Egypt ............................ | 368,108 |
| 38 | 1891 | Leeds, England.......................... | 367,506 |
| 39 | 1890 | Leipzig, Germany .... ... .............. | 353,272 |
| | | Leipzig, Germany ....................... | † 293,525 |
| 40 | 1891 | Dublin, Ireland (Metropolitan police dist.). | 361,891 |
| | | Dublin, Ireland.. .. ..................... | † 254,709 |
| 41 | 1890 | Munich, Germany ... .................... | 348,317 |
| 42 | 1890 | Breslau, Germany........................ | 335,174 |
| 43 | 1890 | Hamburg, Germany...................... | 329,923 |
| 44 | 1890 | Mexico, Mexico.......... ....... ... | 329,535 |

* Mr. Henry Gannett's figures; this volume, p. 31.

† Excluding suburbs.

*List of the most populous Cities*—Continued.

| Rank. | Census year. | | Population. |
|---|---|---|---|
| 45 | 1891 | Sheffield, England | 324,243 |
| 46 | 1890 | Odessa, Russia | 313,687 |
| 47 | 1891 | Haidarabad, India | 312,390 |
| 48 | 1890 | San Francisco, United States | 298,993 |
| 49 | 1884 | Kioto, Japan | 297,527 |
| 50 | 1890 | Cincinnati, United States | 296,908 |
| 51 | 1881 | Milan, Italy | 295,543 |
| 52 | 1890 | Cologne, Germany | 281,273 |
| 53 | 1892 | Buffalo, United States | 278,727 |
| 54 | 1890 | Dresden, Germany | 276,085 |
| 55 | 1872 | Rio de Janeiro, Brazil | 274,972 |
| 56 | 1881 | Rome, Italy | 273,268 |
| 57 | 1891 | Lucknow, India | 273,090 |
| 58 | 1887 | Barcelona, Spain | 272,481 |
| 59 | 1890 | Cleveland, United States | 261,353 |
| 60 | 1891 | Edinburgh, Scotland | 261,261 |
| 61 | 1891 | Belfast, Ireland | 255,896 |
| 62 | 1890 | Bordeaux, France | 252,415 |
| 63 | 1890 | Stockholm, Sweden | 246,564 |
| 64 | 1878 | Lisbon, Portugal | 246,343 |
| 65 | 1890 | New Orleans, United States | 242,039 |
| 66 | 1890 | Pittsburgh, United States | 238,617 |
| 67 | 1890 | Washington, United States | 230,392 |
| 68 | 1881 | Turin, Italy | 230,183 |
| 69 | 1891 | Antwerp, Belgium | 227,225 |
| 70 | 1891 | Benares, India | 222,520 |
| 71 | 1876 | Bucharest, Roumania | 221,805 |
| 72 | 1891 | Bristol, England | 221,665 |
| 73 | 1891 | Hong Kong, China | 221,441 |
| 74 | 1891 | Montreal, Canada | 216.650 |
| 75 | 1891 | Bradford, England | 216,361 |
| 76 | 1891 | Nottingham, England | 211,984 |
| 77 | 1890 | Rotterdam, Netherlands | 209,136 |
| 78 | 1890 | Detroit, United States | 205,876 |
| 79 | 1887 | Palermo, Italy | 205,712 |
| 80 | 1891 | West Ham, England | 204,902 |
| 81 | 1890 | Milwaukee, United States | 204,468 |
| 82 | 1890 | Magdeburg, Germany | 202,235 |
| 83 | 1891 | Lille, France | 201,211 |
| 84 | 1882 | Alexandria, Egypt | 200,755 |
| 85 | 1885 | Santiago, Chile | 200,000 |
| 86 | 1891 | Kingston-on-Hull, England | 199,991 |
| 87 | 1888 | Havana, Cuba | 198,261 |
| 88 | 1891 | Salford, England | 198,136 |
| 89 | 1888 | Riga, Russia | 195,668 |
| 90 | 1891 | Delhi, India | 193,580 |
| 91 | 1888 | Kharkoff, Russia | 188,469 |
| 92 | 1891 | Mandalay, India | 187,910 |
| 93 | 1891 | Newcastle, England | 186,345 |
| 94 | 1891 | Singapore, Singapore | 184,554 |
| 95 | 1890 | Prague, Hungary | 184,109 |
| 96 | 1891 | Kieff, Russia | 183,640 |
| 97 | 1891 | Cawnpore, India | 183,210 |
| 98 | 1891 | Newark, United States | 181,830 |
| 99 | 1891 | Toronto, Canada | 181,220 |
| 100 | 1891 | Rangoon, India | 181,210 |

In view of the preponderating influence exercised by great cities upon the progress and welfare of the world, it is extremely interesting to note that more than one-half of the cities herein named are either populated by English-speaking races or are under their control. Of these fifty-two cities, two are in Australia, two in Canada, one in China, two in Egypt, thirteen in England, ten in India, two in Ireland, two in Scotland, one in Singapore and seventeen in the United States.

It is not the purpose of this sketch to investigate the causes which particularly favor the enormous aggregations in modern cities, for such causes must be complex, local, and numerous. It is evident, however, at a glance, that the elements of easy transportation and a moderately rigorous climate are the most frequent concomitants, if they are not the predominating causes. As some one not very wisely remarked, "it is fortunate that great rivers run by so many great cities," and in this list but few cities are found which have not facilities for water transportation. By far the greater number of large cities are situated climatically in an average temperature between 45° and 55°. In the parts of Europe and America where these annual temperatures prevail there is one city of 100,000 inhabitants to about every 2,000,000 of population. In Russia there is only one such city to over 9,000,000, and in India one to over 10,000,000 souls.

With but few exceptions the populous cities of the world are the product of the age, as is illustrated by the fact that at the beginning of this century the United States had no city of one hundred thousand inhabitants, while now it has twenty-eight; England had one only, now it has twenty-four.

# OUR YOUNGEST VOLCANO

BY

J. S. DILLER

(*Presented before the Society April 28, 1893*)

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Our youngest volcano is in Alaska. There was an eruption at Bogoslov in October, 1883, and at other points since then, and there can be no doubt whatever concerning the existence of active volcanoes in Alaska. In our own country, exclusive of Alaska, there may be some doubt whether living volcanoes exist.

It is well known to all, no doubt, that the greatest volcanic region in the world lies in the northwestern part of our own country, occupying a large tract in Idaho, Washington, Oregon and California. There were many active volcanoes there during the middle and latter portions of the Tertiary period, and there is still a considerable number of them which can hardly be called extinct.

Frequent reports of volcanic eruption may be seen in western newspapers, but the large majority of them are of doubtful authenticity. There is considerable evidence, however, that in 1842–'43 mount Baker and mount Saint Helens, in Washington, discharged large quantities of "ashes" with which the adjacent country was covered as with a light fall of snow. Professor Davidson, of the United States Coast and Geodetic Survey, and Mr J. S. Hittel report eruptions of mount Baker in 1854, 1858 and 1870. These reports are based on observations made at long range, and so far as I know have not been corroborated by actual ascent of the mountain.

Dr Harkness, of San Francisco, reported to the California Academy of Sciences a volcanic eruption in Plumas county of that state, at a point about ten miles northeast of Lassen peak. He found the trees near the lava were scorched as if by the heat of the lava at the time of the eruption. He visited the locality, and from data he gathered there, with historical evidence from natives and early settlers in the Sacramento valley, he concluded that the eruption occurred in January, 1850.

In 1885 Captain (now Major) Dutton and I visited the region and, approaching it from the same side as Dr Harkness did, saw no reason whatever to doubt his conclusions. A few years previous Major Dutton had studied the active volcanoes of the Sandwich islands, and he was deeply impressed with the newness in the appearance of the lava field and cinder cone northeast of Lassen peak.

Later in the same season I revisited the volcano alone for the purpose of studying the phenomena more thoroughly, and found good reason for believing that it is very much older than was at first supposed.

Pine trees grow from terminal buds in joints at the rate of one joint each year; so it was thought that if we could find a living tree that was well scorched we could climb up and count the number of joints above the scorching and could thus discover the number of years since the eruption.

We started out around the lava field to find a suitable tree, but to our great surprise on the further side of the lava field the scorched sides of the trees were away from the lava, so that it was evident that the scorching was not produced by the lava. A little further examination convinced us that a forest fire had swept through that region from the north and scorched all the trees more or less on that side.

We returned to the cinder cone and, finding large pine trees growing close to the cone, it was doubted whether the trees could have survived so close to the volcano. The question arose as to the thickness of the layer of volcanic sand near the cone where the trees were growing; and with soup-plates for shovels (we had no better in camp) we dug down to find the bottom, but the loose sand caved in and we could not penetrate it. A quarter of a mile away from the base of the cinder cone another attempt was made, and at that distance the layer of volcanic sand was found to be seven feet thick. Of course, it was evident at once that no living trees in the neighborhood could have survived such a shower of hot "ashes." The large living trees must have grown up entirely since the eruption.

Near the cinder cone there are some dead trees which have been partially burned. Examining these it was found that they had not grown on the top of the layer of volcanic sand like the living trees, but that they extended down through this layer to the original soil beneath. The relation of the old and new forest trees, as well as that of the stumps of the older forest, is shown in the accompanying sketch (figure 3).*

It is evident that the tree from the original soil beneath is older than the eruption, and that since the tree was either dead

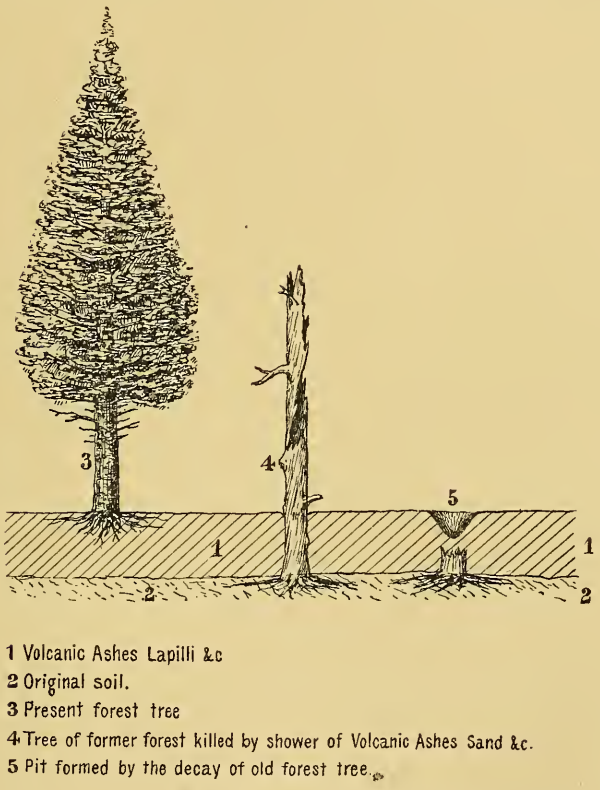


FIGURE 3.—*Relations of older and younger Forests to volcanic Sand.*

or killed at that time and has not completely decayed, that the eruption cannot have occurred many centuries ago. Of the time that has since elapsed we have some measure in the age of the living trees. In the same region the timber is cut for lumber, and by counting the number of rings of growth it was found that the

* Reproduced from Bulletin 79, U. S. Geol. Survey, 1891, p. 20.

largest trees near the cinder cone are not less than 200 years old, so that the eruption at the cinder cone must have occurred a little more than 200 years ago.

On the whole, it would seem probable, therefore, that our youngest volcano south of Alaska is not the cinder cone ten miles northeast of Lassen peak as once supposed, but is most likely to prove to be mount Baker, in Washington.

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THE

# NATIONAL GEOGRAPHIC MAGAZINE

# PROCEEDINGS

OF THE

# INTERNATIONAL GEOGRAPHIC CONFERENCE

IN

# CHICAGO

JULY 27-28, 1893

WASHINGTON
PUBLISHED BY THE NATIONAL GEOGRAPHIC SOCIETY

Price 75 cents.

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# PROCEEDINGS OF THE INTERNATIONAL GEOGRAPHIC CONFERENCE IN CHICAGO

JULY 27-28, 1893

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## CONTENTS

## *INTRODUCTION.*

Inasmuch as the World's Columbian Exposition, held at Chicago, Illinois, from May 1 to October 30, 1893, was in commemoration of the greatest geographic discovery of recorded history, the National Geographic Society felt that in some manner American geographers should participate therein. Since space and means were lacking for the installation and maintenance in the Columbian Exposition of a geographic exhibit fittingly illustrating the evolution of geographic discovery and exploration in the American hemisphere, it became necessary to devise other means of celebrating the discovery of our hemisphere by Columbus.

For these reasons the President and Board of Managers of this Society took into consideration the advisability of participating in the series of remarkable congresses which were to be held at Chicago during the period of the Exposition. It was thought that a separate congress of geography was inadvisable and that a meeting to be designated a "Conference of American and European geographers," should form a section of the World's Congress of Education. This decision was formally approved by the Society, and action in accordance therewith was promptly initiated.

The Board of Managers decided that this conference should be held under the auspices of the National Geographic Society, and with this view appointed the following committee with full powers in the premises: The Honorable Gardiner G. Hubbard, General A. W. Greely, Dr T. C. Mendenhall, Professor W. B. Powell, and Professor T. C. Chamberlin.

The United States Commissioner of Education, the Honorable William T. Harris, President of the World's Congress of Education, cordially approved of the plans of the committee and offered all possible facilities for their satisfactory completion. The preliminary notices were incorporated in the program of the World's Congress of Education. The Hall of Washington, Art Institute Building, was assigned as a place of meeting, and two days, Thursday and Friday, July 27 and 28, 1893, were set apart for a "Conference of American and European geographers" by authority of the Congress of Education.

Formal invitations, in the name of the National Geographic Society, were extended to the principal geographic societies of the world to participate in the Conference by delegates, or by the presentation of memoirs, and many favorable replies were received. The Conference met on the designated day ; its proceedings were marked by a degree of interest and an attendance quite beyond the expectations of the committee, and it is believed that it exercised a material and beneficial influence toward the study of geography in the United States.

With a view of affording variety to the meetings, and also of utilizing, in the interests of the Conference, the numerous objects of geographic interest in the Columbian Exposition, it was decided that the sessions of July 27 should be held in the Art Institute Building, Chicago, and those of July 28 within the Exposition grounds.

As this Conference was the first international meeting of geographers in America, the Board of Managers of the National Geographic Society deem it proper to publish, under the auspices of the Society, the record of this Conference, together with such of the memoirs as it has been found practicable to incorporate therewith.

Among the countries and societies which showed their lively interest in the Conference by designating delegates are the following :

*BRAZIL.*

Instituto Historico Geografico y Ethnografico (Rio de Janeiro) ; delegate, Baron de Marajo.

*FRANCE.*

Société de Géographie (Paris) ; delegate, M E. Levasseur, Membre de l'Institut.

Société de Géographie de Lille ; delegate, M Paul le Blau.

*ENGLAND.*

Royal Geographical Society ; delegate, Colonel Sir Casimir S. Gzowski, K. C. M. G.

Manchester Geographical Society ; delegate, Mr James D. Wilde, Member of the Council.

*MEXICO.*

Sociedad Mexicana de Geografia y Estadistica; delegate, Señor Dr D. Inau N. Navarro, Consul-General of Mexico at New York.

*PORTUGAL.*

La Sociedade de Geographia de Lisboa; delegate, Mme Regina Maney.

*SCOTLAND.*

Royal Scottish Geographical Society; delegates, Dr George Smith, C. I. E., LL.D., Member of the Council, and the Honorable John Abercrombie.

*UNITED STATES.*

American Geographical Society (New York); delegate, Professor William Libbey, Junior.

The Geographical Society of the Pacific (San Francisco); delegate, Professor George Davidson, of the United States Coast and Geodetic Survey, President of the Society.

The National Geographic Society was represented by the Honorable Gardiner G. Hubbard, President, and General A. W. Greely, U. S. Army, Vice-President, as delegates; Miss E. R. Scidmore and Mr F. H. Newell, Secretaries; Professor William B. Powell, of the Board of Managers; Major J. W. Powell, Director United States Geological Survey; Colonel F. W. Parker, and others.

## *MINUTES OF THE CONFERENCE*

F. H. NEWELL AND ELIZA R. SCIDMORE, *Secretaries*

The sessions were opened in the hall of Washington, Art Institute building, Chicago, at 10 o'clock a m, July 27, 1893. There were present about four hundred individuals, including delegates and invited guests.

The Honorable Gardiner G. Hubbard, President of the NATIONAL GEOGRAPHIC SOCIETY, was called to the chair as presiding officer of the Conference, and Mr F. H. Newell was appointed Recording Secretary.

Several communications from societies and individuals were laid before the Conference.

The Royal Geographical Society, through its Secretary, Mr J. Scott Keltie, expressed its sincere regret that it could not be represented by a member of its Council in addition to the regular delegate, Sir C. S. Gzowski.

The Royal Scottish Geographical Society, through its Secretary Colonel Fred. Bailey, offered its congratulations to the Conference and expressed its cordial good wishes for the success of so important an assemblage.

Dato Sri Amar d'Rajah, of the Johore Commission, regretted that his unexpected departure for Europe prevented him from reading a paper on Johore. On the part of the Johore Commission he expressed the hope to be able shortly to present the first complete map of Johore ever published.

Baron de Marajo, delegate of the Instituto Historico Geografico y Ethnografico de Rio de Janeiro, expressed the very lively interest of himself and the society he represented in the Conference, and presented nine volumes of geographic researches, etc, published by his society. While he could not then speak on the geography of Brazil, he promised a memoir thereon for future publication.

Señor Graciano A. de Azambuja, Commissioner from Brazil, congratulated the Conference on its meeting, and promised for publication a paper on the development of southern Brazil.

M E. Levasseur, Membre de l'Institut, delegate from the Société de Géographie of Paris, wrote from New York that impaired health prevented his attendance, greatly to his regret. His thirty years of geographic study and research inspired him with an intense desire to participate actively in the discussions of the Conference. He had hoped to set forth the importance of economic geography, and enclosed a bibliography of his works.

General John Eaton, formerly United States Commissioner of Education, took the Chair and presented to the Conference the Honorable Gardiner G. Hubbard, who made the opening address, treating of the relations of the currents of air and water to the temperature of countries and to animal and vegetal life.

Honorable John Abercrombie, delegate from the Royal Scottish Geographical Society, spoke briefly as follows:

Mr President, Ladies and Gentlemen: Though here to represent the Royal Scottish Geographical Society I had not intended to address the Conference, as I am not a professional geographer, and indeed have only been actively associated with the work of the Society for less than a year; I come rather to pick up information than to impart it, rather in the capacity of an absorbent sponge than as an overcharged rain-cloud. Such being the case, I confine myself to giving a brief summary of the origin and work of my own Society.

The Royal Scottish Geographical Society was formed some nine or ten years ago with the laudable object of educating the Scottish public in the subject of geography and of keeping them thoroughly informed of the progress made in the subject in all parts of the world through the medium of a monthly magazine, which I am glad to say has also a certain circulation in the United States. Some of the earlier numbers contain valuable papers on the various methods employed by map-makers to overcome the inherent difficulty of transferring geographic points on an irregular globular surface like the earth to a flat surface like that of a map. Other technical matters have also been treated of at various times, so that the magazine has a real educational value apart from the papers descriptive of travel, adventure and the strange habits and customs of savage peoples. Our late secretary, Mr A. Silva White, contributed more than one monograph on the geography and history of that part of eastern Africa in which Great Britain and Germany are more nearly interested, and they will always possess a permanent value, In order to popularize the subject as much as possible, papers are read monthly before the members of the Society and their friends for nine months every year. Most of the explorers who have read papers before the Royal Geographical Society of London are willing to speak before us in Edinburgh as well as at our branch societies at Glasgow and Aberdeen. The first speaker to address our new-born Society was Mr Stanley after his return from one of his earlier travels of exploration in the great African continent; and the session this year was expected to close by an address from Lieutenant Peary, on his projected expedition in the direction of the North Pole. Unfortunately a letter arrived from him shortly before I left home expressing regret that owing to unforeseen circumstances he was obliged to abandon his scheme of coming to lecture in Great Britain before the departure of his expedition.

I ought not to omit to mention that though we are a private society and receive no aid from the government, our library and the privilege of consulting maps, books and consular reports is freely opened to the public. Considerable use is made of these facilities by persons engaged in commerce, and almost daily our librarian is consulted by those who are not members of the Society, but are desirous of obtaining commercial information in regard to foreign countries. In this way the Society distinctly benefits the public. Another way in which the public may receive instruction free of cost is by courses of lectures on physical geography or geology in relation to geography, on the distribution of plants and animals over the globe, and other kindred subjects. These lectures are given either by a member of the Society or by some other competent person, and are generally well attended, especially by the young and by the fair sex.

The most important work on which a committee of my Society is now engaged is a thorough and complete revision of the spelling of the Gaelic and worse names in northern Scotland, in conjunction with the director of the Ordnance Survey of the United Kingdom. On existing maps the Gaelic names are not always given correctly; the spelling is irregular, and when given correctly cannot be pronounced properly by a person ignorant of Gaelic and its remarkable spelling. For instance, in the island of Skye the Cúlin hills are spelt on the ordnance map Cuchulin, as if they were called after the old Irish hero of that name, though they have never received that designation from the people of Skye. The committee is proceeding in this manner: Every local name on the map is submitted to three or four of the oldest men in the parish, and their pronunciation is taken down by a person speaking Gaelic. In this way the local pronunciation is surely fixed, and if the words have a significant meaning they can easily be written in standard literary Gaelic if that should differ from the local pronunciation. As I am not on the committee myself, I am not certain whether the words are to be given phonetically on the map or according to literary usage in Gaelic; but I have no doubt that they ought to be rendered phonetically, so that even those unversed in Gaelic would be able to read them correctly. Old Irish was written as it was pronounced, but unfortunately the faddists of the sixteenth century—for there were faddists even in those days—invented an absurd rule, opposed to every philological principle, and still in force, which they called in Irish or Gaelic, "*caol ri caol, leathan ri leathan;*" that is to say, if there is a slender vowel, an *e* or an *i*, in the first syllable, then the first vowel of the next syllable must be slender. Similarly, if the vowel of the first syllable is broad, as *a*, *o*, *u*, the first vowel of the second syllable must also be broad. These extraneous, inorganic vowels do not affect the pronunciation, and in a reformed spelling ought certainly to be omitted. Another fruitful source of inaccuracy in writing Gaelic words arises from spelling in accordance with a fanciful and in reality a baseless etymology. The dictionary of the Highland Society and O'Brien's Irish Dictionary are full of examples of this sort, though there is this excuse for them, that both were compiled before philology became an exact science and before old Irish of the ninth and tenth centuries was known to the learned world. The task which the committee has to accomplish is therefore by no means an easy one.

Another subject which the Royal Scottish Geographical Society has had under consideration, though no action has yet been taken, is one that relates to lake basins. On all our ordnance maps the configuration of the earth's surface always ceases with the surface of the water; no soundings are given, no under-water contours, and all knowledge of the bottom of the lakes is left to the imagination. Such a state of things is clearly inexcusable, but unfortunately the funds of the society are insufficient for the task. The Admiralty, which considers fresh-water lakes beyond its province and draws the line at salt water, has been applied to but without success, and so for the present the subject is in abeyance.

General A. W. Greely, chairman of the committee on awards of prizes of THE NATIONAL GEOGRAPHIC SOCIETY, made an announcement of the progress of the committee and of the steps taken to call public attention to the generous offer of the Society.

The chairman then introduced Mme Regina Maney, delegate from La Sociedade de Geographia de Lisboa, who made a few remarks concerning the attitude of that society and of the Portuguese people toward the Conference.

General John Eaton, ex-Commissioner of Education of the United States, presented the following address on the relations which may or should exist between THE NATIONAL GEOGRAPHIC SOCIETY and geographic instruction.

MR PRESIDENT, LADIES AND GENTLEMEN: Voluntary activity in America for the benefit of mankind has an almost boundless opportunity.

THE NATIONAL GEOGRAPHIC SOCIETY, as one of our voluntary agencies, has proposed to itself as one of its object the promotion of the knowledge of geography among the people of the United States.

Geography in its narrower sense, as a description of the surface of the earth which we inhabit, lays under contribution various sciences, and includes topics of deep interest. Its literature is not a collection of meaningless words. Geographic discovery with its thrilling adventures is by no means at an end. But geography in its larger sense not only includes as is said, "The forms and measures of the earth, its astronomical relations, the relative positions and distances of places, and the representations of the whole or portions of its surface on globes or maps," which is known as mathematical geography; it describes as well "The principal features of the earth's surface as consisting of land and water, its atmosphere, its climate, and its various animal and vegetable and mineral productions," which is called physical geography; it also considers "The earth as the abode of mankind," and treats of all that relates to the moral or social condition of the different races or nations which dwell upon it. So comprehensive is geography in its bald definition.

As mankind in all conditions must have a definite habitat on the face of the earth, so knowledge in all its forms has a local habitation. Shakespeare has taught us that when the poet would make real "Forms of things unknown," he gives

> To airy nothings
> A local habitation and a name.

Herein is recognized a law with which both the action of mind and the logic of the subject of thought are in accord. This fact is of supreme importance to the educator. He who has the facts in human progress fixed in the place where they occurred has a ready index to the history of mankind—to what man has thought and done. He may at will call up any actor, event, science, or philosophy. He has only to introduce the element of time to unfold, in order and at will, the record man has made for himself as he has ordered his ways under the hand of his Creator. Naturally, as the oak springs from the acorn, the human mind follows the tree from the seed to the fruitage, and in obedience to this law we have, in teaching, the historical method. Naturally, too, the mind looks on this and on that and compares one with another, and in obedience to this law we have, in teaching, the comparative method.

Geography can furnish from its stores untold data adapted to use in both of these methods most essential to successful instruction. Out of its data may be drawn in the greatest abundance that which is fitted to the attention and understanding and to awaken the interest of beginners in school and of those of any grade of progress. If this view is correct, it cannot be doubted that schools among us have treated geography and related subjects most unfitly. As a result, there has been inattention where there should have been attention, dullness where there should have been enthusiasm, waste where there should have been gain. Let geography be put in its proper place and treated according to sound pedagogical principles, and all that pupils acquire of what man is and what man has thought and done will be gained, with less waste of time, energy and purpose and with far more satisfactory results, in other subjects of instruction. Geography, if rightly taught, will furnish the pupil what is needed for nourishment of mind on the one hand, and for discipline on the other. It will not unbalance the faculties; it will not cultivate reason to the injury of memory, or reflection to the destruction of expression, or *vice versa*.

Here, therefore, in this Department of Education, there is most ample scope for the efforts of the NATIONAL GEOGRAPHIC SOCIETY.

Voluntary in its methods of action, it may move with all the freedom consistent with good reason. It has before it as its objects, (1) The perfection of geography itself; (2) The dissemination of the data of geography; (3) The selection of the data and their adaptation to other subjects of instruction and to the best results in teaching; (4) The training of all teachers in the right knowledge of the subjects and in the best methods of teaching them for pupils in all grades; and (5) The devising and use of all objects, graphics or stereoptics, and other aids in illustration to make most effective the presentation of places, persons, events, and their relations. Thus, travel will unite instruction with diversion. For the student, man, races, nations will arise and take their places on the stage of action in their true relation and character.

The National Geographic Society, voluntary in its character as we have noticed, in promoting its great ends by improving the methods of education, may ally itself with all coöperative official agencies. Its purposes are most strictly in accord with the statutes regulating that great disseminating agency, the United States Bureau of Education, now so ably and efficiently administered by its Commissioner, the Honorable W. T. Harris. By the aid of the facilities of that Bureau and the great confidence reposed in it, the Society may bring its helpful service, by its leadership, prizes, lectures and publications, to the aid of every teacher and school in the land; other nations, too, may gain its coöperation; and thus it may accomplish the great and beneficent purpose of its honored president and his collaborators.

Following General Eaton's address the Chairman announced: We have with us to-day a friend who promised to speak provided his name was not placed on the program. He will now address you; Major J. W. Powell, Director of the United States Geological Survey.

Major Powell addressed the Conference as follows:

Mr President, Ladies and Gentlemen: The occasion on which we meet, the anniversary of the discovery of America by Columbus, notes a great geographic event, the greatest event of human history. It had a wonderful influence on the world, this discovery of America of which you have heard so much during the past year; and it had an influence in a direction which perhaps you have not considered.

Prior to the discovery of America, all the humbugs of the world gathered under the skirts of religion. If any man had a nostrum which he wished to vend or a doctrine which he wished to inculcate, he claimed that it was a revelation from heaven. Somehow or other the discovery of America changed all that. Up to that time the people of the world had not believed the earth to be round. Here and there a scholar believed it, but the teachings of scientific men and scholars had but little effect on the world at large. When Columbus proved by sailing across the sea that the earth is actually round, that it is in fact a globe, so that the great multitude of people themselves came at last to believe it, it made science respectable; and when the feat of Columbus had the effect of making science respectable, people came ultimately to place on the shoulders of science the responsibility for all the humbugs of the world. If a man now has a wonderful nostrum which he wishes to vend, he does not say it was revealed to him by heaven, but it was taught to him by science; if a man wants to bombard the heavens for rain, it is scientific to do it; if a man wants to recover the lost rivers of the arid regions, he has some scientific theory on which to do that work. So science has come at last to be the bolster and the foundation of very many of the humbugs of the world.

That is not all. Science has gone forward to accomplish something, and since the time of Columbus science has accomplished much in the great field of geography. The earth has three envelopes, movable, ever-changeable, moving vertically and moving horizontally. There is one envelope of air, another of water, and another of rock. These three envelopes are changing their positions, moving back and forth over the surface of the earth horizontally, and rising and falling forever; three great classes of movements are discovered on the surface of the earth—one in the air, one in the water, and one in the rocks themselves. We study the movements of the atmosphere in modern scientific geography, and have learned much about them. Your president has to-day learnedly placed before you some most interesting results of scientific investigations in relation to the movements of the atmosphere and the movement of the waters of the earth. As the winds blow about the earth, and the air rolls in vertical movements, storms gather and hurricanes blow here and there, and thus we find that the whole aërial envelope is forever in motion. In a similar manner the watery envelope is forever in motion; it is not alone moving in currents in the ocean and in great rivers, but it is forever moving vertically. In some portions of the earth 20 inches of water are evaporated every year, and in other portions 120 inches, and the envelope of water, varying from 20 to 120 inches in thickness, is lifted into the heavens and descends again as rain every year.

There is a third envelope of the earth, which is in the same manner in motion: Modern geography is no longer engaged simply in the study of the position of geographical localities, no longer engaged solely in measuring the depths of the seas and the heights of the mountains, no longer engaged in simply delineating the currents of the seas and the winds which blow about the earth, but modern geographic science has come to study the origin of the land areas and the reason why the rivers run where they do and why the waters circulate as they do, and it is especially throwing vast light in modern times, in the last decade or two, on the origin of land forms; it is classifying valleys, it is classifying plateaus, it is classifying mountains and hills and explaining their origin, it is classifying islands. This study of physiography, this new branch of the study of geography, is being cultivated in many lands, and it has discovered that there is an envelope of rock moving horizontally with the waters as the rivers wash the hills and valleys and mountains, and moving vertically by upheaval from beneath and by the pouring out of volcanic lavas from below; so that the three movable envelopes of the earth, the air, the water and the geologic formations of the rocky envelope, are forever in motion, and the laws of these motions are being studied. It is thus that a new theme is being introduced into the study of our schools; and the reason that geography is in this Conference allied with education is that these new facts, new laws, new principles of this systematic knowledge in relation to the earth, are to be introduced into our schools; and it forms a theme of wonderful interest.

Colonel Francis W. Parker, principal of the Cook County Normal School, read a paper entitled "The Relation of Geography to History." It is printed on later pages.

Captain Magnus Andersen, of the ship *Viking*, delivered an address on "Norway and the Vikings." This address also will be found on later pages.

At 1 p m the session was adjourned for two hours.

AFTERNOON SESSION, *July 27, 1893.*

At 3 p m the Conference was resumed, about 200 persons being present.

The first paper, "Geographic Instruction in the public Schools," was by Professor W. B. Powell, Superintendent of Public Schools, Washington, D. C.

Professor T. C. Chamberlin, representing the University of Chicago, read an essay on "The Relations of Geology to Physiography in our educational System."

Professor William Libbey, Junior, delegate from the American Geographical Society of New York, spoke briefly on "The Relations of the Gulf Stream and the Labrador Current off the New England Coast," describing his researches into the effect of these currents on the distribution of food-fishes.

Mr F. H. Newell, United States Geological Survey, read a paper entitled "The arid Regions of the United States."

These communications appear among the "memoirs and addresses" appended hereto.

The session was then adjourned until 8 p m.

EVENING SESSION, *July 27, 1893.*

At 8 p m President Hubbard introduced General A. W. Greely, United States Army, who delivered an address on interpolar expeditions, making especial reference to his own expedition, the explorations of Lieutenant Lockwood and the terrible sufferings and partial destruction of the party on their retreat.

There were about 500 persons present.

At 9.30 p m the Conference adjourned to meet next morning at the monastery of La Rabida, in the Fair grounds, Jackson park, and afterward to continue the session at 11 a m in Recital hall.

FRIDAY, *July 28, 1893.*

The members of the Conference met in Jackson park, where, through the courtesy of Mr William E. Curtis, chief of the Latin-American department, they had the exclusive use of the monastery of La Rabida from 9 to 11 a m. Mr Curtis and Captain John G. Bourke, United States Army, escorted the members through the monastery and explained the precious collection of historical papers there exhibited.

At 11 a m President Hubbard called the session to order in Recital hall, introducing Miss E. R. Scidmore, who read a paper entitled "Recent Explorations in Alaska," printed elsewhere.

Dr Adolph Ernst, Venezuelan Commissioner to the World's Columbian Exposition, delivered an address on "Venezuela," and Ensign Roger Welles, Junior, United States Navy, described a trip up the Orinoco river.

Dr Emil Hassler, Paraguayan Commissoner to the Exposition, was present, but asked to be excused from attempting an address in English.

The Brazilian commissioners to the World's Columbian Exposition, Señor Graciano A. de Azambuja and Baron de Marajo, while expressing their highest regards, also made their apologies for not participating more fully.

At 1 p m the meeting adjourned until 3 p m.

Afternoon Session, *July 28, 1893.*

Present about 100 persons. President Hubbard first introduced Captain John G. Bourke, United States Army, who read a paper on the history of the old monastery of La Rabida, describing the changes in that part of Spain in which it is located.

Paul B. du Chaillu then spoke of his travels among the Norsemen and of the character of their ancestors, the Vikings.

Captain Victor Maria Concas, commandant of the Spanish caravels, related what is known of the history of the caravels of Columbus, and upheld the Spanish sovereigns and their court.

Mr Frederick A. Ober read a paper entitled "In the Wake of Columbus," reciting his searches for relics of Columbus and his examinations of the places at which Columbus probably landed.

Honorable William E. Curtis, in a paper entitled "Recent Discoveries in the Archives of the Vatican regarding early Norse Voyages to America," described his successful search for records regarding the probable early Norse voyages to America, and stated that there was evidence there showing a knowledge of land in the direction of North America.

Several of these papers are appended.

The representative of the Rajah of Johore was not able to be present, owing to an unexpected call to London.

At 5 p m the Conference adjourned *sine die.*

# *MEMOIRS AND ADDRESSES*

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## RELATIONS OF AIR AND WATER TO TEMPERATURE AND LIFE

BY

HONORABLE GARDINER G. HUBBARD

PRESIDENT OF THE NATIONAL GEOGRAPHIC SOCIETY

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### *Circulation of Air and Water.*

It was said in olden times, "The wind bloweth where it listeth, and thou hearest the sound thereof, but canst not tell whence it cometh and whither it goeth."

That which was unknown, science hath revealed. The wind in its currents is governed and directed by laws as fixed as those of the solar system. If a moisture-laden wind passes over the country it leaves the land fruitful; but a dry wind leaves it barren. The currents of air are among the most important factors in the physical geography of our earth, affecting not only soil and climate but also vegetal and animal life.

The winds obtain their moisture through evaporation, which goes on everywhere and at all times; in the equatorial and polar oceans, from the rich cultivated soil and the arid desert, from the valley and the snow-clad mountain. Reclus tells us that the evaporation from the equatorial ocean is from 13 to 16 feet a year. This estimate is confirmed by the United States Geological Survey, which found the evaporation from the southern Colorado river to be 102 inches, or nearly 9 feet in a year. The quantity of water evaporated from the land must be very large, as only about two-fifths of the rainfall is returned by the rivers to the ocean. A great part, probably more than one-half of this quantity, is reëvaporated to fall the second and third time as rain.

The movements of the atmosphere depend either directly or indirectly on differences of temperature; without these differences the air and ocean would be stagnant. There is a constant interchange of atmosphere between the equator and the poles. Cool air from the north blows toward the equator, first in a southwesterly, then in a westerly direction, crossing the Atlantic about the tropic of Cancer. Cool air from the south blows in a northwesterly and westerly direction, and crosses the Atlantic near the equator. The difference of solar accession between the equator and the poles gives the northward and southward motion to these currents; the revolution of the earth on its axis gives the westerly motion.

These air currents are the great trade winds which wafted Columbus across the Atlantic and Magellan across the Pacific. The trade winds of the northern Atlantic are about 20° in width from north to south; those of the southern Atlantic are not quite so wide. These winds oscillate northward in August and southward in February, following the sun. Between the trade winds of the north and the trade winds of the south there is a zone of calm.

While the winds blow over the land as well as over the ocean, their movements, interrupted by hills and mountains and affected by temperature, lose that broad sweep and uniformity so characteristic of the ocean.

Return currents of warm air blow across the ocean from the torrid zone toward the northeast in the northern Atlantic, and toward the southeast in the southern Atlantic. The trade winds, or equatorial currents, blow around the world from east to west; the polar currents blow from west to east.

The great ocean currents follow the same general courses as the wind system. Their movements are initiated by differences in density, caused chiefly by temperature and by evaporation; yet the larger part of the motive power is derived from the wind. These movements have been ascertained by years of observation on vessels in every ocean, sea and gulf, by the cumulative evidence of drifting objects, some of which have had their influence on the spread of vegetal and animal life and even civilization itself, and by the researches of scientific exploring expeditions to polar regions and remote islands. These oceanic movements are as well understood as those of the great atmospheric ocean above us.

When water has acquired its movement, the configuration of the bottom of the ocean and of the shore line, the rotation of the globe on its axis, and the direction and velocity of the wind modify its movement.

*South America.*

By this circulation the equatorial waters of the Atlantic blow across that ocean, impinge against the coast of South America, and are deflected northward and southward. The southeasterly trade winds blowing over it become surcharged with moisture and pass directly up the valley of the Amazon, watering the earth with frequent rains for 2,000 miles to the foot-hills of the Andes, where some of this moisture is deflected by the mountains southeastward to water southern Brazil; the remainder ascends the slopes of the Andes until it is condensed and falls as rain and snow, and only dry winds blow across the comparatively narrow plains between the Andes and the Pacific. The vapor from the Atlantic falling in rain over the valley of the Amazon and along the eastern slope of the Andes and the Cordilleras flows back to the ocean through the Orinoco, the Amazon and la Plata, and makes the interior of South America one of the richest countries of the world.

The Amazon, a great mediterranean sea as it is often rightly called, is projected into the heart of the continent. Its total fall from the foot-hills of the Cordilleras to the ocean is not over 300 or 400 feet, affording for the largest vessels uninterrupted navigation and innumerable harbors for 1,500 miles into the interior, and 1,000 miles further for smaller vessels. The aggregate navigable waters of the main stream and its tributaries are estimated at 50,000 miles. The moist winds abundantly water the valley and modify its climate. Their influence in tempering the climate is felt directly more than 1,000 miles up the valley, and indirectly still further, through the shadows thrown by the clouds and through the rainfall and the cooling effect of the drops of rain falling from a high altitude. It is from 8° to 10° cooler than on either side of this rain belt, and it is more healthful than other equatorial regions. The tropical woods are so thick and the creepers and undergrowth so luxuriant that animal life is almost entirely confined to the trees above and the waters below. Nature has thus far been more powerful than man, who has struggled in vain to subdue this fertile valley to his use.

The winds that pass up the valley of Rio de la Plata to the mountains of Peru, Bolivia and Argentina are not so heavily charged with moisture as those of the Amazon valley; consequently the thick forests and dense vegetation gradually disappear, and, instead of an inland sea, there are vast plains or pampas, over which roam herds that could not live in the valley of the Amazon. Thus the difference in the rainfall changes the entire vegetal and animal life.

Through the center of South America, from the Caribbean sea to the straits of Magellan, there is a vast stretch of lowland through which run the waters of the Orinoco, Amazon and la Plata, with low divides between their valleys. A boat can pass up the Orinoco, thence by Cassiquiare river to the Rio Negro, a branch of the Amazon, thence through the Amazon and its branches to a low divide between the valleys of the Amazon and Rio de la Plata. Here there is a carry of six or eight miles, and then continuing down la Plata to the Atlantic ocean, the traveller may make a water journey of over 3,000 miles between the Cordillera and the eastern plains of South America.

The easterly currents flowing from the Antarctic pole are deflected by Cape Horn along both the eastern and western coasts of Patagonia. On the eastern coast the winds blow off shore, leaving that coast arid. The westerly current, as it approaches the tropics, is deflected further westward and forms the greatest of the equatorial currents. The moisture of the winds that blow over this antarctic current is precipitated on the cool shores of Patagonia and lower Chile, and these countries are correspondingly enriched, while the same winds continuing over the heated plains of upper Chile, Peru and southern Ecuador are rarefied and take up what little moisture there is in these plains, to be afterward condensed and precipitated on the mountain slopes.

From this cause the western coast of South America for the 3,000 miles from lower Chile to upper Ecuador is dry and barren, and would be uninhabited except for the mines of gold and silver in the mountains and the deposits of nitrates and guano along the coast and on the islands. Yet the rainfall in South America is greater than in any other part of the world, and more than twice as great as the rainfall in Asia.

## *North America.*

The northern equatorial current, less powerful than the southern, crosses the Pacific about the tropic of Cancer, where it is deflected by Japan, and flows northward as the Kuroshiwo current, recrossing the Pacific in a northeasterly direction.

The Pacific ocean is so wide that it is doubtful if this current would reach the American coast were it not for the drift caused by the wind which blows across the Pacific with strong and steady force. When it strikes the shores of North America it is feebler and has a lower temperature than the Gulf stream of the Atlantic ocean on reaching the coast of Europe.

The currents of wind strike the coast between the fiftieth and fifty-fifth degrees of north latitude, the region of greatest rainfall, and are in part deflected northward and southward by the Coast range of mountains; the remaining portion blows over the mountains and up the valley of the Columbia. Continual fogs and rains abound on these shores, and the coasts of southern Alaska, British Columbia, Washington and Oregon are covered with the densest and largest growth of evergreen forest in the world. These winds prevail as far southward as the latitude of San Francisco, where the southeasterly trade winds commence and blow off-shore, leaving southern California and the western coast of Central America a zone of calms, dry and barren.

While the western coast of the continent is bathed by the waters of the Pacific, its eastern shores are washed by the equatorial current of the northern Atlantic, which flows around the West India islands, through Caribbean sea and the Gulf of Mexico. The trade winds from the Gulf of Mexico water the eastern coasts of Central America and Mexico, and impinging on the mountains of the interior are deflected toward the north and east over the southeastern states and up the Mississippi valley, where they unite with the warm winds which blow directly up the valley from the Gulf of Mexico, and water the valley of the Mississippi. The rainfall in the upper part of the valley is derived largely from the Rocky mountains, the waters of the Pacific carried by the winds and deposited on the Rocky mountains as rain and snow being again evaporated and carried eastward to fall as rain.

This great valley extends from Canada southward to the Gulf of Mexico, and from the Rocky mountains eastward to the Alleghanies; it is 1,500 miles long and about 2,000 miles wide, the largest and richest valley of the temperate zone.

A very low and narrow divide separates the Mississippi valley from another great valley extending from the Rocky mountains eastward, with a gentle slope to Hudson bay and the Atlantic. It is as long from west to east as the valley of the Mississippi is from north to south, and is from 500 to 600 miles wide. The western portion of this plain is drained by Saskatchewan river. The winds which blow over this valley from the Rocky mountains in some years water imperfectly the western portion of this plain, but with a copious rainfall the land yields abundantly; the eastern portion is watered from Hudson bay, lakes Winnipeg, Manitoba and the other large lakes of that province. As the climate is cold, less rainfall is required than in the valley of the Mississippi.

Another very low divide separates this valley from the great plain, 2,500 miles long, descending with a gentle slope to the Arctic ocean, through which runs the Mackenzie river. The winds that blow from the Arctic ocean fall in rain and snow in this valley.

Thus through the center of America, from the Arctic to the Antarctic oceans, there are no high elevations, while there is a more uniform distribution of rainfall and temperature than on any other continent.

From the Arctic ocean cold currents of water flow along both the eastern and western coasts of Greenland and bear immense icebergs and fields of ice southward until they meet the warm waters of the Gulf stream, when the ice melts, causing fog banks and depositing the débris brought from the Arctic glaciers, thus aiding in the making of the great fishing banks of Newfoundland. The Arctic current, still cold, runs southward inshore from the Gulf stream, and affects the climate of North America to the latitude of New York if not to Cape Hatteras.

From the Caribbean sea and the Gulf of Mexico the Gulf stream passes around Florida and flows along the southern Atlantic States. The currents of air from the Gulf stream blow over slightly cooler waters and deposit rain on the eastern side of the Alleghanies and water the eastern coast of the United States.

### *Europe.*

The main Gulf stream is deflected, by the shape of the ocean bottom and the contour of North America, northward and eastward toward Europe; but its drift is largely increased by the winds. The drift from the southward sets around the North cape of Norway, 71° north latitude, keeping the coast free from ice all the year round, and is felt in the Kara sea. It is by means of this current that Nansen hopes to be borne through the Kara sea and from the Lena delta by way of the north pole to Greenland.

The winds that blow over the Gulf stream, water the western coast of France, Great Britain and Scandinavia, and temper the climate of these northern regions to such a degree that Stockholm and St. Petersburg have become great cities, while in a lower latitude in Labrador, on the other side of the Atlantic, "The country is so rocky and rough and the temperature so intensely cold in the winter (lower than the inhabited parts of Greenland) that Labrador would be worthless and uninhabitable except for the seals and fish." These currents are deflected by the coasts of France and Spain toward the west and are drifted in different directions by the wind, watering the eastern coasts of Spain and Portugal, but having precipitated their moisture they leave the high lands of Spain dry, cold in winter and hot in summer.

In the Mediterranean the evaporation is much greater than in the Atlantic ocean; its water is therefore salt and heavier. To supply this loss by evaporation, water flows from the Atlantic into the Mediterranean from west to east as a surface current. The projection of Italy and Greece into the sea deflects these currents along each coast of both countries.

The general course of the winds of southern Europe is interrupted by the Alps and Apennines in Italy, and by the high mountains in Greece. Land and sea breezes water these countries in August and September, while the winter snow on the Alps fills the Italian streams in summer and irrigates the land through numerous canals.

A plain, beginning in Holland and Belgium, runs through Germany, gradually growing broader, into Russia, where it is known as the Black zone; thence northeastward through a large part of Siberia. It is low in the west, gradually rising toward the east, though in Siberia its northern margin dips gently beneath the Arctic ocean. The western part of this plain is watered by the winds from the Atlantic and from the North and Baltic seas and the Gulf of Finland. The eastern part in Siberia is watered by the winds from the Arctic ocean. These plains are the granary of Europe and Siberia, although a small part, comparatively, of the Siberian plain is good for corn.

### *Asia.*

The regularity in the motion of the currents of air and water prevailing in the western hemisphere and the Atlantic ocean is apparently lacking in Asia and the Indian ocean. The mountains of America run northward and southward, and have little, if any, effect in originating currents of air, and none at all on the ocean currents. In Asia the largest and highest mass of mountains in the world runs east and west, and from their foot-hills the great plains of India and China extend to the Indian ocean and the China sea, bringing a polar climate into close contact with the torrid zone.

Cold winter winds blow from the Himalayas and the high plateaus of central Asia southwestward into Indian ocean and China sea and drift the waters with them. When the sun turns toward the north in the summer solstice and the plains in India and China become heated by the torrid sun, the wind changes and blows toward the northeast. At the meeting of the winds the monsoon breaks, and the cyclones of India and the typhoons of China follow. They are soon over, and then the monsoon blows over Indian ocean and China sea. All India, Kashmir and western Tibet, Farther India, Annam, and eastern China and Japan are well watered, fifty feet of rain falling in a year in some parts of India.

In these countries there are generally six months of rainy season and six months of dry. In parts of India the water of the rainy season is stored in large reservoirs for irrigation in the dry season, while in China numerous canals between the different rivers in like manner irrigate the land. India and China are among the richest countries of the world and have the densest population, though destined to be surpassed in the future by the population of the Amazon and Mississippi valleys.

We have thus seen the effects of the winds and ocean currents in modifying the climate and in enriching the great valleys of South America and North America, of Europe, India, China and Japan.

### *Deserts or Basins.*

About one-fifth of the territory in each continent is arid and desert land. With one or two possible exceptions these arid regions are *basins*, where the rivers and rainfall either run into salt lakes or are lost in the desert and never reach the ocean. These deserts are caused by the winds which blow either from colder over warm areas and are therefore dry, or over vast plains or mountainous regions upon which they have precipitated their moisture.

The average rainfall on the great deserts does not exceed ten inches a year, and the evaporation is usually greater than the rainfall. They are situated generally between the twentieth and fortieth degrees of north latitude and between the twentieth and thirtieth degrees of south latitude. In the northern belt are the Carson and other basins of Nevada, the Salt Lake of Utah, the desert of Sahara, Arabia, Persia, the Aral-Caspian desert, the Tanin Gobi and Mongolia desert. In the southern belt is the desert of Atacama in South America, Kalahari in South Africa and the Australian deserts. These basins in the northern belt contained formerly, lakes much greater than are now found in either of the continents.

Salt Lake was formerly much larger and deeper, for its waters once beat upon shores one thousand feet higher up the mountain sides than at present; its waters then found their way to the ocean. This was probably in the ice age, when the surrounding mountains were covered with snow and great glaciers, and the evaporation was much less than the rainfall and the water from the melting glaciers.

In the desert of Sahara numerous dry water-courses show where great rivers formerly ran into Lake Tchad.

In Asia the Caspian and Aral seas were connected, covering a territory many times greater than at present, with an outlet to the Bosphorus and Mediterranean.

We have not sufficient knowledge of Arabia to know the former condition of that arid country. The process of desiccation is still going on, and how much longer it will continue no one can tell.

### *Mountains of America.*

Next we will notice the influence of the mountains on the atmosphere, either in enriching or impoverishing a country, or in intensifying the movements of the currents of air and water.

The mountains of America rise at the Arctic ocean and form the divide between the Mackenzie and Yukon rivers. A second range runs from northeastern Alaska through Mount Saint Elias.

Then these two bands extend through British Columbia, gradually widening as new ranges arise until they obtain a width of 500 miles at the boundary line between British Columbia and the United States, and a width of 1,000 miles on the line of the Union Pacific railroad. These two ranges, the Sierra Nevada and the Rocky mountains, come together in southern Mexico and extend as a single range through Central America and the Isthmus of Panama. On entering South America this range again divides, forming the Cordilleran and the Andes systems, and thence they extend southward, with a varying width between them of from 40 to 200 miles. They are connected from east to west by several cross-ranges or spurs. From southern Chile the Andes continues as one chain through Patagonia and Tierra del Fuego to Cape Horn. This is the longest and most persistent chain of mountains in the world. The peaks gradually rise in height from north to south until in Chile, Aconcaqua, 22,427 feet in height, is the culminating point; thence southerly the range gradually lowers to an elevation of a few hundred feet only at the Straits of Magellan and Cape Horn. Several volcanoes in this long range rise to a greater elevation than any of the non-volcanic peaks.

In North America the currents of air from the Pacific ocean, in passing over the Coast, Sierras and other ranges, deposit a large portion of their moisture on the mountains. Between these ranges are warm valleys, and the winds chilled in crossing the mountains evaporate the little moisture in these valleys, and they are left dry and arid unless irrigated by mountain streams. Thus we have a succession of arid valleys and green mountain ranges moistened with rain and snow, and rich in forests and vegetation. A number of these valleys are enclosed basins, from which the mountain streams have no outlet to the ocean and in some of which saline lakes are found.

### *Mountains of Asia.*

In Asia we have the largest continent, the highest mountains, the most elevated plateaus and the greatest extent of desert land in the world.

The Pamir, or "roof of the world"—"the abode of the Gods," as it was called by the inhabitants—is a vast plateau of 30,000 square miles area, with a north and south extension of about 400 miles, and with a mean elevation of 12,000 feet. It is traversed by a high range of mountains, culminating in the Taghama, 25,500 feet in height. The Pamir was the only barrier Alexander could not pass. Now, the English, the Russians and the Chinese meet on this plateau and struggle for the control of Asia. From it branch all the great mountain ranges of Asia.

The Hindu Kush range runs west through Afghanistan, between Persia and Turkestan, along the southern shore of the Caspian sea, culminating in mount Ararat, thence as the Caucasus mountains to the Black sea, while a spur of this chain follows the southern shores of the Black sea to the Mediterranean. The Himalayas run a little south of east from the southern part of the Pamir for 1,500 miles, separating India from Tibet and China.

The Kuen Luen range, sometimes considered as an extension of the Hindu Kush, runs from the middle of the Pamir through western and part of central China for 2,700 miles. The Thian Shan runs from the northern end of the Pamir northeast, separating Tarim and Mongolia from Siberia. As it approaches the ocean it turns toward the north and ends in Kamchatka, forming the great divide between the waters of the Arctic and Pacific oceans. Between these mountain ranges are elevated plateaus, and the former dominate the rainfall and temperature of the continent.

The steeper slope of the mountains of Asia is toward the Indian ocean. Between the Himalayas and Kuen Luen ranges and running from the Pamir east is the highest and longest plateau in the world, varying from 17,000 to 10,000 feet, its lowest elevation.

Above this plain the mountains tower from 4,000 to 18,000 feet. Their summits are covered with everlasting snow from 8,000 to 10,000 feet below their crests. Here is truly the "abode of the snow." This plateau, from its height and position between two ranges of mountains, is cold in winter and hot in summer. This is Tibet, the land of the Llama. Here all the great rivers that empty into the Pacific and Indian oceans, excepting the Yukon, the Columbia, the Colorado, and the Zambesi, have their source.

In the western part of Tibet the Indus and Brahmaputra rise, one running west through a pass 14,000 feet in height into India; the other running east, through passes thus far inaccessible and unknown into India. East of the head-waters of these two rivers rise the rivers of Siam and Farther India.

Further to the northeast rise the great rivers of China, the Hoang-ho and Yang-tse-kiang. Their valleys are separated by high chains of mountains, extending in a northwest and southeast direction. The Hoang-ho runs north and east through the temperate zone of China, and the Yang-tse-kiang south and east through the semi-tropical regions of middle China. As they gradually approach, they inclose a great valley and become the arteries of the superabundant life of the empire. The eastern part of this great valley, watered by the winds from the China sea, is crossed from northeast to southwest by parallel ridges, from which numerous streams descend. The valley of eastern China is thus abundantly watered and the rich soil yields bountiful crops. For thousands of years this region has been the home of the Chinese, a self-dependent world. It is a limited territory of 1,300,000 square miles area, no larger than the valley of the Mississippi; yet it sustains a population of 400,000,000, or one-third of the people of the globe.

North of the Kuen Luen mountains, and the valley of the Hoang-ho and south of the Thian Shan, is the plateau of the Tarim, sometimes called Eastern Turkestan. It is much lower than Tibet, and is traversed by cross-ranges of hills or low mountains, through which flows the river Tarim. Little rain falls on this plateau, the sand from the desert is gradually covering the fertile valleys, the ancient lakes are now little more than salt marshes, and where formerly lived bands of Huns and Vandals that overran Europe, now only a few shepherds find a scanty living. This part of the world seems exhausted. "Without a shrub or tree or blade of grass," and no longer fit for the residence of man, it has become the sole home of the wild horse and the yak. East of this plateau of Tarim are the deserts of Gobi and Mongolia, which extend far eastward toward the sea of Japan, a high range of mountains separating Mongolia, however, from the sea-coast, so that only dry winds blow over these great deserts.

North of the Thian Shan and the Altai mountains is the great plain of Siberia. It starts from a lower level than that of the Tarim desert and descends with a gradual slope northward for 1,500 miles to the Arctic ocean. These plains resemble in some respects the great plains of the United States, but the latter slope toward the east and south with a climate growing continually warmer, while the Siberian plains slope toward the north, the temperature growing continually colder. The winds in summer blow from the Arctic ocean over these plains to the Altai mountains, while in the winter they blow from the mountains to the ocean. There is a slight evaporation from the Arctic ocean, but the temperature of Siberia is so low and the summers so short that the plains require comparatively slight rainfall to fertilize them.

There is a large portion of Asia, Arabia, Persia, Turkestan, including Caspian and Aral seas, to which we have not particularly referred because it is entirely outside of the influence of either the monsoon, trade, or other moisture-bearing winds. This territory extends from Arabia northeastward beyond the Lake of Balkash into Siberia, a vast extent of country, larger than Europe—a dry, rainless desert, hot in summer and cold in winter. Part of this region is from six to seven thousand feet above the level of the sea, part below the sea level, yet neither height nor depression makes any difference in this arid land. Formerly sections of these countries were thickly populated. The Aral and Caspian basins were called the "Garden of the world." In Mesopotamia were Ninevah, Bagdad and Babylon; in Persia, Susa and Persopolis. Historians tell us of great cities, flourishing empires, where now is only a barren and sandy desert. We do not know whether the climate has changed or whether in ancient days the country was thoroughly irrigated, and now through neglect has been buried deep in the sand of the desert. Although four-fifths of Asia are either desert or mountainous land and are only scantily inhabited, two-thirds of the population of the world are found within its borders.

# THE RELATION OF GEOGRAPHY TO HISTORY

BY

FRANCIS W. PARKER

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Geography is the science of the present appearance of the earth's surface. Geology is the history of the present appearance of the earth's surface, the record of the countless changes which have led to the present phase of geology or geography. Mineralogy is the science of the rock material which has undergone countless changes. Physics and chemistry are the sciences of the laws of change in the crust of the earth as well as in air and water generally. Meteorology is the study of heat acting through air and moisture changing the earth's surface, producing and sustaining life.

Geography, with its kindred sciences of inorganic matter here named, may be called the science of the physical basis of life, since it deals with the environment, the support and the nourishment of life; it is therefore the interpretation of life. The modern geologist, who reads as an open book the present surface of the earth in all its varied forms, traces there the significance of each characteristic area; in other words, the present surface forms of the earth are the visible revelation of its geologic history. Thus each particular form has its profound significance; it is to him the manifestation of all the changes that the earth has undergone by the action of forces through matter under law.

But there is still a higher and more important significance of surface forms, that may be called functional. Geography has been defined as the physical basis of life; life in its multiplicity of organisms can best be studied by understanding the influence of structural and meteorological environment upon it. Ethnology and history are the sciences or philosophies, if you please, of the evolution of the human soul from the beginning. When the written record fails, then suppositions must fall back upon all the influences which surrounded it in its earlier stages. Of these influences, probably, the geographical structure is the most potent.

We owe to the founder of modern geography, Carl Ritter, the first systematic investigation in the direction of the relation of history to geography. Ritter's fundamental statement, though not given in his own words, may be stated as follows: That each and every characteristic area of the earth's surface has had a determining influence on the evolution of mankind. This statement presents us a working hypothesis for our study of this subject—the relation of history to geography,—but it needs some very marked modifications and limitations in order to make it valuable as a means of searching for truth in history. First, there are marked differences in the influences of a characteristic territory or a specially defined form of surface structure on man in each stage of his development. For example, a particular structure may act as an obstruction to growth in one phase of man's evolution while in another phase it would be of the greatest assistance. The savage aborigines of India probably deteriorated in a land which afterward presented great advantages to the invading Aryans. If those savages could have been taken up bodily and put down on the vast steppes of Eurasia, they would have, in a forced nomadic life, taken a vigorous step in advance, while the Aryans, who had had the education of the plains, took a mighty step forward in the refuge which the great mountain walls offered against the attack of their nomad enemies. A land of swamp and morass exercises one influence on the savage, as a land of refuge; to the barbarian and civilized man, however, it is a land easily defended by ditches, canals and dikes. It is of the first importance to know the degrees of development before we can have any understanding of the influence of the structure of the country.

The second modification is in regard to the community life of the people or the ethnographic relations in tribes and nations. These relations of gens and tribes and phratres in the evolution of peoples are common to all mankind in whatever part of the globe. They have had a tendency to overcome and control to a certain extent the influences of structure; the Aryan race, for instance, whether they lived in the tropics or in cold Norway, had in their community life the same general tendencies, the same habits and customs, the same worship of ancestors, modified, it is true, to a great degree by their environment of structure and climate.

The third modification is probably the highest of all, and is that which has been foreshadowed in the ethnic relations of a people; that the human spirit in all lands, ages, and stages of growth from the beginning has had the same general tendencies, modified, it is true, greatly by structure and climate, but nevertheless overcoming to a degree all external influences. This is shown by the fact, although it is still under discussion, that collision, contact and mutual influences of peoples with peoples have not been necessary to similar manifestations and common tendencies. It is also shown by the universality of like myths, of religious beliefs, fetiches, totems and religious tendencies, common to the Eskimo and South Sea islanders, and arts that bear strong resemblances that grew out of these common tendencies. With these great modifications of the fundamental principle of the influence of surface structure on the growing life of man, the knowledge of geography—that is, of surface structure—is absolutely indispensable to the study of history.

The study of history, briefly stated, is the study of the growth and development of the spirit, or soul, of man from the beginning; the study of the individual, anthropology; the study of community life of man, ethnology; and with it, closely allied, is the study of the influence of surface structure, or geography, and its relation to that life.

It is not my purpose to present a method for the study of geography in its relation to history, but rather to call attention to the general direction of this study. We may begin in broad lines and show the common relations of similar forms of structure, as for instance, the influence of mountains, natural fortresses and enclosures, swamps, and desert oases, as places of refuge for tribes and nations after they have passed the lower phases of the development of the plains and steppes. The steppe or prairie was adapted to nomad life, a stage of evolution which may be considered as indispensable to human evolution. The periodic or scanty rains on the steppes made grass the principal means of nourishment. Nomad life on the steppes of Eurasia had far stronger influences on civilization than the prairies of America, for the old world had domesticated cattle, while the prairies were mere hunting grounds until river bends afforded protection to barbarians emerging from lower stages.

From tract to tract the nomad drove his cattle in order to gain sufficient nourishment, and in that life the attrition with other tribes, the struggle for existence, led to a higher stage, and the tilling of the soil and the building of the village began. The moment a barbarian discovered the art of agriculture and remained in one favorable place for a time, he took a long step in development; but, surrounded by wandering savages, he was at a great disadvantage. He was the prey of his savage brother, who burned his house and stole his cattle. This led him to seek for a place of refuge, and here we see the direct relation of natural fortresses, mountain fastnesses, the inclosures by deserts or swamp lands, to history. Thus we have India, a great naturally inclosed fortress, walled in by high mountains on the north, easily defended by passes on the west. We have Persia, Palestine, desert-inclosed Egypt, Greece, Italy, Spain, Great Britain, Norway, Mexico and Peru. The Aryans of India, the Semites of Palestine, and the mound-builders of Mexico and the Incas of Peru no doubt fled from the open lands to the great structural fortresses of mountain and desert. Prolonged relief from continued or threatened war made civilization possible.

Again each natural fortress by its structure and climate determines to a great degree the special influences. The structure and climate of India present a marked contrast to those of Norway, in their influences on the same race. Egypt in its valley unity, its unity of river source and silt distribution, led, we are told, to monarchy and monotheism. Greece, with its mountain-walled valleys, made polytheism a human necessity, and founded democracy. The little strait that separates England from the continent determined the peculiar civilization of Great Britain. The shutting out of Russia from the practicable harbors and natural seaports, hemmed in the civilization of that land.

We have already spoken of the grassy plains. With regular rains forests spring from the plains, and make it possible for man to take higher steps in civilization. Wood and timber presented the necessity for tools; forests were the means of both protection and progress. The vigor of the early stages of the Aryan race may be traced to the forests on the northern and western slopes of Europe.

It can be said that a shut-up condition is absolutely necessary during one phase in the evolution of a nation; but the contact of a nation with other nations by friendly intercourse or war is as absolutely necessary in higher stages of growth. China, a pioneer in human civilization, owes its present state of fixed ideas to the isolation of vast deserts and mountain regions. The contact of Greece with the Roman empire gave the tremendous influence of Grecian art, literature and politics. True, the Romans conquered Greece, but, in a far higher sense, Greece conquered the whole world through her aggressors, for the invading Romans not only gathered the rich fruit of the little peninsula but scattered its seeds over the whole civilized world.

The plateau continent, Africa, is the most marked illustration of the influence of geography on human development. Rivers falling from highland to highland in cataracts make inland navigation exceedingly difficult, thus isolating her tribes from the outer world.

It is a common inference that the higher the stage of civilization, the less dependent man is on surface structure. True, the path of progress is marked by overcoming and subduing physical obstructions, but that does not limit the developing influences of characteristic areas of surface. Utah, changed to a garden by man's invention and enterprise, exerts a far stronger influence than it did as a desert on the degraded savage. The savage hunted over Pennsylvania, totally ignorant of the riches that lay beneath his feet; the civilized man comes and uses the vast treasures to his own advantage; but in this change we do not say that he frees himself from nature; he simply uses natural products—uses environment for a higher stage of growth.

The river valleys once marked the lines of migration of tribes and nations, of which the Danube is a notable instance. Under civilized man the same river cuttings and natural excavations are made the new pathway of the civilized world—the railroad. The vast plain, to a low stage of civilization, is either a hunting ground or a pasture of cattle; in the higher stages, this plain becomes a place where civilized men from all nations and tribes under the sun can come together and live together, melt and fuse into one great nation. Different nations have gone through the wild, nomad life, the life of the fortress, and have reached a stage in which isolation means decay. The fortress life hems in the intellectual and moral life, and they step back to the plains of their ancestors to live together in one great nation on the grandly modeled continent of North America.

These are only some of the phases in the interpretation of history in its relation to geography.

There is a psychologic relation which is organically connected with the study of history. The earth's surface is the home of man, and geography is the study of that home. A psychologic definition may be given as follows: The study of geography is the formation of an individual concept of the earth's surface, gained either by observation or by imagination; that is, the study of geography is the formation of individual concepts corresponding to the earth's surface as a whole or any of its parts. The earth's surface, as the home of man, is the stage on which all human action has taken place. Not only does the structure interpret, to a great degree, the events in the evolution of man, but it is at the same time an indispensable factor in the retention or memorizing of historical facts. In other words, history can neither be understood nor remembered without a clear mental picture of the stage, or the surface structure, on which the historical events took place. The knowledge of surface structure is of the greatest economical importance to the study of history.

In the usual way of studying history, events, the march of nations, wars, are not clearly localized and defined. Facts and events "schweben in der Luft," as the Germans say. They are only related by the vague web of time without any notion of differentiated space, and are therefore easily forgotten. We all know in early youth how a child spontaneously cultivates fancy and imagination. Geography is essentially in its basis the product of imagination, the imagining of surface characters. To illustrate, a clear mental picture can easily be acquired of the beautifully modeled peninsula of Greece, with its great northern defensive barrier of mountain maze, its midrib of the Pindus, its beautiful valleys, and its great walls of mountains. Here are the conditions for the autonomy of seventeen states, and the necessary proximity for mutual influence and defense. The separation, as I have already said, produced polytheism and initiated democracy; the proximity, federal life. Now, a distinct picture of this beautiful peninsula, surrounded by its seas, is an easily acquired product of geography by real study.

It must, however, be said in this connection that there is very little true geography, the geography of Ritter and Guyot, now taught in our schools. We must all admit that the most of the so-called geography now taught in the schools is a conglomerated mass (and mess) of disconnected and doubtful facts, with little or no psychologic unity and very little practical use. Witness the failure of the best geography ever written, the Common School Geography by Guyot. It is doubtful whether that splendid book ever paid for its maps. Real geography is not taught because teachers do not understand it and because they have very little or no means of studying it.

But, to return to the main point in question, how easy it is to develop by the imagination a clear concept of the peninsula of Greece, the main range of the Pindus, the spurs and the plateau of Peloponnesus. On this basis, how easy and how delightful it is to follow the development of Greece from the ages of the gods and heroes through its struggles to its highest reach of art and intellect! We can see Thermopylæ and study with interest the memorable events connected with it; we can study the Marathon plain; we can travel with the athletes to Elis; we can picture the unwalled city of Sparta! This is only one example of the countless instances in which the memorizing of history would be made permanent, effective and delightful. The causes are studied, the effects known and the pictures become more and more distinct. Geography is the study of the earth's surface as the home of man, the influence of that home on man's growth; and it is organically united, psychologically related to memory.

Geography, the picturing of the divinely modeled earth, is beautiful and inspiring in itself. No art man ever produced equals in beauty and grandeur the sculptured earth; but add to this intrinsic glory the function of the earth as the home of man, a home that throughout the ages has been his home and school alike; trace human history in all its stages by the light that the study of geography throws over it, and we have a subject of extreme fascination in itself and of the highest use in education.

# NORWAY AND THE VIKINGS

BY

CAPTAIN MAGNUS ANDERSEN

I am called upon to speak of the Vikings. I do not know that I can tell much more about the Vikings than most of you have read in history, though it may interest you to know that it is an ordinary sailor who speaks of them. But I might improve the opportunity to tell you a little about modern Norway.

As you know, Norway united with Sweden in 1814, on equal terms; that is to say, each country enjoying the freedom and liberty of a government independent of the other, except as to the King and the diplomatic representation abroad. This union has benefited both countries to a large extent, and every true Norwegian of to-day feels an admiration for his forefathers who had the courage to sacrifice home and almost everything dear to them to save the liberty of Norway, which was threatened not only by foreign foes, but by starvation which stared the people in the face in 1814. By reason of this union both Norway and Sweden have advanced in commerce, so that to-day we do not call ourselves a very poor nation. We have a commerce which we believe to be up to the times. The Norwegian fisheries are conducted on the most modern principles; great improvements have been made, and new devices invented and utilized. The Norwegian department in the Fisheries building at the World's Fair speaks for itself, and I think every one will agree with me that it is astonishing what a small nation can do. Our fish exports amount to something like thirteen million dollars a year, which is very well for two million people. Besides the ordinary fisheries, the whale and seal industries have in the last forty years yielded a handsome income to the country. The pioneer of this trade is the still living Commander Sven Foyn, who, by his intelligence, energy, endurance and integrity, raised himself from an ordinary sea captain to the wealthiest man in Norway. He is now eighty-four or eighty-five years old, and has been going to sea since he was fourteen.

We have also had, since the tenth or eleventh century, our wood industries, and the exporting of wood is next to the fisheries. When the latter fail, we always have something to fall back on. The wood export consists mostly of dressed goods, wood-pulp, spars and poles, which are shipped all over Europe, though the largest consumers are Great Britain and the English colonies. Mining and quarrying are carried on, and in the last fifty years important manufacturing districts have sprung up where sufficient water power was found, and every year enterprising young men go out to foreign lands and on returning set up fresh branches of industry. Another source of income is the great number of tourists within the last few years who are attracted by the beautiful scenery of the land of the midnight sun. However, this has demoralized poor farmers somewhat, and we have always been proud of our farmers.

The important place which shipping Norway occupies is world renowned. The Norwegian merchant flag floats on every sea, and each one of Norway's two million inhabitants represents one ton of shipping, placing us fourth in the ocean-carrying trade. The bulk of our shipping is employed by foreign nations, indicating that shippers have confidence in us as seamen.

A glance at the map will show that it is not an agricultural country, although the ruling class are farmers. Our rock-bound country, with its long and rugged coast, has a wonderful attraction in the roaring North sea, and every boy, as soon as his arm has attained sufficient muscular strength, goes off to make his living there. It is no wonder, then, that the Norwegians are found in every part of the world, and that they have gained a reputation for being first-class sailors.

The word "Viking" must undoubtedly have originated from the word "vik," and indicated in olden times what is now known by the term pirates. They were no doubt worthy of that name, as they committed many an evil deed. By perusing the Sagas it will be found that these men possessed many good qualities, which make their characters a very interesting study. They had a manly independence and a high sense of honor and liberty, as well as courage and pluck. Their word was never doubted and their promise never broken. They treated a weaker enemy fairly, and toward women behaved like true gentlemen. It is true that their expeditions gave them the name of plunderers and fearful warriors, who ruined everything before them, but history tells us that these men were also able to found dominions and rule countries. We are all acquainted with their voyages around North sea through English channel and to the Mediterranean, as well as with their discoveries of the Faroe islands and Greenland; but the most interesting expeditions for us to study while we are at the World's Fair are undoubtedly those made to this country in the tenth, eleventh and twelfth centuries. Leif Ericsson sailed in 999 from Greenland to Norway, where he entered into the service of King Olaf Tryggvesson. There he was christened and started for home the following spring in company with a priest, steering what was afterward looked upon as the regular course from Norway to Greenland, between the Faroe Islands and Shetland; but he must have been overtaken by storms and carried out of his course, for after having drifted about some time he reached an unknown land in the far west, where he found wild grapes and uncultivated corn-fields. He returned to Greenland the same year, bringing news of the new land, which he called Vineland, and this resulted in two attempts to colonize Vineland.

It will thus be seen that the first discovery of this continent was by chance, as all discoveries generally are, and was the result of the good seamanship of our ancestors and their love for a seafaring life. Their voyages back and forth afterward show us also that they were great navigators and daring enough to venture out on the open sea, guided only by the sun, moon and stars.

The first attempt which was made to colonize the newly found land was made in the year 1,000, under the command of Eric the Red and Thorstein Ericsson, and failed, as the sailors steered too far south and found no land. They returned home in the autumn, thoroughly exhausted. The second time they were more fortunate, as Thorfinn Karlsefni, early in the spring of 1003, took command of another expedition, consisting of three ships and 140 men, and set out for Vineland, which they must have reached safely, as we afterward have accounts of Helleland, Markland and Vineland. By reason of the hostility of the natives they gave up their possessions and returned to Greenland in the summer of 1006. The inhabitants of Greenland were too few to enable them to keep up any colonization outside of their own land. Thus the expeditions must have terminated, for we only hear of another attempt made in the twelfth century by a bishop named Eric, who started off on missionary work, but as no more was heard of him and as a new bishop was elected in his place, he must have perished. Vineland expeditions appear, according to Norwegian history, to have been brought to an end in 1121. According to Professor Horsford, the last ship returned from America to Iceland in 1347.

Besides the history to prove that our ancestors were here, we also have the excavations in Massachusetts by Professor Horsford, who, with Professor Anderson, has done so much to enlighten the world about the discovery of America. Professor Horsford is dead, but I am glad to know that a daughter has taken up the work, and on April 22 of this year found the log house built by the party of Thorfinn Karlsevne in 1004.

It has often been said that the Vikings could never have crossed the northern Atlantic in an open ship such as they had in those days. I would not really say that we started on this trip to prove that they could, because when I first got the idea I had not heard much doubt expressed about it. What we really started for was to bring the ship over to the World's Fair. In 1880 an old Viking ship was discovered buried in the clay of the Norwegian coast, and most of it as sound as it was the day it was put down; consequently we were the only nation that could produce such a ship as was used in those days. We knew that Americans admired courage, and that if we could bring a ship such as this over to the World's Fair that it would be appreciated as well as interesting. We started a subscription. The government had already been asked for money, but they decided that it was too risky an undertaking. They said if it is to be built for the Chicago World's Fair and if you will send it over by a steamer, we will vote the money, but if it is to be sailed over, we think it is sport and very dangerous sport at that, and money will not be appropriated for that purpose. So we went to work and got subscriptions from nearly 15,000 people, ranging all the way from ten cents to two hundred dollars, and I believe two hundred and fifty dollars from one man. That was the man I mentioned, who was the most enthusiastic of the whole lot. Having obtained the money and the model, we started to build the new ship about three or four miles from where the old one was found. Even sailors doubted whether an open ship like that could be brought over safely, and with all my reasonings I was rather doubtful myself. The only argument I had was that if the Vikings could sail the ship over, we ought to be able to. I had confidence in the *Viking*. We got the ship fitted out and towed her around the coast to Bergen April 1. Finally, we were off for America.

We had been out two weeks before we found what she could really do in heavy weather and how she could steer, encountering then a heavy gale which lasted thirty hours. Up to that time there wasn't a man aboard that took so much as his boots off; but after we found that the ship steered in all kinds of seas, that the rudder on the side worked finely, confidence in our ship gradually stole upon us, and after that we took it as easy on board of that ship as on any other; we undressed and went to bed, and I really was ashamed of myself for not believing in history. We were out six weeks altogether, forty-four days from Bergen to New London. The last four weeks we had a favorable passage, encountering some gales during that time, none of them, however, lasting so long as the first one. We did not mind that, because, as I said before, we had obtained confidence in our vessel, and my opinion is that really not fifty per cent of our seafaring class use as safe vessels as the *Viking*. I would not hesitate to take that ship across the Atlantic any time of the year when I have a cover for it. We had only a canvas one. For eight or nine days the thermometer was down to zero, but we were well dressed and fed and we were not troubled.

On arriving on this side we had a series of astonishments in the receptions tendered us. I was astonished also that everybody seemed to want to make the trip a kind of demonstration against Columbus's discovery of America. That was something new to me. I tried at banquets and receptions to explain that we didn't wish it that way. During the construction it was proposed to the committee in charge of the ship that we call it the Leif Erickson, but we finally decided not to, as we did not want Americans to think us demonstrating; the Norwegian is modest. But after we found that the newspapers had taken the case up on this line, we knew there was no use of further discussion. When I get home and they ask me how this came about, I will simply tell them that the American newspapers did it.

I feel very grateful to the American people for the reception they have given us and it will be very gratifying to me to carry home their good wishes. I hope that we have made the impression we wished to make, that we had an old ship of the Vikings of long ago and that we have sailors at the present day.

# GEOGRAPHIC INSTRUCTION IN THE PUBLIC SCHOOLS

BY

W. B. POWELL

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The purpose of teaching geography is the education of the learner. The methods of teaching the subject must be such as to secure the end sought.

Different views exist among parents and also among teachers respecting what education should do for the learner, some persons, representing the extreme on one side, believing that the acquisition of knowledge is the main purpose of education; other persons, representing the extreme on the other side, believing that the training of the faculties of the child constitutes the main purpose of education. Between these two extremes every grade of belief and every grade of practice respecting the purpose of education finds its adherents.

In arranging a course of instruction for the children of the public schools of the District of Columbia it has been assumed that both ends above named may be accomplished, namely, that the children may be trained for the purpose of gaining power, and that while being trained they may come into the possession of knowledge that will be of value to them, and furthermore, that such training may be on lines of experience and investigation that will contribute to develop a power to insure success in the future prosecution of the study and at the same time the acquisition of the knowledge that lies at the base of all geographic information.

The first important end to be secured by the study of geography is to train the learner to see geographic facts or recognize geographic phenomena when he sees them. One who goes through the world with his eyes open is constantly learning and is ever in the possession of enjoyment. It is not an easy matter to train the beginner to see and know what there is to be seen and known by seeing when passing over a country: for instance, to see springs and know their causes; to see the wearing of river banks and the changing of the courses of streams and know their causes; to see the denuding of elevations and know its causes; to see the filling and making of valleys and know their causes. This, however, can be done by a systematic course of training. The steps of such training, however, to insure the desired result, must be sequential and each must have its definite and well-outlined purpose.

Another important end to be secured by studying geography, and one which sequentially follows the first step, is that training which will enable the learner to see geographic facts and to understand geographic phenomena from symbols or from the examination of maps and by reading text in connection therewith. An attempt to teach geography by reversing these steps will prove fatal to educational success, for it anticipates the strength of the mind and its power to receive. The result of such instruction is not knowledge but rote-information. The latter purpose has in the past constituted the main effort of teaching geography in our schools. The first step, that of training the child to understand geographic phenomena when he sees them, has in the main been omitted.

A third purpose of teaching geography is the acquisition of knowledge. This purpose is easily secured, when the work for the accomplishment of the first two purposes has been done systematically carried out. If first knowledge is obtained in the right way its value is almost inestimable from either of two points of view:

First, as an acquisition of the mind on which it has made an impression because obtained by contact with phenomena first hand or from original sources, it will serve ever after as an interpreter of kindred information, whether received first hand by contact with things or through symbolic channels.

Second, as a possession of the mind it is a nucleus to which all future information on the same subject obtained by original investigation or through symbolic channels will be added naturally and logically, thus insuring a well-arranged body of information on that subject at every step of acquisition.

The process of learning to see is slow. It is, however, easy if the beginning is made simple and each step is made a sequential advance on its predecessor. The young mind grows by slow increments; it expands by short stages, but it grows and expands easily, as does its physical home when given opportunity to do so naturally. To learn to see, the child must make purposive efforts in looking. He must be made to look for the purpose of discovering characteristics. Characteristics are not impressed easily. The young mind does not learn to see until it has looked many times and looked discriminatingly.

Phenomena well adapted to the beginning of this kind of training are found in plants and animals. Fortunately these are geographic phenomena, a knowledge of which will be valuable in the future prosecution of geographic knowledge. A study of the forms of leaves, the colors of leaves, the parts of leaves, the growth of leaves, involving comparisons and leading to conclusions, will strengthen the mind systematically and develop its power to see. A study of buds, their forms, their positions and their development, will train the mind systematically, but on a slightly different line from that resulting from the study of leaves. There is in the study of buds a beginning of the study of cause and effect, but so simple, so easily understood, that the most childlike mind, if properly directed, can master it. Correspondingly it may be said of other parts of the study of plants; then may it be said of plants in their entirety. By simple steps, each of which is taken many times, the child advances to the knowledge of the forms of plant life and many of the sequential changes of the same. The child's mind during this study is strengthened, his breadth of seeing and thinking is enlarged, for it has involved his knowledge of the phenomena of cold and warm weather, of wet and dry weather, of sunshine and cloud, of springtime and summer, of fall and winter; and his experiences, because of other relations of life than those of his school, have been made to form a part of his knowledge as one compact interrelated entirety, and to do office in that training which gives him power to see and strength to discover cause and effect. The work here indicated is possible in the school-room; fortunately also it is the most profitable work that can be done for the accomplishment of those mechanical results which the school is expected to secure. In a corresponding way the study of animals is equally profitable. It is a little more difficult because the phenomena are not so easily secured for study, a little more difficult again because the phenomena are not so easily understood as those of plants. The child has been prepared for this more difficult work, however, by his study of plants.

It will be observed that in the study of units of work thus far named the child has been made acquainted with many geographic phenomena and has come into the possession of a large geographic vocabulary, every word of which is the symbol of a geographic fact that has come into his possession by contact with the phenomenon itself. To this extent, then, has the mind been trained geographically; it may be said to have a geographic bent.

It will be observed also that the teaching thus far has had for its purpose, first, that training which leads to the perception of facts without reference to their causes—facts of size, color and form, of which the vegetal and animal world furnish so great and so delightful a variety,—and second, the perception of facts of size, color and form, and also of use or purpose, which involves an effort to see effect and to discover cause.

The materials for use in training the child in these two steps are easily obtained. Their investigation affords a most delightful occupation for the child, which occupation correlates mental and physical activity in the acquisition of knowledge, thus insuring both mental and physical improvement.

The next series of units or facts is learned by both experiment and observation. The child has become strong enough now to project causes and note results. The unit or series of work is the study of vapor and its various phenomena, as steam, cloud, rain, hail, mist and dew. By experimenting the child sees water changed to dust, become invisible, return to dust, and, finally, look into his face from the ice pitcher as water again. By repeated efforts, by slow stages, he learns the causes of clouds and their precipitation as rain. He sees the morning mist, rising from the sidewalk as water, being carried away to be formed into drops to be returned again to the hilltop as water; and, by slow degrees and by easy steps, he learns that the sun is lifting the water from the sea and from every other place where water is found, in whatever form, to the skies, where it is gathered and drifted and cooled, to be returned to the earth. Thus does he learn one great cause of geographic facts, of geographic phenomena, without which the mountains would not be denuded, valleys would not be made, springs would not become, and rivers would not flow.

While the work in the study of plants and animals and in experimenting with water and studying its wonderful and interesting phenomena is going on, the child is being trained in some of the simpler steps of the study of position. He comes by this means into the possession of a vocabulary that is necessary for future use in the study of geography. He learns many terms used in showing the relative positions of objects, as *ud*, *down*, *above*, *below*, *farther*, *nearer*, *beyond*, *this side*, *that side*. He studies the dimensions of definite areas, as the teacher's desk, the school-room in which he works. He learns to represent things on paper with the pencil, and, placing articles in various positions on the desk, he learns to represent them, not in perspective, but as objects on a flat surface. Thus he is led from the things to the symbols of things, and thus does he gain power to see things in symbols. The school block or the park in front of the school or in some other part of the city is viewed, examined and talked about. It must be remembered that the talking about this block at this early stage of the work is most essential. By repeated viewing, repeated examinations and repeated conversations, representing in oral symbols what has been seen and the relations of the things that have been seen, the mind is caused to grow continuouily and with a truly geographic bent.

An intermediate step is now thrown in, that is, a new symbol is introduced—a symbol between the oral symbol and that of the map,—representation by the sand-board. The block or lot or other portion of ground viewed and examined is represented on the sand-board in miniature in plastic material. This is most profitable work in the development of judgment. Having thus made a miniature block or park on the sand-board in the school-room, the child is led to represent the same on paper with the pencil, and is led to invent the mechanical means by which the elevations and depressions may be represented, giving further and valuable cultivation to the productive imagination on determinative lines.

Next comes effort to read corresponding, correct maps of parts of the city, as blocks or parks, which work at first must be very simple. The measurable product of such reading is the conversation of the child in oral description, and also the representation of what he sees on a little sand-board at his desk in plastic material. The product of such work of greatest value which is not measurable is the growth of the child's mind in learning to read facts from symbols, for the world of geography, which is to be to him a source of profit and delight throughout his future life, will be presented to his mind mainly by means of symbols.

During all the work thus far outlined the child has been assigned no tasks, or at most very few tasks. He has been led to put forth purposive effort by an interest that the teacher has aroused in him in the subjects under consideration. The kindergarten has been taken up into the primary school; but the child has learned geographic terms, has learned their uses by using them, has learned their definitions by talking about them repeatedly, and has learned to spell them by writing them many times in his little compositions. He has learned the proper use of English idiom in the expression of geographic phenomena, whose forms and other conditions he has sought to explain to his teacher.

Our young learner is yet in the primary school while doing the different kinds of work enumerated above. He has been learning to read, having read many stories and descriptions and poems relating to, and based on, the work which he has done and which enables him to understand thoroughly what he reads, and which causes him to be interested in what he reads, because it is the confirmation and expansion of that which he knows to be true, as found by his own efforts. Very few, if any, tasks have been assigned, yet the child has become an original investigator. Very few lessons have been prescribed, yet the child has learned to use English for the expression of exact ideas and in their exact relation. Very few requirements have been demanded, yet the child has made a delightful beginning in the most interesting study of geography.

If the purpose of the child's school life thus far had been only that he might learn to read, no more profitable plan nor one more certain of true success could have been adopted. If the purpose of the work had been only to teach him to talk correctly, to use his mother tongue for a purpose accurately and at the same time exactly, no better scheme could have been invented. If the purpose of the work had been to train the child to see, to discover, to project, to observe and to conclude within the limits of the possibilities of his mind adapted thereto, no better process could have been employed.

The work, however, requires ideal teaching. It is not done by the assignment of lessons on the part of the teacher; it is not done by conning on the part of the child. It is done by self-imposed purposive activity on the part of the child; it is induced by a loving appreciation of the way the child learns and by a broad, intellectual, thoroughly-planned leading on the part of the teacher. Thus far have I given what I am pleased here to state as the first circle in the teaching of geography in the schools of Washington.

The giving of geographic knowledge has been but a secondary consideration in the teaching of the subject thus far, as will be readily seen. It has been, rather, the ever-present aim of all the work to put the learner's mind in a rational attitude toward geographic phenomena. Quantity is of little importance in any school work. More important is that presentation of subjects and that consideration of subjects that result in an attitude on the part of the learner toward these which may be characterized by intellectual alertness or interest, intellectual exactness or accuracy, and intellectual control or a cultivated will.

The child who has finished a subject in school has not been put in a rational attitude toward that subject. The learning must be such that it will nourish and give appetite for more, and at the same time develop that intellectual activity and strength that will insure success and continued pleasure in the further prosecution of the subject. He who closes his German book to read no more because he has finished the subject has not been taught right and has studied largely in vain, no matter how high he stands on his final examination. So is it with any other subject. The fault is always in the teaching, and is found in the wrong idea of what should be taught or in a wrong selection no less than in the wrong methods of teaching. What to teach is harder to determine than how to teach.

In our study thus far we have been brought in contact with two kinds of phenomena, geographic conditions and causes of geographic facts. Neither has been studied, however, in a way to show its relation in the groups of geographic categories. The child does not know that he has been studying geography. He has been growing familiar with the forms and other characteristics of naturalistic facts which, however, have been so grouped as to make their relations easily seen when he shall have reached the stage of progress in his development where it will be desirable and profitable for him to resolve his store of facts into categorical series. He has been preparing for geographic study.

This preparation is not yet complete; it must include a knowledge of humanistic phenomena which he must get first hand, for geography involves a knowledge of men and of nations, with the conditions of their lives and their related industries and commercial characteristics and achievements.

The second circle of studies may well begin with the study of humanistic phenomena.

Now we study the life of the city in all its ramifications as far as the child is able to understand it;—the buildings of the city, of what they are made, for what they are used, where the materials came from of which they are made, how these are prepared and how they are transported; home life under different conditions such as nationality and classes; home interiors, schools, churches; the uses of buildings, and their corresponding structures thus fitting them for their uses; the streets, how they are named or designated, how houses thereon are named or designated; where bridges occur, why they are there, thus determining thoroughfares and principal streets by their causes; the occupations of the people; the productions of the city, means of transportation, means of communication, means of lighting the city; the water system of the city in its details; the sewerage system, which leads to a knowledge of the use of the river as a scavenger; all of which knowledge, with much more that cannot here be enumerated, is gained by actual observation and experience and, if properly done, helps to lay the foundation for a correct understanding of geography; helps to prepare the child for the study of other cities which he may not have visited, but of which he may know by reading and by comparison with the facts of his own city which he has studied. This group of facts should be taught thoroughly and with great care.

Children twelve years of age are found in the city who have never seen the White House, who do not know the relative positions of the Capitol and the Treasury. Children, graduates of the high school, are found who have never seen the Soldiers' Home and do not know what it is for; who do not know how Washington is supplied with water, or understand the meaning of the name Conduit road. Such children are not found in great numbers, but that a few have been found suggests that others may have been ill-prepared for the study of geographic text, and that perhaps all have had less preparation by contact with things than they should have had.

Another group of phenomena to which the children's minds are directed and which must be taken up systematically, consists of interesting facts having climatic causes. The children do not study them as such, because they do not know what climate is. They, however, associate them in climatic categories while studying them, thus being helped to understand climate, its causes and effects logically, when later, they study the subject for that purpose. They observe the coming and going of birds and note the time of the year of each; they observe the birds that do not leave and the kinds of homes that each species build; they observe the coming of snow, the coming of flowers, and the length of the days with each of these times of year, and learn to associate them as correlated facts, but not as cause and effect. They are yet too young to know the distinction. This group of phenomena is large, interesting and valuable for educative purposes. Like other groups to which I have called attention, it must be passed after alluding to it enough in detail to make its character and purpose understood to the hearer.

Our children have now grown strong in their power to see, so purposive have been the steps by which their observation has been directed. They are next taken to the fields to observe the decay of rocks, the making of soil, the running of streams, the washing of hillsides, the making of valleys, the denuding of hilltops, and the numerous other phenomena which the casual, uncultivated reader does not see, cannot see, but which the student of geography should be trained to see before he is allowed to proceed further in the study. Much of this work is done in the school-room, involving the examination of rocks, the examination of pebbles, and the study of the causes of their forms. Miniature coal mines are made to appear in the school-room; the different kinds of coal are examined (the causes for the existence of different kinds of coal need not trouble us at this time); the different kinds of rock—shale, sandstone, etc, may be studied advantageously in the school-room. The purpose of this is to give information and especially to open the eyes of the children and to put them in a proper intellectual attitude to their surroundings, when, for any cause, they go into the fields or onto the hill-tops.

During the progress of the study of this last unit the children learn many valuable geographic facts, facts that are valuable as interpreters in their further reading and as nuclei in their further acquisition of geographic information. Some of these are concepts of valleys, of slopes, of water-divides, of drainage areas, of denuding of land surfaces, of filling of lake basins, and of changes in courses of streams. They are the geographic alphabet for further reading and investigation.

Some of these lessons must be given many times because the real meaning of some of the phenomena is difficult of perception. During the progress of this series of lessons the children handle many specimens and talk about them; make many river basins in sand and talk about them; make many miniature ranges of hills and talk about them; compound small valleys into larger ones and talk about them; gather the waters of many little streams and carry them down in one large flow to lake or ocean; define, that is bound, the smaller basins and in turn the large basins including the smaller ones, thus building in the mind concepts by means of which in later study they may be made to understand the great basins or drainage areas of which a continent is made. During all this activity with the mind and hand they read about the subjects upon which their minds and hands are engaged and thus learn the real meanings of words and the correct uses of geographic terms, thus learn to get geographic information from the printed text.

Our next group of work, for which the children are now prepared, is the close study of a section of country having various characteristics, first noting the different characteristics and recording them, then representing the section on the sand-board in plastic materials from the study of the field-notes. To do this in some cases it is found necessary to make the sand-map in the field from observation and afterwards make field-notes, that the children may learn how to make field-notes, and then how to use them in the workshop or laboratory. This power comes slowly, but like all other acquisitions of power, it comes easily if the steps are short, sequential and taken often enough.

The next step is the representation of the section studied with pencil. This representation is made from the sand-map rather than directly from the section studied. The next step is that of studying a wall map representing a section of country, and then translating it, in representation, on the sand-board. This whole unit of work is given chiefly for the purpose of training children to see contour and other geographic facts in symbols—that is, for teaching children to interpret a map. We have thus far, if we have done our work as we had hoped to do, trained our children to such a degree that, in part at least, they can be lead to understand maps and texts that describe them. They are now ready for the study of geography as found in the text book. The last group of units constitutes the second circle of geographic work.

It should be stated here that during the progress of this technical geographic work the children read much of people and of places, of industries, of products and of processes. This reading is made intelligible by the preparation the children have had for it and by the fact that most of it is either exemplified or illustrated in the school-room. The children have articles of clothing brought into the school-room to be examined and to be compared with corresponding articles of their own; they have products, both natural and manufactured, on their desks in abundance, for study, for comparison, for conversation; they have illustrations of fields, of factories, of processes; they study the changed forms of materials, in connection with the processes and machines by which these forms are changed; they compare the crude materials with the marketable materials, and show where the one kind is found, in a package on the grocer's shelf, and name the processes by which the transformation is made. Thus are they made ready, in a further sense, to study the geography of the world and to understand some of the very important and valuable facts which the study of geography discloses to him who knows how to read properly.

One purpose of the work thus far has been that of training the imagination of the child. If he goes from home he sees other cities and compares them with his own, for which comparison he has been prepared; he sees hills, valleys, streams, plains and other phenomena, which he interprets by that which he learned in his home study, by comparing the two. If he does not travel from home he takes journeys in imagination, for books are put into his hands for that purpose. He thus, in imagination, visits other cities in distant states. These he finds on river banks or by the seaside. He sees ranges of hills, valleys, mountains, streams, dams, canals, factories; he witnesses processes and examines products, in every step of which comparison is made and conclusions drawn. In this work, too, he is trained to estimate distances by comparing the unknown with the known, thus getting some adequate conception of direction and space.

The children are now strong enough to look upon the world as a whole; they are acquainted with much of the phenomena resulting from the facts that the earth is spherical and that it revolves on its axis. They undoubtedly know these facts also, for an intelligent teacher could not thus long instruct children without being forced to tell them of these facts. They now, therefore, are to become acquainted with the globe representing the earth and its surface. They learn the grand land divisions of the earth and its chief water divisions and learn the relations of each to all the others; learn the relative size of each and approximately as as nearly as they can be made to understand the actual size of each in extreme breadth and length. They learn some facts of climate without special study, of course, further than that derived from a knowledge of the relation of the axis of the earth to the plane of its orbit. This gives opportunity for teaching belts or zones, and as far as it is taught at all it is taught with accuracy. Now, the children's knowledge of plants and animals and kinds of people about which they have been learning may be further enlarged, and each kind or group of facts relegated to its appropriate belt or zone home. The continents and oceans may be located in zone belts or climatic homes, and plants, animals and men located in their respective parts of continents or oceans; thus correlating the old, or that which was previously learned, with the new. Thus may the learner see the globe divided into land and water, related to heat and cold, possessed of life, distributed by climatic causes, possessing characteristics consistent with and lives induced by such causes.

The children are now prepared to study geography as the home of man and as the result of man's skill and efforts; study geography by states, by civilization, by socialistic phenomena, by economic phenomena. State lines may be made to mean something to the children now. Great and important lines of commerce may be fixed easily, because the children find out not only where they exist but why they are there. But before these are studied in their detail it is desirable to study the continent in its special structure of mountain ranges and consequent basins or drainage areas. For this the children have been prepared by their previous work. To prevent making this part of my subject too long and too tedious I will say that North America is studied physically, in which connection it is studied historically also, so that national lines or divisions are seen to move back and forth and finally become fixed by physical causes when such exist, as is the case frequently. The relations of these States are studied historically and politically. Commercial centers of commerce are fixed definitely, and the reasons for their locations are ascertained either in history or in physical causes, or in both.

The character, value and extent of the commerce of each city are definitely studied; the relations of the same are discovered and means by which such commerce is carried on are definitely known.

The character of the people, their industries, their habits of life, are studied in each country. Comparisons are made and conclusions are drawn, and causes are sought and sometimes, if not in all cases, ascertained. Natural products and manufactured products and articles of dress are studied. Other articles, as of warfare or husbandry, showing conditions and habits of life, are brought into the school-room and examined and discussed. The imaginations of the children are called on in picturing the lives and homes of the people of these countries in comparison with their own lives and their own homes. The cultivation of the imagination is helped by the use of pictures and by the reading of text, describing and narrating; by reading tales and poems, the result of which is tested from time to time by the writing of essays and the representation in graphic form of what is in the minds of the children. During the progress of this study the children are made to know how to get to these centers of commercial life. Thus do the children learn the relation of each state of the continent to the other states. To say that they learn of steamboat lines and railroad lines, and telegraph lines and express companies, is unnecessary. These are taught necessarily, but as a means, not as an end.

Now the children are to study the United States as an entirety in a corresponding way, the details of which need not here be given. It should be said, however, that the states are grouped by physical characteristics and climatic conditions, which in turn help to group them according to productions and industries and resources, which in turn enable us to determine the character and occupations of the people in large belts or sections, and at the same time to locate commercial centers. Now we have only to get the connecting links between these commercial centers or, in other words, the ways and processes of communication and transportation, then we have a good general view of the United

States and of the people of the United States, where they are, and what they are doing. Details in great number are avoided; the definite locality of important places is insisted on, as well as the means of communication by land and water between such important places, the geographic history of the states and their cities having been learned at the outset.

We are now prepared to look again from the United States out on the continent and get the governmental relations between the states of the continent and the United States as a whole, as well as with large commercial centers of the United States, and the child is led to see lines of communication, freighted with commerce and human life, stretching between cities of different states, each end of which is guarded by representatives from other states. The child is made to know why such guards are placed there and what some of their prerogatives are. It will be seen that this is the geography of man and his doings, and not the geography of state-line boundaries and locations of capital cities and their sizes.

The relativity of the values of industries, of the values of products, of the areas of states, of the populations of states, of the sizes of cities, the industries of the cities, etc, are studied and represented in graphic form for comparison, innumerable examples of which may be found in our schools at the proper time of year.

Now, before South America is studied, we need to know a little more of the causes of climate, many of the results of climate having been taken on faith, without having had recourse to their causes. Some physical phenomena of the United States would have been better understood had the children known better the climatic causes; such causes however, it is believed, are too difficult for them to master at the time of their development, when the facts were learned. The children are now stronger. The climate of South America and its resulting effects are a little more difficult to understand than those of North America, partly because they are farther from home; so we give a little study of the trade winds, their causes and effects, and try to give an understanding, if not of the causes, certainly of the existence of the Gulf Stream and its effect on climate, which prepares the children for the study of South America in a way corresponding to that in which they studied North America. It may be stated, in passing, that South America is studied largely in its commercial relations to the commercial centers of the United States. The people of course, demand a large part of our effort in the study of this country. In point of quantity, the study of South America is very small compared with that of North America or even of the United States.

Now Europe is studied in a corresponding way; but Europe is more difficult to study than South America. The geographic history of North and South America is easily obtained and easily remembered because of its sequential character and because of its relation to our present condition. The historical geography of Europe, however, is long and complicated. Not much of it therefore, is attempted. The causes of climate however, are studied and physical reasons for present state lines are considered. Europe is studied by representative nations in their relation to the United States and representative commercial centers of the United States. In this study the locations of commercial centers are definitely fixed and means of communication are considered and learned. Of course the people are studied, and their lives, habits and industries are considered. To accomplish these ends we study the habits of their representatives among us and ascertain their home life in fatherland by studying the causes of their coming here. Their manufactures are brought into the school-room and studied by comparison with our own. The location of some of their representatives in this country is ascertained; the location of some of our representatives in their country is ascertained; the result of having such representatives in two countries is ascertained to some extent. Thus the children are made to know as far as they are able to understand, the governmental, the social, and the commercial relations existing between the great centers of Europe and of those of America, and while learning them they are led to consider their causes and their effects upon our lives and upon our industries, and thus they come to know how man is making and changing geography.

Now Asia, Africa and Oceanica are studied, but to only a limited degree by comparison with Europe or even by comparison with South America, because there is not time to study them more. The purpose of teaching geography in the school, as has been before stated, is to train the children how to study it. It is not possible to teach anything exhaustively; it is not desirable. We have trained the children to see that an interesting purpose of their work in school is the knowledge of the geography of man, of what he is, of what he has been, of what he is doing, and of how he is related to the activities of the world, and to the ever and constantly changing geographic phenomena of the world.

Later in the school course, if I may speak definitely, in the eighth grade, the children have a study of the essential outlines of physical geography from a logical and scientific standpoint, during which study there is opportunity for relegating the vast amount of phenomena with which they have become acquainted during their study of geography into categorical series, and thus classifying them sequentially and logically.

I must not omit one other point. I have stated from time to time that our children do much reading from standard authors, accounts of travels, descriptions of peoples and of countries, expositions of processes etc, which they are able to understand because of the character of their preparation for such reading, namely, their contact with things first hand. I have stated also that the teacher and children avail themselves of charts and maps and pictures or graphic representations almost without number or limit for the purpose of explanation, elaboration or more definite view, some school-rooms being veritable museums or picture galleries. For instance, when a city like London or Philadelphia is being studied, these pictures hang side by side with Washington pictures, with which they are compared. But there is one other class of reading for which we have been preparing our children, which without this preparation could not be appreciated by them, even if it could be made intelligible to them. I mean pure literature that has for a part of its contents, facts of nature, all of which when properly studied, is a part of the study of geography. I do not refer to that valuable literature used largely in getting information, of which I have spoken so much in this paper, as that for instance, by Bayard Taylor, in his account of other lands; Washington Irving, in tales of travel, such as his voyages, Italian scenes, description of London; John Burroughs, in his fascinating accounts of animals and their haunts, and other similar authors. This is studied as a means of getting information. I refer to a body of pure literature, whose office is to please and cultivate rather than to instruct and cultivate. Alhambra by Moonlight; A Description of Niagara; A Description of a Storm at Sea; Oliver Wendell Holmes's Chambered Nautilus; Gray's Elegy in a Country Church-yard; Whittier's Barefoot Boy; Bryant's Waterfowl, and Proctor's The Sea, represent this literature.

> "I thought the sparrow's note from heaven,
> Singing at dawn on the alder bough;
> I brought him home, in his nest, at even,
> He sings the song, but it pleases not now,
> For I did not bring home the river and sky.
> He sang to my ear—they sang to my eye."

One must get close to nature and know it well; must learn much of birds and flowers; must commune with river and sky as a lover, to understand how Mr. Emerson could see in them the enchanting part of bird song.

> "Ye banks and braes o' bonny Doon,
> How can ye bloom sae fresh and fair?
> How can ye chaunt, ye little birds,
> An' I sae weary, fu' o' care?"

No dictionary can define for the student this most masterful contrast of English tongue; no grammar or rhetoric explain it; no eloquent master develop it. He alone can know and feel its full force who, though life may have given to him the darkest sorrow, knows by experience of the caroling of birds, of flowery banks, of chattering brooks, and of carpeted meadow lands stretching to shaded nooks in the hillside beyond.

A large part, not the larger part, of our literature can be understood and appreciated only by him who has been properly prepared to study geography aright. How many men and women, how many students, read such literature only as words. This body of literature is to be studied and classified and known by authors as literature proceeding from a knowledge and love of nature.

# THE RELATIONS OF GEOLOGY TO PHYSIOGRAPHY IN OUR EDUCATIONAL SYSTEM

BY

T. C. CHAMBERLIN

There was a time when it was necessary to search for the material of instruction, but that time has passed. Research has not only supplied a sufficiency of intellectual matter, but has overwhelmed us with a plethora of knowledge. There is much, infinitely much, yet to learn, but more is in hand than can be taught. The day of selection has come. It falls to us now, as educators, to look over our several fields and choose that which is most serviceable for general educational purposes, setting aside the remainder for specialists. This is not less true of the field of geography and geology than of the fields of other sciences.

The primary question is, What shall be the criteria of our selection? Granting that all knowledge and all culture are good, the question that presses for solution is, What is best—best on the whole; best for the average student; best at the several stages of study? It will be but repeating an ancient and much-worn maxim to say that the selection should have high regard for disciplinary culture. It does not follow, however, that disciplinary culture is not compatible with other desirable characteristics, and that these should not determine the selection. An intellectual wrestling with an economic problem or a struggle to gain knowledge inherently valuable may be as disciplinary as though the problem or the knowledge were valueless in itself. The quest is rather to find that which shall possess value in itself when attained together with disciplinary value in its attainment. It is not one merit alone that should be sought, but a combination of the greatest possible merits. The selection should, therefore, have high regard to the value of the knowledge involved.

The selection should embrace a due measure of phenomena with which the student may come into direct contact. The more immediately he deals with the phenomena themselves, the more clear and definite will be his basal concepts, and the more solid and tangible his fundamental ideas. The basal factors of thought in any department should be vivid, and in the study of earth-forms and earth-structure this vividness may be best derived by work on the part with which the students are in immediate contact.

The selection should be such as to call forth not simply observation and acquisition through memory, but the higher mental processes, analysis, induction, imagination, interpretation, and so forth. The selection will fall short of the highest merit if it does not invite and promote a constant inquiry into the causes that lie back of the phenomena, the history through which they have passed, their significance, and the extension and application of the results of the study to remote phenomena and to broader fields.

The selection should embrace matter that has inherent and stimulating significance, that will lead students to read similar significances in like phenomena whenever and wherever presented.

The value of the selection will be enhanced if it has immediate and evident relationship to human affairs. However beautiful the purely idealistic conception of mental activity and mental acquisition for its own sake may be, the fact remains that we are human beings and more easily and effectively interested in human affairs than in that which is remote from man's interests. If the selection shall have an evident relationship to economical and industrial interests, its effectiveness will be promoted; but if it does not also bear upon man's sociological, intellectual, esthetical, and ethical interests, it will fall short of the full measure of merit. It should make its contribution to these not only by helpful knowledge, but by the culture that accompanies its acquisition, by the suggestiveness of its laws, its modes of action, and its analogies.

In addition to these qualities, which may be common to other subjects, the selection in each field should be so made as to open to the student a special realm of culture, and to familiarize him with some great factor of thought not equally well developed by any other subject of study. Each great field may be assumed to possess a richness of its own and to be competent to yield a fruitage which has its own peculiar and incomparable qualities.

Now, the study of the earth may assume the phase which we term geography, or the phase which we term geology, or the intermediate phase which we are coming to designate physiography. Each of these has its peculiar place and merits, each makes contributions to the other, and each imposes the duty of selection within its own field. But besides this there are questions of the inter-relationship between these. It falls to me to discuss the relations of geology to physiography in general education.

It may be assumed that the natural order of succession of the phases of earth-study in our educational system is—first, geography, then physiography, and lastly, geology. A practical question of importance presents itself on the threshold: How far will the best selection and adaptation of subject-matter take material from the field of geology and use it in the field of physiography? How far, on the other hand, should physiography relinquish its field to be cultivated in the name of geology? Or, since the field is a common one in a large degree, with no sharp dividing lines, what shall we select as the chief subject-matter of instruction and training in physiography? The great features of the earth are at once geographic, physiographic, and geologic. We may shift our somewhat arbitrary lines of distinction very much as we see fit. We may choose that which is educationally best with little regard to these.

From the geologic standpoint the physical study of the earth divides its attention between three great elements: First, the agencies and processes engaged in the sculpturing of the land and their results; second, the agencies and processes concerned in the deposit of the waste of the land in the seas and other basins and in the building up of strata; and third, the internal agencies and processes which disturb and distort the surface and modify the preceding activities and their results. Now, if we are to study processes and agencies in the geologic phase, we must make selection from these three great fields, and our study should embrace agencies and processes if it is to meet the criteria of merit already sketched.

To some extent we may make selection from all these fields, and within limits this is eminently desirable to give balance, scope and completeness to the general conception; but an equable distribution will prevent thoroughness of study in any one field. Besides, they possess unequal merits as educational factors. There is furthermore, a natural order of succession that cannot wisely be ignored. That should be selected which comes first to hand in natural order and is least dependent on other factors.

It is obvious that the study of the internal forces presents the most obscure and difficult of the three fields. These forces were very influential in determining the grosser outlines of the earth's physiognomy, but they were only indirectly involved in developing the finer tracings of the earth's features, the lineaments of which furnish the best subjects of detailed study in the earlier courses.

When the selection is limited to a choice between the sculpturing of the land and the deposition of the seas, the application of the criteria above indicated seems at once decisive. We may be said to be everywhere in contact with the land and in the presence of land-sculpturing. We are only here and there in contact with the seas or other depositional basins, and the processes of strata-building and land-growth are not everywhere subservient to direct study. We may be said to be constantly dealing with the results of the disintegration, wear and wastage of the land. We are only here and there immediately concerned in the depositions of the seas or of like agencies.

The natural sequence of processes brings the land action first to our study. The material must be loosened and borne down to the basins before it can be deposited. Derivation goes before deposition.

The surface-shaping processes are simple in part and complex in part. They present a gradation from simplicity to complexity, and from ease to difficulty, that makes them happily subservient to the skillful teacher in leading scholars on step by step from the mastery of one point to another as their capacities develop and their previous successes warrant. The processes of deposition and of land growth are simpler and have narrower limitations and hence afford a less rich and pliable field for disciplinary endeavors.

The surface-shaping agencies are more intimately associated with human affairs and more determinative of human interests than are the depositional processes. From many points of view, therefore, if not from all, the sculpturing of the land constitutes a more rich, pliable, and inviting field for the earlier educational processes than the depositional work of the basins or the crust-disturbing activities of the more obscure forces within the earth.

Obvious as this seems upon mere statement, it is nevertheless, true that the sculpturing of the land has been rather the last than the first field systematically and adequately cultivated by geologists, and contributions from it to geography and physiography have been among the tardiest and thus far among the most incomplete.

The earlier efforts of geologists were largely bestowed on the old strata that form the outer part of the crust and that were produced by ancient deposition, and to the great wrinklings and reliefs of the surface produced by the earth's internal forces. It is only within recent years, perhaps we may be justified in saying only within the last decade or two, that the detailed processes by which the surface contours, the drainage features, and the agronomic adaptabilities were wrought out and are being wrought out, have received systematic and analytic study at the hands of any considerable body of specialists. It is now, perhaps for the first time in the history of the earth-study, possible to teach effectively the processes by which surfaces take on the forms they possess, and to read the history and the significance of the physiognomy of the land. The face of the land has its ages and stages as truly as does the face of man. It has its babyhood, its youth, its maturity, its advancing age, its senility, and its end. Every portion of the earth is in some one of these ages or stages and is passing on to the next succeeding. There may arise intercurrent events which cut off the history of a landscape as accidents cut off the history of a man, but a new history begins and a new succession of stages is inaugurated. Every part of the surface of the earth is, therefore, full of significance. Every valley, every stream, is young or old, and is working out a definite history. Every hill and every mountain is developing toward maturity or decadence. Every part of the earth carries on its face a record of what is being done, of what has been done, and of what is to be done, unless intercurrent events cut off its natural progress. There is, therefore, a physiognomy of the earth as well as a physiognomy of man, full of interest, full of significance, full of bearings upon industry and upon civilization.

This new field, though chiefly opened up by the geologists, is ground common to geography, physiography and geology. As a field of original investigation it will doubtless remain largely the possession of the geologists until there shall arise a specialized class of physiographers who shall assume its particular cultivation. It is yet rich in unsolved problems and invites the advanced student and the young investigator as well as the expert specialist. In our established educational system there appear to me sufficient grounds in the considerations offered, for urging that this phase of activity should constitute the central training ground in physiography, not to the exclusion of the other departments, but as that basal part of the subject on which the early disciplinary endeavor should be chiefly expended and from which the work of the beginner may proceed to other fields.

Respecting the place of physiography, the same considerations seem to assign it an intermediate position between geography, as usually introduced, and geology.

Geography may be said to have for its special function the presentation of the features of the earth as they are; physiography has for a part of its special field the study of the physiognomy of the earth as an exhibition of agencies and processes and as a portrayal of the forces that are making and unmaking the face of the land and influencing its inhabitants; while geology has for its function the revelation of the history and structure of the earth and of the forces that work within as well as without it. These are only the salient features. Each has a wider field when given its full compass.

It is the peculiar province of geology to teach us something of the extent and significance of time. No study opens up in like degree the great vista of time and extends and amplifies our conceptions in terms of this fundamental condition of thought. Astronomy performs a like function respecting space. These are the twin expansive studies in terms of time and space. The special function of physiography is to develop our perceptions and conceptions of present surface activities and environment and to give us an intellectual command of the agencies which are constantly engaged in moulding its configuration into that wide variety and expressiveness and that diverse utility which gives to its intellectual and physical reactions upon the human race such scope and potency in the development of human civilization.

Not the least of my purposes has been to invite attention to the important contributions which recent studies have made to physiographic study, and to the important place it is entitled to occupy in our educational system. It is my conviction, as already indicated, that physiography should be given a distinct recognition under this distinctive term and a definite place in our curricula intermediate between geography, as usually understood, and geology.

To avoid possible misunderstanding, permit me to say that I recognize, as already intimated, the breadth of the field appropriate to physiography. It may be made to embrace the entire physical environment of man and so to include large factors of meteorology and astronomy as well as the distribution and physical relations of plants, animals, the races of man, and the types of civilization. Its realm is broader than that of either geography or geology, and in this breadth and comprehensiveness lies one of its claims to a place in our high-school courses. It is because of this very breadth that I urge selection and a sufficient concentration upon the part most available for educational purposes, to furnish typical ideas and basal training. I urge concentration upon the immediate environment of man and upon the processes and activities transpiring in our very presence, as a groundwork and point of departure for the broader view of man's physical surroundings. The immediate environment involves an important meteorological factor, but that does not fall within my special theme.

When physiography shall be developed effectively along these lines, it may very wisely, I think, replace the formal study of geology in our high schools except in special cases where there are local or personal reasons for retaining it, for physiography taught in this vital and genetic way contains many of the most essential and fundamental elements of geology.

# THE RELATIONS OF THE GULF STREAM AND THE LABRADOR CURRENT

BY

WILLIAM LIBBEY, JUNIOR

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The problem assigned to the writer in the fall of 1888 by Colonel McDonald, the United States Commissioner of Fish and Fisheries, was the study of the movements of the schools of fish along a portion of the Atlantic coast. These movements have been a constant puzzle to the fishermen in their efforts to follow the schools.

The object of our investigation was to see if some relation could not be discovered between the changes in temperature in the water and the migrations of the fish which inhabit it.

Colonel McDonald has shown that such a connection exists, in his researches on the shad, and the same was found true in Professor Goode's study of the menhaden. We attempted to verify this on a larger scale and in a systematic manner. The United States Fish Commission schooner *Grampus* was placed at our disposal and especially equipped for the work assigned to the party.

The body of water off the New England coast was chosen because it was supposed that in this region the contrasts between the currents would be more distinctly shown, from the fact of their being forced closer together by the projection of the mainland so far southeastward from its general curve. This expectation was realized in the course of the work.

We aimed to cover the space lying between Block island and Nantucket, and extending southward to a distance of 150 miles from the land, with a network of stations which should be 10 miles apart in all directions, and on which, at as regular intervals as possible, observations were to be made.

These observations related to the temperature and specific gravity of the surface water, together with a regular hourly series of meteorologic observations; and serial observations were made on the temperature of the water at each of the several stations.

In the serial temperature work the thermometers were fastened to a wire cable of 19 strands of number 24 crucible steel music wire, with a breaking strain of 1,500 pounds. The interval between the instruments varied as the depth increased. They were placed closer together where the changes were quickest—*i. e.*, near the surface—and where the temperatures became more regular they were placed further apart. We only adopted a regular system for the distribution of the thermometers along the cable after having examined the whole area to be studied from north to south along several lines and were sure that all the facts were covered by the system.

The area was studied by running out a series of lines 10 miles apart, along which at intervals of 10 miles the stations were made. These lines were repeated as often as possible, and temperature profile curves were plotted along these lines, based on the observations made at the stations. On most of these temperature profiles we have given the curves of 70°, 60° and 50° as being the most important.

The 50° curve has been an interesting one from the beginning, as it was the means of showing us that there were two sets of conditions under which the two measurably distinct bodies of water came in contact.

It will be convenient to speak of these two portions of the main current of the Gulf stream separately. I shall therefore speak of the upper portion first.

### *I. Upper Portion.*

The boundary between the cold and the warm currents of the surface is very seldom a straight line, perpendicular to the surface. It marks the position of the resultant of all the forces at work. Of course the general position of the boundary will be determined by the velocities of the two bodies and the direction of their currents when they come in contact.

If we leave out of consideration the wind as an effective agent in the production and directing of the oceanic currents, we find that it becomes a most potent factor in the changes which are produced in the position of this line at the surface. The winds sway the surface of these currents one way or another, sometimes for many miles, and they may retard or reinforce th ecur rents in their flow.

The winds which blow over this portion of the northern Atlantic may for convenience be grouped in two classes. One may be said to blow in a southeasterly direction and the other in a northwesterly direction. The general tendency of the first group, or the summer set, will be to drive the warmer waters at the surface over toward the coast, thus forcing them above the colder waters of the Labrador current. The other, or winter set, may be considered to have the opposite effect on these waters, and the final position reached after a cycle is completed will depend on the relative velocities of the winds. It is not denied that there are other factors which enter into this result, nor that this position is not affected by the physical characters of the waters, viz, their relative temperatures, densities, etc; but it is claimed that, after due allowance for other factors, the winds are the most active causes of the daily and seasonal variations which take place in this boundary.

While these motions may equalize one another and the resultant position remain the same from year to year, it is supposable that there may be an excess in one of these directions for a series of years, with the result that the boundary will be carried far inshore from its normal position and thus to a great extent obliterate the surface indications of the other current near the surface.

### *II. Lower Portion.*

Here only the general causes which produce and modify the currents in the oceans can produce any change, unless by the cumulative effect, spoken of in the previous section, modifications are brought about. As a rule, however, the variations referred to might almost be classed as accidental, because they are rarely productive of changes below 25 fathoms. When these changes are brought about, they are usually of such a character as to evade detection unless the averages of many observations are carefully studied, when the change in the position of the resultant can be seen.

These two portions of the Gulf stream are therefore seen to have different characters. The lower one, being more steady and constant, is further characterized by the slight changes which take place in it. The upper one, on the other hand, might be said to be characterized by the rapidity of its changes of position. As has been said, the 50° temperature curve is the line which bounds these two portions.

The shape of this curve beyond the edge of the continental platform is that of the letter S inverted. The lower part of the letter represents the main body or lower portion of the Gulf stream.

In the year 1889 the lower portion did not touch the edge of the continental platform at any point within the area we were studying. In 1890 this portion of the curve touched both at Block island and at Nantucket in the latter part of the season; and in 1891 it touched along the whole edge for the greater part of all the summer months. The change which was thus produced in the temperature at the bottom along this edge of the continental platform was somewhere in the neighborhood of 10°, an item of considerable importance. The effect produced by this temperature change can be seen to best advantage by reference to a very interesting problem in biology on which it directly bears.

In the years 1880 and 1881 a new edible fish was found in considerable numbers in the area we were studying, and had attracted so much attention among fishermen that preparations were made to take it on a commercial scale for the New York and Boston markets during the ensuing season.

Unfortunately it happened, however, early in the summer of 1882, before the fishermen could enter upon their work, that the water from Cape May to Nantucket, in a long crescent-like curve following the continental edge, was covered with the bodies of this fish, dead and dying, in countless millions. From that time the tile-fish (*Lophilatilus chamæleonticeps*) disappeared from this area entirely, and attempts to find the fish since that time have been unsuccessful. The subject, moreover, had become a sort of biologic puzzle. Fortunately the temperature of the water in which the fish was caught had been noted at a number of points.

In studying over the three sets of profiles for the three years, 1889, 1890, and 1891, obtained from our work I noticed the fact that there had been a progressive movement of the warm body of water toward the shore, and saw plainly that if the same rate were to hold good this year the whole of the continental edge of the area in question would in all probability be covered by the warm water. The idea then suggested itself that if such were the case the conditions for the reappearance of the tile-fish would be established, if environment meant anything in the case. The fish had been previously in a depth of water varying from 70 to 120 fathoms, and its feeding ground, being on the bottom, would occur just at the edge of the platform. It was probably, moreover, a tropical deep-sea fish, and the temperature at which it was caught (50° to 58°) could only be established on the New England coast by just such an invasion of the continental edge as has been described. It is only necessary to conceive that the whole of the continental edge from Florida to Nantucket is thus overflowed by this warm band of water to see how the regular feeding ground of a tropical fish could be extended so that the fish could follow it throughout the whole of this largely increased area.

While in the midst of this interesting theoretic work I was aroused by a letter from Washington, from Colonel McDonald, stating that owing to an economical turn, Congress had largely reduced the appropriation for the Commission, so that we should have to give up a great portion of the scientific work. I went to Washington with my facts, and they interested the Commissioner to such an extent that he agreed to give me the chance to test the theory, and further expressed a wish to take part in the work himself.

We first went out south of Marthas Vineyard, found that the temperature was right, set the trawl lines and caught the fish. During the next two months I spent considerable time in tracing up the area over which the temperature of 50° and over was to be found on the continental edge, fishing at the same time with the trawls to see if the fish were there. We found them all the way to the Delaware capes, and were satisfied that though they were not numerous they had taken advantage of changed conditions over the area to occupy an enlarged feeding ground.

The explanation of the disappearance of the fish in 1882, as suggested by Colonel McDonald, seems now to cover the ground perfectly. If we suppose this area to have been flooded by warm water in the years previous to that date in the manner suggested above, it is easy to see that when this warm band receded the first break in its continuity would occur in that extreme part of the bend in the coast between Cape May and Nantucket. The fish over this portion of the bottom would, in the event of the withdrawal of the warm water, be suddenly exposed to a bath of water of sufficient degree of coldness to benumb them and start them on their way to the surface. After they had reached a point in the water which marked the limit of their adjustment to water pressure, they were bound to go the rest of the way to the top, where they arrived in abnormal condition, as their bodies were all puffed up, and in most instances their stomachs protruded from their mouths as a result of the diminution of pressure.

This study of the environment of the life forms in this area has therefore led to interesting results. It is to be hoped that Congress will some day see the connection between pure and applied scientific work clearly enough to enable them to supply the means for the carrying out of investigations which can lead to practical results, and that the scientific commissions of the Government will not be forced to suffer through the lack of intelligent support which should be given them.

# THE ARID REGIONS OF THE UNITED STATES

BY

F. H. NEWELL

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Our honored President in his opening address on "the relations of the currents of air and water to animal and vegetal life and to the temperature of countries" gave an admirable description of the interdependence of climatic forces and showed in a concise manner how the topography of a country modifies the character of life, and through this fixes the industrial and social relations of its inhabitants. His address renders it unnecessary to discuss the causes of aridity, or to more than mention the general effects; so this paper, supplementing what has been said, will dwell more upon the industrial or economic side of the matter, describing in general terms the present utilization of this vast region, much of it consisting of vacant lands.

To the people of many countries, as well as our own, the geography of the arid regions of the United States has a peculiar interest, owing to the fact that they include by far the greater part of the public lands, upon which new homes can be freely made either by our citizens or by foreigners intending to become citizens. These regions may be described in a general way as being in the western half of the United States, beyond the great plains, and extending westward nearly to the Pacific coast. On the north and south they are bounded by territorial lines, the conditions of aridity prevailing in the north through Canada nearly or quite to the Arctic circle, and south through Mexico until interrupted by the belt of tropical rains. Although characterized by prevailing or occasional droughts, these areas are by no means a continuous desert. On the contrary, the deserts, as the term is applied in the old world, are comparatively rare and relatively small in extent.

The arid regions may be defined as those portions of the United States where the rainfall, in quantity or distribution, is not favorable for the production of the ordinary cultivated food products.

The limits are not easy to place, for they depend upon climatic forces which vary in intensity from year to year—that is to say, in any given locality within the arid regions there may not be for several successive years sufficient moisture for maturing crops of grain, while in the following year rain occurring at the right time may enable a farmer to produce a heavy crop. Thus in the latter year these arid regions might be considered as reduced in size, to be again increased as drought follows drought. It is necessary, therefore, to assume certain arbitrary boundaries based upon considerations of general success or failure of ordinary agricultural operations in so far as they are dependent upon rainfall.

For the eastern boundary it is convenient to assume the one hundredth meridian west of Greenwich, although, as a matter of fact, "dry" farming has been successfully carried on as far west as the one hundred and fifth meridian or even beyond. The western boundary is more irregular, owing to a wide difference in the topography of the country which lies between the well-defined arid and humid areas near the Pacific coast.

As laid down by Powell* on the maps of the Geological Survey, the southwestern boundary of the arid region is the Pacific ocean up to a point on the coast of California north of Monterey bay. From here the line turns inward across the valley of the San Joaquin, then, excluding the bay counties, follows northward along the western foothills of the Sierra Nevadas and the eastern slopes of the Cascade range of Oregon and Washington, in which latter state it turns eastward, excluding from the arid regions the northeastern portions of Washington and Idaho. These lines, as originally drawn, were based largely upon the assumption that twenty inches of annual rainfall were necessary for farming operations, but were modified, however, by considerations of the seasonal distribution.† The lines thus laid down, although they may be criticised from various standpoints, are sufficiently exact for any general discussion, and are, perhaps, more useful than others drawn with greater nicety and attempting to reach higher precision.

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* J. W. Powell: Second annual report of the irrigation survey, in Eleventh Annual Report of the United States Geological Survey, part 2, irrigation, Washington, 1891.

† Lands of the Arid Regions of the United States, J. W. Powell, Washington, 1879, p. 3 et seq.

Within this great area, the extent of which is nearly half that of the United States, there is almost every variety of topography and climate, from the low sandy plains exposed to almost tropical heat to the lofty mountain ranges with alpine snows and winds. Portions of it are as truly humid as any part of the east, but these are too small and isolated to be severally distinguished in a broad survey of the whole. Plant life is everywhere abundant, but it is of a kind strange to the eyes of the traveller from the Eastern states, appearing to him sparsely distributed and partaking of the general dry sun-burned character of the landscape. The bright green of fields and trees is rarely seen in the natural conditions, except after the rainy season, or on the high, well-watered mountain slopes. During the long seasons of drought the vegetation becomes brown and dusty, apparently dying, to revive, however, after the occasional rains.

During the many years in which the population was spreading from the Atlantic coast westerly over the broad Mississippi valley the arid regions were regarded as of little or no value, and were left for the Indians, the wandering trapper or prospector, and the despised Mormon ; but when at last the fertile areas of the east were exhausted and places for homes must be had elsewhere. the people of the eastern part of the United States suddenly awoke to the realization that there were great resources yet to be developed within this vast extent of country. Thus within comparatively few years the population of the arid region has enormously increased. Every possible resource is being rapidly exploited, and the results of geographers and other investigators are being immediately acted upon to aid in pushing forward the development of this new land, which from its enormous extent promises to furnish homes for future millions.

The arid regions, as a whole, are best known by their mineral wealth, especially of the precious metals. For many years mining has been the principal industry, the necessary supplies being originally brought from great distances. Agriculture was then deemed not only as too slow a road to wealth, but it was even asserted that owing to drought it would be utterly impracticable. Stock-raising, however, gradually encroached upon the areas hitherto regarded as deserts, the cattle men, as they were forced westward by the advance of civilization, gradually displacing the roving bands of Indians and buffaloes. A peculiar form of agriculture, looked down upon by the adventurous miners and cattle men, had long been practiced by the Pueblo Indians and neighboring Mexicans, and to a certain extent adopted by Mormons when driven into the wilderness by their fellow-Christians. This depended upon the cultivation of the soil by artificial application of water, obtained usually from a small river or creek, and conducted to the field by laboriously-made ditches, often miles in length. The expense and trouble of applying water necessitated the tillage of relatively small farms, this disadvantage being compensated in part by a larger average production. Nothing could be in greater contrast to the broad corn fields of the Mississippi valley, extending on all sides to the horizon, than the miniature gardens, from which, however, come luscious fruits and extraordinary vegetables.

As mines were opened and towns established it soon became evident that in the long run the furnishing of food-stuffs and forage would be equally profitable with laboring in the mines and mills, if not more so. The methods of the Mormons and Mexicans were copied, new sources of water-supply sought, ditches dug, and land brought under cultivation wherever it could be irrigated. Thus it has resulted that within a few years towns have sprung up in every direction, most of them dependent to a large extent upon mining, but having, through practice of agriculture by irrigation, capabilities of self-support and of future extension. These areas are so vast that the land irrigated or occupied by towns and mines or other industries forms but a very small percentage of the total area, most of which still belongs to the United States and is open to entry and settlement under the homestead laws.

The total land area west of the 100th meridian and excluding certain of the more humid portions of Oregon and Washington is 1,371,960 square miles,* or, in round numbers, 878,000,000 acres. Of this, about 7 per cent, or 64,000,000 acres, may be considered as desert, having no known value, even in its minerals. A somewhat larger area—about 9 per cent, or 83,200,000 acres—is timbered, this heavily wooded land consisting mainly of mountain slopes and plateaus. Fringing this and scattered on the hill slopes and along the streams are clumps of trees capable of yielding firewood, fence posts, etc. The aggregate area of these scantily wooded lands is estimated to be 115,200,000 acres, or a

*Thirteenth annual report of the United States Geological Survey, part 3, p. 8.

little less than 13 per cent of the total. Deducting the aggregate acreage of desert and wooded lands, there are left about 615,600,000 acres, the greater part of which supports a scanty herbage which, either green or sun-cured, is readily eaten by cattle. This may all be grouped under the head of grazing lands, since at one time or another of the year herds of cattle or sheep can find sustenance. Most of this latter class of land, comprising over two-thirds of the area west of the 100th meridian, has a fertile soil and climate favorable to agriculture in all respects save that of moisture. With water, great crops could be produced, but without it nothing but the scanty native grasses succeed. The area which has actually been redeemed by irrigation is quite small, not to exceed 1 per cent. The eleventh census of the United States found that in 1889 only 3,631,381 acres* were irrigated, this being but four-tenths of 1 per cent of the entire area west of the 100th meridian. Besides the area irrigated a relatively small area was cultivated by "dry" farming, the yield being, however, small.

The further extension of agriculture within the arid region rests on the complete utilization of the water supply. As previously stated, the streams have been employed to a large extent and there now remain only a few rivers from which water for irrigation is not diverted.† These flow on undisturbed because of the great expense, and the engineering difficulties encountered rendering doubtful the financial success of any undertaking. In the case of many of the smaller streams the aggregate of the claims to the water exceed by far the ordinary quantity discharged, and, as a result, most of the claimants must be satisfied with an amount of water less than that to which they assert ownership. At the same time a large proportion of the water of these streams flows to waste either in floods or in winter, all of which could be used to advantage if it could be held by storage.‡ The enormous cost of creating reservoirs for the waste waters and the small apparent profits have to a large extent deterred private capital from entering upon such projects.

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* Eleventh Census of the United States, 1890, Irrigation in Western United States by F. H. Newell, p. 3.

† Water Supply for Irrigation by F. H. Newell, in thirteenth annual report of the United States Geological Survey.

‡ Hydrography of the Arid Regions by F. H. Newell, in twelfth annual report of the United States Geological Survey, p. 224 et seq.

The tillable lands to be benefited by water conservation or by the utilization of the larger streams not now diverted by canals are almost wholly owned or claimed by individuals or corporations, so that future developments must rest most largely with these. Wise legislation will do much to aid in making feasible many great undertakings, but as a rule it may be said that developments in this line must depend largely upon individual efforts and upon the ordinary laws of supply and demand.

It has been estimated that by a complete utilization of the water supply of the arid regions about 40,000,000 acres can be irrigated; but, allowing even that 100,000,000 acres of the fertile grazing land can be thus redeemed, there still remain over 500,000,000 acres, most of which, as well as the desert and timber acres, are still in the hands of the general Government.

The question as to the best utilization of the great body of unoccupied lands is one of immediate concern to the country at large, as well as to the inhabitants of this area. In a general way it may be said that the more easily available resources have already been taken possession of by individuals or by associations of men, and there remain only such as were rejected or not available. Much of the best mineral land is owned by private parties, but even on the explored Government land there are probably many mines yet to be discovered. The herds of cattle have increased to such an extent that the lands, whether owned by the Government or by corporations, are thoroughly grazed over, and in many localities the herds must be fed with hay, during part of the year at least. All of the water supply of the country which can be readily diverted is claimed or appropriated by irrigation or land companies, and almost without exception the irrigable lands along perennial streams has passed out of the hands of the Government. Still the demand for homes continues, and settlers are from necessity forced to attempt to make a living where conditions seem to be against them. There are thousands or perhaps millions of farms which can be purchased from individuals or corporations, but the possibilities of obtaining agricultural land from the Government seem to be almost exhausted.

# RECENT EXPLORATIONS IN ALASKA

BY

ELIZA RUHAMAH SCIDMORE

When the United States made purchase of Russian America by the treaty of June 20, 1867, there was acquired a vast empire, whose shores were not even wholly surveyed or explored, whose interior was untrodden by whites, and of whose resources almost nothing was known. It had been maintained only as a fur-preserve by the Russian company holding lease of the entire country. They had made no effort to explore the interior, satisfied that the natives should bring their pelts down to the coast forts. They had traced only the largest river for a few hundred miles, and the Hudson Bay Company's men had discovered its head-waters and found out that the Yukon and the Russian Kwichpak were the same. The Coast range and its great peaks were only known as navigators of the Pacific had seen them, and of the interior ranges only the surveys of the Western Union Telegraph Company in 1863–'65 had given any account.

There was a considerable interest in the new territory at the time of its purchase, and Secretary Seward immediately arranged for a scientific reconnaissance in the summer of 1867 under the charge of Professor George Davidson, of the United States Coast and Geodetic Survey. His observations covered the coast country from Dixon entrance to Unalaska, and so much of interest resulted that the American Geographical Society of New York petitioned Congress to have a thorough survey made of the newly acquired territory.

A quarter of a century has elapsed without the general government yet undertaking any systematic scheme of survey or exploration. There are no official maps of the mining regions, which have been adding $1,000,000 in gold to the wealth of the world each year. Only the mineral laws and not the general land laws apply to the territory, which has but a skeleton form of government and no voice or representation at Washington.

None can explain this neglect of and indifference to such a valuable territory, and Elisée Reclus in his "Boreal America" rather sharply notes that the United States considered Alaska "unworthy of its attention until the pockets of its concessionaires [the seal island lessees] were touched."

During the first ten years of military rule (1867 to 1877) no reconnaissances or expeditions were attempted. The presence of a naval ship in southeastern Alaska for fourteen years has added nothing to our geographic knowledge of the country. With the exception of the expeditions sent from the Columbia by General Miles, all exploration has been by private enterprise. Miners found their own way over to the Yukon, and their camps and communities are still without shadow of government control. Professor Muir discovered and first reported the great glacial system as the result of his own investigations, and the National Geographic Society's two expeditions to mount Saint Elias anticipated government surveys and measurements of that corner-stone of the continent.

After General Miles' summer pleasure trip to southeastern Alaska in 1882, he had some expedition to Alaska always in hand so long as he remained at fort Vancouver. At his instance Lieutenant Frederick Schwatka was detailed to make a military reconnaissance of the Yukon river, following the route used by some three hundred miners during the two seasons preceding his famous raft voyage. It was not discovery in any sense, as not only these miners but the surveyors of the Western Union Telegraph Company had long preceded him, and the Drs Krause, of the Berlin and Bremen Geographical Societies, had but a short time before mapped the passes over the range at the head of Lynn canal.

General Miles next detailed Dr Everette to further explore Chilkat pass and the source of the Alsek, and dispatched Lieutenant Abercrombie to ascend Copper river, but neither expedition was fully successful.

His detail of Lieutenant Henry T. Allen for a reconnaissance of the Copper river in 1885 resulted in the first discoveries and really important contribution to the geography of the country since the transfer. He traversed an absolutely unknown region, tracing Copper river up to its head-waters and the Tanana down from that same divide to the Yukon, and made a hasty survey and track-chart of the Koyukuk river before hastening to Saint Michaels. His triangulations gave the first reliable data concerning the active volcano of mount Wrangell, whose summit is by his estimate only 17,500 instead of the fabled 28,000 feet above the sea. He accomplished all this in the face of the greatest hardships; and while the Allen expedition was the most successful and noteworthy of any thus far made in Alaska, it has been the least exploited and appreciated. Had his rivers, canyons, glaciers and great volcano been in Greenland, New Guinea or central Africa, two continents would have applauded and bestowed medals on him.

The NATIONAL GEOGRAPHIC SOCIETY has not only equipped two expeditions to Alaska, but it claims enrolled in its membership nearly every individual who has discovered, explored, exploited or made any special contributions to our knowledge of this farthest northwest territory. It has twice attempted to have mount Saint Elias scaled, and it may yet find the navigable channel of the Yukon, a river easily navigable for two thousand miles were a deep channel known through the flats that extend a hundred miles off its mouth. While ships run aground before they are within sight of land, the white whale enters the sluggish river by some deep pass and spouts for hundreds of miles up the stream.

One eminent member of the Society, Professor John Muir, discovered the great bay full of tide-water glaciers at the foot of mount Fairweather in 1879. Captain Lester Beardslee, another member, named this Glacier bay, and furnished its first rough sketch map; and a third member, Captain James Carroll, successfully navigated it by ocean steamer in 1883, and named the great Muir glacier. There has not been an actual government survey of the waters since the bay was discovered, and all charts are compiled from private sources.

In 1890 Professor Harry Fielding Reid, another member of the Society, explored and mapped Muir glacier and its twenty-six tributary ice streams. In 1892 Professor Reid explored the upper end of the bay, finding and naming the Woods, Charpentier, Johns Hopkins, Rendu and Carroll glaciers, and mapping also the Geikie, Hugh Miller and Grand Pacific glaciers, which Professor Muir saw from the mountain summit ten years previously. Four other members of the NATIONAL GEOGRAPHIC SOCIETY camped at the Muir glacier one season, exploring the region as a hunting ground, while Professor T. J. Richardson made careful record of its landscape features in the series of ice studies and other paintings exhibited in the Alaska section of the Government building at Chicago.

In 1890 the late Frederick Schwatka, who had then resigned from the army, led an expedition through the British northwest and Alaska to seek an easier route from Juneau, the mining center of Alaska, to the head-waters of Yukon river, and a new route from that region to the seacoast. His untimely end prevented his publishing the narrative of a journey as hazardous and important as any he ever attempted. He was accompanied by Dr C. Willard Hayes, of the NATIONAL GEOGRAPHIC SOCIETY. The first half of their journey, while not over wholly unknown ground, was virtually an exploration, in that it was a practical search for and trial of a new route to the Yukon. They ascended Taku river, crossed the Cordilleran divide, and rafted down rivers and lakes to the junction of Pelly and Lewis rivers which form the Yukon; thence, following White river to its source, they crossed a divide formed by a spur of the Saint Elias range and descended the Nizzenah to Copper river, and thence to the ocean—their route describing a great arc behind the Coast range and twice crossing it. A brief narrative with maps and descriptive text representing the scientific results of this expedition, prepared by Dr Hayes, has been published in the *National Geographic Magazine.*

Mr E. J. Glave, fresh from African exploration, spent two seasons in exploring between the Chilkat pass and the Alsek's mouth. His later success in taking pack-horses over Chilkat pass in 1891 and finding rich pasturage for them in the bush country beyond proved the feasibility of pack-trails all through those mountains. The miners have vainly urged upon the government the building of a military road across the Yukon passes, but even Mr Glave's demonstration of the pack-horse problem does not incline that institution to heed the request of the thousand wholly ungoverned miners.

There is no record that any of the navigators who sighted mount Saint Elias and made such varying estimates of its height ever made any attempt to reach it. The first known attempt to climb the great mountain was that made by Professor Charles H. Taylor, of Chicago, in 1877. He went out admirably equipped and accompanied by Lieutenant C. E. S. Wood, of the United States Army. The refractoriness and final mutiny of their Indian canoemen after leaving Sitka prevented their scaling this keystone of the great Cordilleran arch.

The unfortunate New York Times expedition, led by Lieutenant Schwatka in 1886, did not succeed in reaching even the base of the mountain. The Topham expedition, led by Messrs Topham of the Royal Geographical Society, included also Mr William Williams of the National Geographic Society. They were the first to stand on mount Saint Elias itself, and climbed to a height of 11,460 feet on the crumbling rim of the crater on the southern face of the mountain. Further ascent was impossible from that side, and Mr Williams left the American flag and his tin box of records at that point in July, 1888.

Professor Israel C. Russell was given charge of the National Geographic Society's first expedition to mount Saint Elias in 1890. He landed in Yakutat bay, at a point 60 miles southeast of the great peak, and ascending to the snow-line followed the glaciers along the slope of the range to Newton glacier, on the southeastern slope of Saint Elias. He was imprisoned in his tent alone at the highest point, 9,500 feet, for two days by a heavy storm which, covering everything with soft snow, rendered climbing impossible for the rest of the season, and made the return difficult and dangerous.

In 1891 a second mount Saint Elias fund was raised by voluntary subscription within the Society, and Professor Russell was again given charge. He landed at Icy bay, 40 miles directly south of the mountain, and in a measure followed the Schwatka and Topham routes to the foot of Libbey glacier. There he diverged toward the east and joined his trail of the preceding season. He followed up past magnificent ice falls and ice ampitheaters to the head of Newton glacier, and attained an elevation of 14,500 feet on the northeastern face of the mountain. From that outlook he saw for 100 miles northward myriad dark peaks pricking through the great mantle of snow and ice, and mount Saint Elias showed itself a detached peak—an abrupt spur running out from the main range of mountains. He camped at an elevation of 10,000 feet for days, waiting for the favorable day to scale the summit, but the storms continued, the provisions ran low, and they retreated from that near point when assured that all chances were against them for the season, and their strength failing from the meager diet to which they were reduced and continued storms that threatened their light tent.

Professor Russell then made his great march across the plateau of Malaspina glacier, which fronts the ocean for 60 miles, all the Saint Elias ice streams uniting in this great ice mantle which so awed Vancouver.

Captain C. L. Hooper, of the revenue marine service, known to geographers by his arctic voyages in search of the Jeannette, touched at Yakutat bay in the autumn of 1890 to bring away the members of the Russell expedition. Before leaving he attempted some independent exploration. He took his vessel through the bergs of Yakutat bay into Disenchantment bay, and sailed 60 miles beyond the solid wall of ice that met Malaspina a century before. Captain Hooper found there a magnificent tide-water glacier, dropping jeweled bergs into the sea from all its four-mile front of glittering ice cliffs. As a loyal member of the National Geographic Society, he named this Hubbard glacier and its guardian peak for the President of the National Geographic Society.

In 1891 Professor Russell took canoe after his exploration of Malaspina glacier, and, following the shore-line of Disenchantment bay, went another 60 miles further than Captain Hooper had gone. He found that the bay extends as a long, narrow inlet down to a broad plain reaching to the base of mount Fairweather, and his observations introduced many striking details into that blank space of the maps.

The height of mount Saint Elias, which has been estimated all the way from 12,000 to 20,000 feet, was put at 18,000 plus or minus 100 feet, by Professor Russell as the result of his triangulations from the Icy bay beach. The field party of the United States Coast and Geodetic Survey, consisting of Messrs Turner and McGrath—and it is unnecessary to say that they, too, are members of the National Geographic Society—devoted all of the season of 1892 to observation, and their final determination was 18,010 feet as the height of Bering's *bolshoi sopka.*

Mount Saint Elias still awaits its conqueror, and while the National Geographic Society retains its interest in the unscaled peak, it yields the right of way to the other societies reported as anxious to send out expeditions to it, greeting warmly even another expedition like that one from over the seas which, learning at Sitka that there were no guides for the region, went bear hunting and then to their homes. This Society has with especial emphasis claimed that American geographers should first consider the unknown and unexplored regions on their own continent; that American mountaineers should climb American mountains, and American geologists seek American glaciers and American volcanoes.

The ascent of mount Rainier, that isolated peak which holds a small Switzerland on its sides and promises reason for another Zermatt to grow up on its slope, has been made by only thirty-eight people, while the records of Alpine clubs tell what American climbers can do on other 14,000-foot summits in other countries. All the northwestern coast from mount Rainier to mount Saint Elias and down the recurved shore to Unalaska offer such a field for the explorer, the mountaineer, the geologist, and geographer as exists nowhere else on any continent. Only one of the eight great glaciers in Glacier bay has been explored, mapped, and measured, and not one of the trinity of great peaks that guard the bay have been trodden by white men, if ever by a human foot. The exquisite Taku glacier, only eighteen miles by water from the largest town in Alaska, is unexplored, unmapped, unmeasured, and the world knows only the facts apparent from its beautifully sculptured front. The great glaciers in Prince William sound, the grandest and gloomiest fiord on any coast within the temperate zone, are unnamed, unvisited, unsung. No more is known of them really than in Vancouver's day, and in that great landscape reserve of Cook inlet the living volcano of Iliamna has been climbed but once since the transfer. No one has ever attempted the greater volcano of Shishaldin, sloping steeply from the sea at the head of the Aleutian chain, the most exquisite uplift of earth even upon all that coast, a mountain with a more purely perfect outline than the Japanese Fujiyama.

# THE CARAVELS OF COLUMBUS

BY

VICTOR MARIA CONCAS

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Invited only a few days ago to take a part in this congress as commander of the caravels as well as a member of the Geographical Society of Madrid, I am very sorry that my address cannot be as important as the subject demands. Although I am intimately acquainted with every detail of the history of the caravels, the special mission assigned to me by the Spanish government, to repeat the voyage of Columbus in the *Santa Maria* and the many ways in which the voyage has been described, make my position the more difficult. The history and the serious representation of that great enterprise, you must admit, are very different from the many descriptions of fancy that have been written on the subject.

You all know the history of the caravels of Columbus; you have heard of his troubles and difficulties, which have grown with the last 400 years; but history as recorded by Navarrete, whom the great Humboldt calls the father of history, says that Spain then approved generally the project, although while the conquest of Granada was hanging in the balance the government decided to undertake no new venture until that was settled. This delay doubtless caused Columbus great sorrow, as he was growing old; but his project was not rejected by Spain. The Duke of Medinasidonia supported Columbus during two years; the other two years Father Diego Deza, professor at Salamanca, afterward Archbishop of Seville, supported him; and he was always protected by the Marchioness of Moya, the best friend of the Queen, which proves that even if he had difficulties he had high protectors to sympathize with and encourage him. The picture so often painted, depicting the learned men of the University of Salamanca scoffing at Columbus, conveys an erroneous idea, as the records of every meeting were kept and exist today, and nowhere can be found recorded any such action against Columbus. On the contrary, Salamanca was the scientific center of the world, and there the theory of the spherical form of the earth was sustained. Nothing is more worthy of mention, in a similar case a few years after, than when Copernicus, who was excommunicated by Rome because of his theory of the solar system, applied to that university, its learned doctors answered in this magnificent form: "*Read Nicolaus Copernicus.*" That is the best defense of that scientific center, which was for centuries the foremost in the world.

You all know that Spain was consolidated by the marriage of Ferdinand and Isabella, sovereigns of Aragon and Castile. Portugal was almost a part of Spain, as the King had married the heiress of the throne of Spain, who unfortunately died without succession—a misfortune that will never be regretted enough by both nations. The only thing to be done by Ferdinand and Isabella to finish their great plan was to drive the Mohammedans from Granada; but that conquest was extremely difficult, as the cities when conquered were depopulated to be repopulated by the conquerors. The last bulwark of the Moors in Spain was so over-peopled by crowds ousted by the former conquests that there were millions of inhabitants disposed to fight to the last, as they had only the sea behind them.

So strong was the struggle on both sides that Spain, instead of keeping its soldiers in camps, built before Granada the city of Santa Fé. King Ferdinand took his residence there, making the conquest paramount to all other business. Queen Isabella, going herself several times to bring supplies to the army, put all her attention in that war; and how is it possible that any serious historian could think that under such circumstances these sovereigns, being such great politicians, could support Columbus or any other venture, whatever might have been the sorrows of the man with whom the voyage was the only thought?

The best proof that the voyage was not forgotten is that after Granada was surrendered, on January 2, 1492, the capitulations were signed on April 30; on August 3 the ships sailed from Palos, and on October 12 of the same year Spain opened to the New World the gates of history.

And tell me when, before or since, in history have events gone so quickly? Tell me why to your great Fulton you delayed twenty-two years to grant him in August, 1807, a patent to navigate his steamer only for twelve months? Could you tell me why, in the nineteenth century, the New York legislature was obliged to threaten with prison and fine anybody that should speak or act against Fulton? Tell me, where is his family, that I suppose are very rich, according to the service of that great countryman of yours? And when those who pity Columbus so much have answered satisfactorily, we shall consider the behavior of Spain toward Columbus and his descendants, who, after 400 years, you have seen yourselves so highly honored in this city of Chicago.

As you know, the expedition of Columbus was prepared in Palos, and consisted of three ships. The largest was a vessel that was employed before in trading with Holland. She was called the *Gallega*, or the *Galitian*. That name was changed to *Santa Maria*. The circumstance that she was chartered by the king, and that afterward, when wrecked on the coast of Santo Domingo, Spain paid for the whole ship and her equipment, has supplied much information about the *Santa Maria*, as all inventories and contracts made by the government exist in the archives at the present time. This permitted the new *Santa Maria* to be built to such a degree of exactitude that I consider at least nine-tenths an exact reproduction of the original, which certainly could not be done with other historic ships of even more recent date.

It is not possible to get the same data concerning the *Pinta* and the *Nina*, as they were in fact merchant ships that went on their owners' account. There is only a memorandum of the general line of the exterior form, gear and sails; but that circumstance proves that Columbus found welcome and help in the opinion, since he was supported by regular merchants and sailors, who willingly took a part in the enterprise not only with their persons, but on their own account. These ships have been reproduced in Spain with the greatest exactitude by Lieutenant W. McCarty Little, of the United States Navy, and with the greatest skill and economy.

The historical treasures, which you can consult at the convent of La Rabida in the exhibition, show to the most incredulous that the spherical form of the earth was already accepted by every learned man in Europe. Even was it true to those mariners who navigated to the west as far as the Azores and Canary islands, and it was especially so to the Portuguese, who had discovered those western islands of the group called Terceras; but only in Spain was that feeling strong and popular, a feeling that, although it was not called by the name of "public opinion," as nowadays, directed the people of all nations with irresistible force. For that reason Columbus came to Spain; for that reason he was obliged to wait until Spain could undertake the voyage of discovery, and for that reason he found owners of ships and rich sailors who risked willingly life and property in the enterprise.

Only ignorance can see miracles and wonders instead of the natural development of facts, science, navigation, astronomy, cartography and preparatory voyages to Africa, the Canary and Azores islands and Iceland. All these made ripe the fruit of crossing the ocean toward the west, and the praise belongs to the tree where that fruit was most ripe. That tree was Spain, where Columbus brought the fortunate error of Toscanelli, believing the distance about one-fourth of what it is. He expected to arrive at Cathay, and so the discovery was made by Spain, and could not have been done by any other nation without committing Providence to historical injustice.

But when we speak of La Rabida, allow me to tell you how much you are indebted to Mr Curtis for that wonder. Let me call it a wonder, for the work could not have been better done. It is not a copy; it is the same, stone by stone, the original building of La Rabida.

The great discovery was not appreciated in all its importance until twenty years after, when more and more new lands and great empires were explored; and the voyage of the *Victoria*, commanded by Sebastian Elcano, went around the world, and whose family yet use for a coat-of-arms a globe with the *lem primus me circumdedisti;* all that made us think what Spain had in her hand. In behalf of that opinion I am going to quote the *probanza* of 1513 and 1515, in the lawsuit against Diego Colon, son of the admiral (volume 3 of Navarrete, page 538), documents of my private library; but I offer them with pleasure to the members of the congress who wish to consult them. Those *probanzas*, that today would be called inquests, were to clear up the particulars of the discovery, and there were heard more than fifty witnesses, some speaking of what they had seen, others of what they had heard from this same Columbus. Among other curious details it is perfectly proved that Columbus contracted with Martin Alonso Pinzon, captain of the *Pinta*, to divide with him in equal parts honors and profits if they succeeded, which contract he afterward did not fulfill because it was not in writing. Let us forget and forgive the man and always think of the hero. But I will finish to explain why there do not exist so many details of the caravels *Pinta* and *Nina* as of the *Santa Maria*. This is because the smaller ships were in their owners' or captains' hands; they did not enter into the contracts and inventories of the admiral.

The three vessels being ready, they sailed from Palos on August 3, arrived at the Canary islands on August 9, and remained there until September 6, and did not sail from Gomera, an island south of Tenerite.

The instruments that they used in navigation were similar to those you see on this table. The astrolabe, well known in Spain since the eleventh century; the jacob-staff, that instrument that proceeds from the Chaldeans; and I offer besides for your inspection these others, which are not copies, but real instruments that have been used at sea and that belong to the Spanish section of the exposition, and I am now to describe to you briefly the use of them. (The description followed.)

The voyage of the caravels was made by the parallel of 27° through the trade winds that, as we know today, come more to the north in summer, in which season the voyage was undertaken. You know how the deviation of the compass was discovered by Columbus, and how skillfully he overcame the difficulty between his men, changing the card on the needle as much as was necessary to correct the difference. You know also the history of the mutiny, made conspicuous by many curious pictures, one of which you can see in La Rabida, where Columbus is menaced by poignards during his sleep. Read the magnificent inquests (numbers 15, 16 and 17, Diplomatic Collection, pages 565–567), where you will see that Columbus consulted Martin Pinzon about returning to Spain that night, and that Pinzon answered, "No, sir; God would never allow a fleet of such a great king to return, not only tonight, but not for a year" (page 566); to which Columbus answered, "Let you be the blessed of God." How could it be otherwise in a short voyage of thirty days that the only thing that made them uneasy was the steadiness of the wind, since it is the only thing referred to in the admiral's log of the 22d of September, when he says that he was very happy at having a head-wind, as the sailors were uneasy at the steadiness of the direction of the wind? Neither was that of the greatest importance, as they had only sixteen days of voyage.

Land was sighted on October 12, and there we again meet the man Columbus. Land was seen by a sailor of the caravel *Pinta*, called Rodrigo de Triana, at 2 o'clock in the night, but the admiral awarded to himself the prize, consisting of an amount of money and a pension for life, because he said he had seen a light at 10 o'clock. According to his own log, Thursday, October 11, they were sailing at the rate of twelve miles an hour, or nine knots of the actual measure, and how on a stormy night was it possible that he could see a light thirty-six knots distant on a low sandy inland that scarcely could be seen from the deck at five or six knots on a clear day? Rodrigo de Triana abandoned Spain in despair and made himself a Mohammedan, and Columbus received the prize allowed to him who first saw land. Let us again forget the man to admire always the hero of an idea; but if you would read the original letter of Columbus to the nurse of the Infanta Doña Juana, which you can see also in the exposition at La Rabida, you will see that Columbus himself, by his own handwriting, states that he had money enough, although he had been five years without paying anybody; and after that study you will be able to appreciate how much value there is in those ridiculous stories and paintings of chains and poignards of authors and artists who otherwise could not sell their works. I do not excuse Bobadilla, who was very tyrannical, even in those times, in all the nations of Europe; but all that exalts more and more the behavior of Ferdinand and Isabella, who forgot the man to reëstablish immediately the hero, the great discoverer, in all his privileges as general governor and admiral of the lands he discovered; and even today in the more cultured and more enlightened nation in the world, and under very similar circumstances, although we know what the Suez canal is for navigation, and that in the time of Ferdinand and Isabella nobody knew what was discovered, yet even now de Lesseps has found one hundred Bobadillas. How, then, can you wonder that Columbus should find one? And where are the Ferdinands and Isabellas of the nineteeeth century to forget the man and only remember the hero of another idea that opened a thoroughfare for six hundred millions of men? After that, tell me where is a nation in the world that should dare to throw the first stone at Spain of the fifteenth century?

On that twelfth of October Columbus planted on this continent a flag in the first island discovered, quite like the one which I offer for your inspection. It was the distinguishing signal of his authority, the admiral's flag. The Pinzon brothers carried these others. These are the flags of the discovery, granted by the king to the enterprise—the true flags of America, planted on the shores by the captains of the *Pinta* and *Nina*. The usual pictures are not in accord with the historical truth, since the flags were similar to the flags you can see here, and there was no priest with the party on either of the caravels, although you always see one represented in the pictures of the landing of Columbus.

A great day was the twelfth of October; a day that placed the name of Columbus and the flag of Castile in the book of immortality; a great day that opened this immense continent to Europe, already threatened by reform under the weight of religious intolerance; a great day, that one, when the gun of the *Pinta* proclaiming Land! the cry answered from the tops of the Andes and the Rocky mountains, "For the White Man!"

The Spanish government, wishing to renew that memory, offered again to the wind the old flag of Castile and another *Santa Maria*, the fac-simile of the caravel of Columbus. A kind Providence has permitted me to complete such a historical voyage and to cross the Atlantic in thirty-six days, the same time that the great admiral employed in crossing it; and after reaching the island where was the first European settlement, and after, at Havana, saluting the tomb where are the remains of that great hero of science and perseverance, I have brought the memory of his immortal spirit and the order of all Spain to wish from the high deck of the *Santa Maria* peace and prosperity to all the countries of the New World.

# IN THE WAKE OF COLUMBUS.

BY

FREDERICK A. OBER

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I have selected as the subject of this paper that of a work recently published by me, entitled " In the Wake of Columbus." Certain friends have rather cruelly suggested that it might better be called "*At* the wake of Columbus," since the subject has been a long time dead, and it is high time he was buried.

But, ignoring their evident flippancy, we shall, with your permission, follow awhile in the wake of the great navigator, and inquire if there are any remaining evidences of his voyages and of his discoveries in the land he was the means of bringing to the notice of Europe. The fact that several towns and cities claim the honor of his birth-place and two islands possess his last and only remains should not deter the investigator, since there are places identified with his career that are well authenticated.

Leaving the somewhat mythical events of Columbus' youth and early manhood to the historian, we will glance at those places that stand forth most conspicuously, particularly in Spain and the New World. Summoning before us the picture of those times, when occurred the events that shaped the beginnings of American history, I suppose there is not one so well defined as the siege of Granada, when, after years of fighting, the Spaniards had at last reduced the Moors to the last extremity, had cooped them up in the fortress of the Alhambra, and had seated themselves before the city of Granada, determined to drive them from this their last stronghold in Europe. That they succeeded we know, and that it was at the termination of the siege, when Boabdil, the last king of the Moors, had surrendered the keys of Granada, that Columbus appeared upon the scene, is a matter of history.

It was in April, 1491, that the armies of Ferdinand and Isabella, 50,000 strong, entered the Vega of Granada and intrenched themselves upon the site of the present city of Santa Fé, building there a camp that eventually became a city. Here Columbus found them in January, 1492, and here he made his last plea for his projected voyages. Disappointed, he left the fortified camp of Santa Fé, and departed toward the coast of Spain, all his years of attendance on the court having apparently been passed in vain.

Fate or fortune took him to the convent of La Rabida, on the coast, near the important town of Huelva, and here he met and conversed with the prior, who, formerly confessor to Isabella, retained Columbus at the convent until he himself had seen her and obtained her sanction to his return. The result the world knows. The "capitulation" between Columbus and the sovereigns of Spain was signed April 17, 1492, and the Genoese returned to La Rabida and Palos, where he completed his preparations for the voyage, sailing in August, to the discovery of the New World.

With all this, of course, every one is familiar; but with the places most closely identified with the life and career of Columbus, and particularly in the hemisphere he discovered, very few people now living are acquainted.

After more than two months of sailing, or about October 12, Columbus found himself at the New World's portal—at the gateway to the unknown lands beyond.

This island, the Guanahani of the natives, called by the sailor San Salvador, the landfall of the first voyage, has been variously located in different portions of the Bahaman chain.

We for a long time accepted the statement of Irving that it was that now known as Cat island, an opinion in which Humboldt coincided; but later investigators have assigned it to Watlings island, most of them agreeing on it who have given the matter much attention.

Of one thing we are sure, that it was an island in the Bahamas and about midway the chain, though islands so far apart as Grand Turks and Cat, with 300 miles between them, have been claimed as the landfall. It is unfortunate that the journal of Columbus, which was doubtless written on the voyage and in detail, is lost, since that might have settled all doubts on this as on many other points.

But, in view of what has been published, and after a careful sifting of all available evidence, I think we may assume it to have been Watlings. All the evidence, and careful descriptions of the island, I have given in my recently published book, "In the Wake of Columbus," to which I must refer any one for further particulars.

Having followed Columbus throughout Spain over five years ago, and having been commissioned by the Exposition to investigate the route of the navigator through the West Indies, as well as to search out all existing remains of his settlements and plantations, when in those islands as a special commissioner during the past two years, I can claim to have given the matter some attention.

Accepting the courses of the first voyage across the Atlantic as worked out by eminent navigators of modern times, we bring Columbus, at least approximately, to an island midway the Bahama chain. He "lay to" outside the reefs, and landed in his small boats, finding an island (described as nearly as possible in his own words from the "Diary of Colon," transcribed from his journal by Las Casas), large and very level, with a large lagoon in the middle, without any mountain, and covered with verdure. The journal also describes the great barrier-reef of coral that surrounds the island and within which the water is as "still as a well," as Columbus himself says.

Now, the distinctive feature of this island and this description is the great lagoon in the center of the island, a feature possessed by no other in the chain except Crooked island, which has never been claimed as that of the landfall. Cat island has no such body of water, and in no respect does it answer the description as given by the admiral.

It should be observed that the only weak link in the chain of evidence in favor of Watlings is the fact that there are no other islands of any size visible from any portion of it, as mentioned by Columbus; but this may not be an objection, for he may have seen distant portions of the same island and taken them for different isles and islets.

The island itself is about twelve miles long by from five to seven broad, with great salt-water lagoons in the center—egg shaped—and almost entirely surrounded with dangerous coral reefs.

Like all the Bahama islands, it is composed of limestone, with a very scant covering of soil—in fact, the rocks are almost denuded of vegetal covering, and that little of the poorest and thinnest. Still the natives have their "farms," as they call them, from which they gain the scantiest subsistence; at the time of my visit, a year ago, they were on the verge of starvation.

The particular spot at which it is thought Columbus and his crew landed on that memorable October morning, 1492, is on the northeastern coast of Watlings island at the end of a bay now known as Greens harbor. From the light-house, half a mile distant, the whole coast is visible, and the beautiful beach lies before you, a stretch of silver sands some two miles long, terminated by promontories of coral, and bordered by a low growth of sea-grape, dwarf palmetto, and sweet-smelling shrubs, such as the southern coast of Florida yields. Near the southeastern extremity of this beach, where the coral rock of the headland juts out toward the barrier reefs, it is assumed that the famous landing took place; but the spot is as desolate now as at that time, four hundred years ago, no sounds breaking the stillness except the murmur of the waves and the cries of seabirds. On the promontory there stands a monument, erected by the correspondent of the Chicago Herald in 1891, who arrived at the conclusion, after careful examination, that this was the landing-place.

Regarding the natives found in possession by Columbus, we can only say that they have long since disappeared. It was during the first century of Spanish occupation that their extermination was brought about through deportation to Haiti to labor in the mines.

Columbus describes them well, and also the few articles of domestic use they had in their possession, as well as the flocks of parrots and the animals of the island. Parrots are no longer found here, but are still seen in flocks on Acklins island, a hundred miles or so away. The only relics of the aborigines I succeeded in finding were the stone implements they used in their agricultural operations, such as celts, locally known as "thunderbolts," a few bones, and a skull. All these are shown in the monastery of La Rabida, that most interesting building erected at the Exposition through the recommendation and efforts of Mr W. E. Curtis, and which contains also other invaluable relics of the great discoverer, presenting an epitome of American history.

The present inhabitants of Watlings are mostly black and colored, some 700 in number, and have no knowledge of the history of the island at all. Their historical lore is limited to the times of the wreckers, and their information respecting Columbus may be summed up in the query of the old negro who took me across from Fortune to Watlings: "Say, boss, who is dis ole man Columbia you is so anxshus about? Here I's been sailing dese Bahama islands more'n forty year, an' I's neber seen him yit." They declare that the relics of the Indian are "sho' enuff t'underbolts" and that they came down from the sky.

One old black man solemnly assured me that he himself saw a celt descend, strike a tree and split it, and that he picked it up at the roots of the tree "after de lightning done pass by." The name of "thunderbolt," is universal, as applied to these objects, throughout the West Indies; in the Spanish island they are known as "*piedras de raya*," and the present descendants of the Caribs call them by that name.

But we will not leave Columbus at Watlings; he sailed thence over to Rum cay; after that to Long island, which he called Fernandina, and then to the present Fortune and Crooked islands, the former of which he called Isabella.

The island first discovered by Columbus is very little visited and is difficult of access. Having come up toward it from Haiti, and having been dropped from the steamer at Fortune, only 100 miles away, I was ten days in the latter island before I could get taken across to Watlings. Respecting the delights of travel in the Bahamas during the summer time, with the thermometer away up in the nineties, no means of communication except dirty "turtlers" manned and officered by black men, and no shade all day save the shadow of the main-boom, I will have nothing to say, except that I do not want to repeat the experience.

From Isabella or Fortune island Columbus sailed southwestward, toward a land the natives told him of, and which they called "Cuba." His first landing there was at or near the present port of Jibara, on the northern coast of Cuba, and thence he sailed eastward, entering the harbor of Baracoa, rounding the cape known as Point Maisi, and discovering another large island to the southward, that of Haiti. He first saw this new island on December 5; arrived at Point Saint Nicolas (recently a subject of dispute between Haiti and this government) on the seventh, and coasted until the twenty-fourth. It was on that date, after leisurely examining the various beautiful harbors encountered and trafficking with the natives, that the fleet of Columbus first met with disaster. On Christmas eve the *Santa Maria* ran on a reef and was wrecked, proving a total loss. The first Christmas in the New World was a sad one for Columbus and his sailors, but their distress was somewhat alleviated by the good offices of the Indian cacique, Guacanagari, whom they were seeking at the time of the wreck. He sent out canoes to assist them and took them to his village, Guarico, where they were hospitably entertained. Near this place Columbus erected a fort, which he called Navidad, or the nativity, in commemoration of the day of disaster, and then, leaving here a garrison of forty men, sailed beyond, as far as the bay of Samana, whence he took his departure for Spain.

The places discovered by him after the first landfall are easily identified, as are all the important settlements made during subsequent voyages.

Returning to America on his second voyage, Columbus found land at a point farther south than on the first, sighting the mountains of Dominica and landing at Guadeloupe. I was at the landing-place in Guadeloupe a little over a year ago, and saw the bay in which the vessels lay while their crews were exploring the woods, when they made their first acquaintance with the cannibals.

The second landfall is a quiet and peaceful country, now the center of the sugar industry of Guadeloupe, but the general features of the country are unchanged, and the great waterfall, so grand and impressive, and which was described by Columbus, may still be seen (to use his own expressive language) "dropping from the clouds that drift around the brow of the volcano."

In Dominica, across the channel, still live the descendants of the veritable Caribs found by Columbus, and who for many years held the Spaniards at a distance. In this island, and in that of Saint Vincent, reside the only Indians remaining in the West Indies, of the estimated millions found here at the coming of the Spaniards.

I myself have lived with them, have hunted with them for months, have studied and photographed them, and willingly testify to their many admirable qualities. Now reduced to a few hundred in number, yet the Caribs formerly occupied all the islands of the West Indies south of Puerto Rico, and were a constant menace to the more peaceful Indians of the Greater Antilles.

Coasting northward, Columbus brought to view all those beautiful islands between Guadeloupe and Santo Domingo and finally arrived off the scene of his wreck and the site of the fort he had erected. It was night, and all was still as death; the Spaniards fired a gun, but there was no response, and in the morning they discovered that the fort had been destroyed and the garrison massacred. Not a man survived, and not a timber or gun has been found since to indicate the site of the ill-fated Navidad. But I secured one relic two years ago that without doubt once belonged to the *Santa Maria* and which was once within the fort.

I visited the coast of Haiti twice, and during my first visit to the island secured evidence of the existence there of an anchor of the caravel, which was in the possession of a black man near cape Haitien. By a chain of evidence that led back to the time of the wreck and established beyond a doubt the authenticity of the anchor in question, I have shown that this relic is genuine. After a great deal of trouble and after a contest with the black man aforementioned I secured this anchor, and it is now in the monastery of La Rabida.

This anchor is especially noteworthy as it is the only authenticated relic we possess of the first settlement in the New World—that of Navidad. Of the second attempt at settlement, made immediately after, I secured many minor objects, which are also in La Rabida.

It was in December, 1493, that the first town was founded, and it was soon after the discovery of the massacre at Navidad. At Isabella, as this settlement was called, there were erected but four or five structures that were intended to be permanent, and the houses of the rank and file of the army have long since disappeared.

Of the few houses that were built of stone some traces still remain, and when I went to Isabella two years ago I found some hewn stones and tiles, but these were all that remained of the town founded by Columbus four hundred years ago. Though I staid there a week, and persistently hunted, I found only the few stones you may now see in the monastery; not even the ghosts of the departed hidalgos, who are said to walk nightly through the forest adjacent, deigned to honor me with their presence. Isabella today is in desolation, completely overgrown with rank vegetation, and with no inhabitants within the region that was settled by the Spaniards. The nearest port is that of Puerta Plata, some forty miles away, and the only means of communication with the outside world is by small sailing vessels.

Although the original settlement of Isabella was soon abandoned, the early settlers made several attempts to erect forts and towns in the interior of Santo Domingo, starting out from this initial town on the coast. They soon after penetrated the Cibao, the famous gold region of the island, and there erected the fortress of Santo Tomas de Yanico, near the headwaters of the Rio del Oro, or the river from which Columbus obtained the first gold in 1492.

I myself have explored the region of Columbus' Rio del Oro and have a nugget weighing half an ounce from the river Yanico, and also some flakes of gold; for there is yet much gold in the interior of Santo Domingo and the region has never been fully exploited.

Santo Tomas is indicated at present only by rude earthworks, but the traditions of its early days still survive, and the memory of the audacious exploits of Alonzo de Ojeda and the fierce Caonabo still lingers. This fortress was erected in 1494, and immediately after were started the towns of Concepcion de la Vega and Jacagua, about 1495. Both towns were destroyed by an earthquake in 1564, but from their ruins I succeeded in taking away some interesting relics, which are to be seen in the monastery, and in photographing the fort and the ruins of the church.

Not far from these ruins is the hill of Santo Cerro, overlooking the glorious plain called by Columbus the Vega Real, or Royal Plain, where his forces had a decisive battle with the Indians in 1495, which reduced them to subjection and sealed their fate forever. From a tree still standing on the Cerro and called the "Nispero de Colon" the discoverer watched the first important battle between red and white races, and afterward erected here a cross, which was long a venerated relic.

The interior of the island of Santo Domingo is little known, and my explorations there were well rewarded, so far as Columbian relics go, and I would recommend it to the adventurous traveller as an interesting field for exploitation.

The Spaniards finally drifted away from the northern coast of Haiti, and the city of Santo Domingo was founded on the south in 1496, which yet contains many things that take us back to those first years of conquest. The chapel still stands, though in ruinous condition, from the porch of which Bobadilla proclaimed the downfall of Columbus, and the house built by Don Diego, the son of the Admiral, rises above the right bank of Ozama river.

There is a castle also, the Homenage, which was built in the year 1509, or during the dominion of Don Diego. Here also are the ruins of the first American university—date, 1507 or 1509; the vast convent of the Franciscans, a contemporary structure; and lastly here are some of the remains of Columbus. To be more explicit, I may say that here are to be seen one set of the remains that Columbus left behind him at his departure, the other being claimed by the city of Havana. It is too long a story to narrate; all the evidence on both sides is given in my book and also in the monastery of La Rabida, reproduced in Jackson Park.

Briefly, Columbus died at Valladolid, in Spain, in 1506. His remains were taken to Santo Domingo about 1540, where they were deposited at the right hand of the high altar in the cathedral, remaining there until 1795, when the Spaniards took up and transported what they thought were the bones of Columbus to Havana; but in 1877, in making some repairs in the cathedral, the workmen found another vault, which contained a casket and bones; also inscriptions showing that those were the real remains and that the Spaniards had made a mistake and had probably taken away the ashes of Don Diego, the son. But, wherever may rest the bones of the Great Admiral, it is with the island of Santo Domingo that his greatest exploits are associated, and in that island he expressed the wish to be buried.

Nearly every island of the Caribbean sea has an association with the great Colon. In his second voyage he discovered the Caribbees, or Lesser Antilles; on his third he found Trinidad and the peninsula of Paria, as well as the Pearl islands, sailing thence to Santo Domingo again, whence he was sent home in chains, in the year 1500. On his last and most disastrous voyage, 1502, and the two years succeeding, he coasted the eastern shores of Yucatan and Central America, the voyage ending at Jamaica, where all of his vessels were wrecked and where he remained a twelvemonth a prisoner on his stranded ships, fighting the Indians and engaged in conflicts with his own mutinous men.

The scene of his last shipwreck is well authenticated, and, as the conclusion of my labors in the search for Columbian footprints, I visited and photographed the little bay in which for a whole year he remained at the mercy of the sea and the savages. It is on the northern coast of Jamaica, in the parish of Saint Anns, the most beautiful portion of that beautiful island. A mile distant from the bay of Saint Anns is a little sea-nook, called today Don Christopher's cove, and on its narrow stretch of beach, with bordering fringe of sea-grape and cocoa-plum, Columbus stranded his vessels, building over their decks a shelter of palm-thatch, and here lived for a year, as Irving says, "castled in the sea."

Half way between Jamaica and Haiti is an island known as Navassa, at which the canoe sent by Columbus to Haiti for assistance touched on its way, the starving crew finding there a little raw fish and some water, which enabled them to complete their most perilous voyage.

But perhaps I have followed too long after the ships of Columbus. I might mention many other spots he visited, and which I have seen; but with you assent I will bring this description to a close.

# RECENT DISCLOSURES CONCERNING PRE-COLUMBIAN VOYAGES TO AMERICA IN THE ARCHIVES OF THE VATICAN

BY

WILLIAM ELEROY CURTIS

Several eminent Scandinavian scholars, and others who have made the early voyages of the Norsemen the subject of special study, have for years contended that the archives of the Vatican contained important evidence bearing upon the pre-Columbian discoveries of America. Some have even had the courage to assert that the legends and traditions of the Icelandic sagas would be established as facts if the records of the church could be called as witnesses, while others have gone even still farther and have insisted that, through the secret aid of the pope, Columbus enjoyed full knowledge of the voyages of the Norsemen and the country they called Vinland the Good, and simply followed the course over which they had cruised across the ocean four hundred years before his birth. But until Leo XIII came to the Vatican no amount of argument or influence was able to unlock the mysterious manuscripts, which for eighteen hundred years have been accumulating upon the shelves of the Holy See. Some years ago a woman went to Congress and asked the passage of a resolution directing the President of the United States to use his influence with the pope to have them examined, but no notice was taken of her petition, and year after year applications from students and historians were made in vain. The officers of the church denied nothing. They simply said that they did not know what the early archives of the church contained; that they had not been disturbed for centuries, and that no one with access to them had either the time or the disposition to make an examination.

In the summer of 1892 Congress passed a resolution requesting the governments of Spain, France, Great Britain, the Pope of Rome, the Duke of Veragua and others to loan for exhibition in the convent of La Rabida, at the World's Columbian Exposition, certain manuscripts, maps, and printed volumes relating to the voyages of Columbus and the discovery and early settlement of America. It was my pleasant duty to convey this request to the nations and persons named, and with the exception of the government of France and the municipality of Genoa, the response was prompt, generous, and complete. His eminence, Mgr Rampolla, cardinal secretary of state, who represented the pope in the negotiations, was extremely cordial and interested, and although he could not permit any original papers to be taken from the files of the Vatican, he caused a thorough investigation to be made, and furnished a fac-simile of every important or interesting document that could be found bearing upon the early history of America. While the claims of the Scandinavian scholars were not sustained, and no evidence was disclosed to show that the discoveries and adventures of the Norsemen in America were ever known to the church, or that Columbus obtained any information or assistance whatever from this source, there were brought to light several historical documents of the greatest value, relating to the settlement of Greenland and the propaganda of the church in the middle ages.

The work of investigation was done under the direction of Mr J. C. Heywood, a ripe and skillful scholar, who has devoted many years to the study of the history and the policy of the Catholic church, and who kindly consented to serve as the representative of the Department of State of the United States in securing a historical exhibit from the Vatican. Mr Heywood was formerly a resident of Philadelphia, but of late years has made his home at Rome, and is one of the chamberlains of Pope Leo XIII. He was inspired in his work by a double motive—the desire to have the Vatican represented at the World's Columbian Exposition by some important and unusual exhibit, and to add to the records of the Department of State at Washington a collection of most valuable historical papers.

The documents were exhibited in the convent of La Rabida, at the World's Columbian Exposition, with the relics of Columbus, and the catalogue of the collection contained, among much other new and interesting historical matter, the following description from Mr Heywood's pen :

" The fac-similes of documents relating to the early history of America here exhibited are taken from the famous series of the Papal registers or letter books. These are a collection of more than 12,000 volumes in folio, written partly on parchment and partly on paper, and are preserved in the secret archives of the Holy See, at the Vatican palace.

"In these registers almost all the letters issued by the popes were recorded before being sent to their destinations. They contain, also, the petitions received, and offer, therefore, original and most important materials for the histories of all nations.

"The collection now begins with Pope Innocent III (1198–1216). All the portion of it prior to that date was lost or destroyed in the commencement of the thirteenth century. What remains is classified as follows:

A. The Vatican registers, over 2,000 volumes, 1198–1600.

B. The Avignon registers, about 350 volumes, 1316–1417.

C. The Lateran registers, about 2,300 volumes, 1417–1831.

D. The registers of the Requests, about 7,400 volumes, 1352–1831.

"It must cause a peculiar satisfaction to Leo XIII that one of the early results of his enlightened liberality in opening the secret archives is, as shown by these letters, to make accessible to all proofs that, by whomsoever represented, the papacy has always been faithful to the divine mission which it claims for itself; that whenever discoveries of, till then, unknown countries have been announced it at once has made provision for the preaching of the gospel and the introduction of christianity among the people of such countries.

"The papers, of which the fac-similes are here shown, may be divided into four groups, viz:

"Those which relate to the bishopric of Gardar, Greenland;

"Those which relate to the line of demarcation;

"Those which relate to the sending of missionaries to America;

"Those in which Pope Julius II recommends Bartholomew and Diego Columbus.

"*A. Documents Concerning the Bishopric of Gardar, Greenland.*

"Greenland certainly is the part of the new world which was first brought into relation with the old. This was done through the Northmen of Norway and Iceland. It was by their means that christianity was first carried to America and there gave occasion for the documents in question.

"According to Adam, of Bremen (died about 1076), and the sagas, Norwegians first reached the American coast at the end of the ninth or beginning of the tenth century; but, as in Norway itself, so in Greenland, the complete establishment of the Christian religion is attributed to King Olaf II (died 1030). It is said that Archbishop Adalbert, of Bremen (1055), sent Albert as the first bishop to Greenland. This bishopric certainly existed in 1124. It was the first bishopric erected in America.

"The numerous researches and publications in regard to the extension of settlements which Christian Greenlanders effected on the American continent, and in regard to the positions of the Helleland, the Markland and the Vinland, make apparent, not only the possibility, but also the probability, that a considerable portion of that continent felt in some degree at that time the civilizing influence of the bishops of Gardar.

"Rafn identified the Vinland with Massachusetts. The question has lately been thoroughly reëxamined by Storm. His opinion is that Vinland, and consequently the extreme point reached by Christian Northmen, cannot be sought for further south than Nova Scotia. In any case, the historic importance of the bishopric of Gardar is plain.

"The bishopric belonged first to the metropolitan see of Hamburg-Bremen; but in 1146 Pope Eugene III sent the cardinal-bishop of Albano, Nicolas, who afterward became Pope Hadrian IV, to Norway to arrange in a more convenient manner the ecclesiastical affairs of that country. He established a metropolitan see at Drontheim, to which he subjected the bishoprics of Norway, of the Northern islands, and of Gardar, or Greenland.

"The letter of Innocent III, the earliest in order of time and the first here exhibited, epitomizes the apostolic case with which his predecessors in the twelfth century had bestowed on the only part of America then known.

"In all ordinary matters the dioçeses were governed by the bishops, without any direct interference on the part of the pope. But when Gregory X, in the council of Lyons (1174), ordered that a tithe of all ecclesiastical revenues should for six years be contributed, in order to provide means at least to preserve the last Christian position in Palestine, which, after the death of Louis IX of France (died August 25, 1270), seemed almost lost, such interference in some cases became necessary.

"The letters of the popes, written under these extraordinary circumstances to the archbishop of Drontheim, contain interesting information regarding the condition of the Greenlanders in the thirteenth century, and show that a part of America helped to furnish money for the crusade.

"The archbishop has informed the pope (letters 2, 6) that it would take him five years, including the voyage to and from, to visit the diocese of Greenland, and has asked permission to send some proper person in his place. Other letters (letters 3, 4) say that the archbishop would have to spend six years in order to collect personally the tithes in his arch-diocese, and that in doing so he would be obliged to live, sometimes five or more consecutive days, in a tent while traveling through desert regions. Therefore he thinks it needful that a larger number of collectors should be appointed.

"In other letters (letters 5, 8) the archbishop notes the poverty of the country. The people had no money of any kind, and no grain or fruit could be grown. The inhabitants lived on milk, or food produced from it (*laticinia*), and fish. In Greenland particularly the people could offer nothing for the expenses of the crusade but skins, probably of the elk or of the musk-ox and of seals (*coria bovina et phocarum*) and the teeth and soper of whales (*funes balenarum*). The non-production of grain and grapes made it necessary for the faithful (letter 7) to provide for a supply of bread and wine to be used in celebrating the eucharist.

"From a letter of Pope Nicolas V, dated September 22, 1148 (letter 9), it appears that the Greenlanders attributed their conversion to Saint Olaf, King of Norway (died 1030); that they had built, beside a goodly number of parish churches, a respectable cathedral at Gardar; that about the year 1418 heathen foreigners, with a fleet, invaded their country, killed or carried into slavery the inhabitants and burned their habitations and buildings, leaving only nine churches, which were in the least accessible regions. Some of the captives, having escaped and returned to their own country, unable to go to the distant churches, have begged the pope to provide them with priests and a bishop. Nicolas therefore empowers the two neighboring bishops of Iceland to satisfy the pious desires of the Greenlanders.

"The information contained in this letter of Nicolas V is in some measure completed and confirmed by one from Pope Alexander VI, written 1492–'93, just when Columbus had made his great discovery. It seems that the letter of Nicolas did not reach its destination, or failed to effect its purpose. At any rate, the Greenlanders had addressed a petition to Innocent VIII, setting forth that for about eighty years (since the heathen invasion, in about 1418) they had been deprived of priests and of a bishop. As a consequence many had already lost their faith, and to those who remained faithful the only memorial of Christian worship yet belonging was the coporal on which, nearly one hundred years before, a priest had, for the last time among them, consecrated the blessed sacrament. Once every year this holy and venerated relic was shown to all the people.

"Before his elevation to the pontificate Alexander, as chancellor, had proposed Matthew, a Benedictine monk, for the bishop of Gardar. By this letter he frees him from the payment of all fees that were due in such cases and praises the willingness with which he had undertaken the difficult mission.

"*Documents that Relate to the Line of Demarcation.*

"Acting on the approved general opinion, a common consent of the time, which acknowledged the right of popes to interfere authoritatively even in political and international affairs, when the welfare of souls are involved, the Portuguese kings, with their discoveries along the western coast of Africa, commenced a series of demands for the exclusive right of discovery and colonization in that direction. This the popes, Martin V, Eugene IV, Nicolas V, and Sextus IV, gradually ceded to them till their successive grants covered all the region from Ceuta around Africa to India.

"The discovery announced by Columbus, and believed even by himself till the day of his death to be only a new and shorter way to the eastern part of India, naturally excited the apprehensions and jealousy of the Portuguese court. On the return of the great discoverer (March 4, 1493) from his first voyage, Ferdinand put in operation all his diplomacy at Lisbon for the purpose of preventing any interference with his claims, and at Rome, in order to procure from the pope a sole proprietorship of the new world, he obtained three papal letters, dated May 3d and 4th, which was to effect this result.

"The letter beginning 'inter cetera,' of the date of May 3, gave to Spain: First, the exclusive right to the lately discovered islands and to the other lands which might still be found, so far as they were not already possessed by some Christian power; secondly, the same privileges and rights for its new colonies as those previously conceded to Portugal for its possessions on the west coast of Africa. The other letter, of same date, which begins 'eximie devotionis,' contains only the last-mentioned concession.

"The third letter, dated May 4, on the other hand gives the first concession indicated above, but not the second, and is, therefore, to some extent, a repetition of the first letter. But it contains, in addition, a definition of the famous line of demarcation, determining more exactly the donation given by the first letter, evidently on account of the grant made to Portugal, although that is not mentioned. The line is fixed one hundred leagues to the west and south of the westernmost island of the Azores. 'To the south' was added because the region was particularly desired by both parties, and because Portugal had already proposed the drawing of a line from east to west in order to confine Spain to the northern side of such a boundary. The condition of geographical science at the time did not permit the intended boundary to be defined more accurately. In proposing it to Alexander VI, Spain only knew that it would fall far from San Salvador and hoped that, by keeping its ships at a distance of one hundred leagues from the most western of the Portuguese possessions, alarm and jealousy on the part of the last-named power might be prevented. But Portugal, like Columbus and Spain, believed San Salvador to be part of India, to which country, passing the cape of Good Hope, in 1487, it had opened a new way, and to which it claimed the exclusive right. It was, therefore, impossible for Spain to maintain the demarcation line of Alexander VI, and in the convention of Torderillas (7th June, 1494) it was moved one hundred and seventy leagues farther west, a change which, without the cognizance of either party, gave Brazil to Portugal. But although the position of the demarcation line of Alexander VI had been changed, it continued, nevertheless, to be the basis of all subsequent transactions and conventions for dividing the sovereignty of the new world, and thus preserved peace between the two colonizing powers.

"It is clear from the text of these letters that the popes, and especially Alexander VI, founded such action, as was his in this case, on their duty to provide for the christianization of the new countries; a duty which carried with it the right and authority to use all power, and particularly all indispensable means for its accomplishment. The conversion of these heathen populations seemed impossible, unless somehow they should be incorporated into and peace preserved between the Christian kingdoms of Spain and Portugal.

"*The Sending of Bishops and Missionaries to the New World.*

"In these grants of lands newly discovered or to be discovered Alexander VI and his predecessors emphatically insisted on the duty of Christian kings to coöperate, by all means under their control, in the conversion of the inhabitants of such lands; in fact, such coöperation was a clearly implied condition and consideration of the grants. The evidence appears insufficient to support a positive assertion that on his first voyage Columbus was accompanied by a priest; but it is a plain fact that for the second expedition, in 1493, Ferdinand and Isabella, as well as Alexander VI, solicitously provided missionaries, not only for the spiritual well-being of the Spaniards, but also and principally for the conversion of the natives.

"Bernard Boil, greatly esteemed for his saintly life and for his great ability in the management of ecclesiastical and also of political affairs, offered himself for this mission, the first apostle who, after Columbus' discovery, went to the new world. Till 1492 he was a Benedictine monk, or hermit, at Montserrat; but at the time of his mission to the lately discovered islands—that is to say, at least from September 22, 1492, to December 8, 1497—he belonged to the order of the Minimi, which shortly before had been established by Saint Francis of Paul. In 1488 he returned to the Benedictine order and became abbot of Cuxa. The copyist of the letter of Alexander IV to Boil made, therefore, a very excusable mistake in writing 'minorum' instead of 'minimorum,' in consequence of which Ragnaldus, Wadding, and many other writers assigned Boil to the Franciscan order. By this letter of June 25, 1493, Alexander granted to Boil and his twelve companions all the powers and privileges which could aid to make their enterprise successful. Of these twelve companions only Pedro de Asena and Fray Jorje are named. Pedro de Asena is said to have celebrated the first mass in the new world after it was discovered by Columbus.

"As early as 1501, at the request of Ferdinand and Isabella, Alexander took steps to provide bishops for the infant colonies in America. In 1504 an archbishopric and two bishoprics were erected at Tagusta, Magua, and Bayuna, in Hispaniola (Haiti), but through the operations of Ferdinand's well-known financial policy the plan came to nothing. On August 8, 1511, these three dioceses were suppressed, and three others were established at Santo Domingo and Concepcion de la Vega, in Hispaniola, and at San Juan, in Porto Rico, and placed under the jurisdiction of the archbishops of Seville, where the government of the colonies had its seat.

"In August and September, 1513 (see five letters of that date), John of Quevedo, a Franciscan friar, was appointed to the see of Banta Maria del Antiqua, or Darien, and his appointment announced to the authorities and people. He was the first bishop of a diocese on the American continent. He died at Barcelona about December 5, 1520.

"Already a considerable body of priests, both secular and regular, were working for the religious good of the colonists and to convert the natives. The popes, however, and the rulers of Spain wished to increase the number of these laborers and to provide for their government. A letter of Clement VII, dated June 7, 1526 (letter 22), the better to effect their wish, urged the general of the Franciscans to visit personally the members of his order in the new world. By another letter (letter 23) Clement authorized the emperor, Charles V, who had asked for missionaries, to send one hundred and twenty Franciscans, seventy Dominicans, and ten Serougmites to the lately discovered islands, even without the permission of their respective superiors, granting to those who should be sent many privileges and exemptions. With like solicitude the kings of Spain and Portugal continued to fulfill the condition under which they had received the papal grants of newly discovered, or to be discovered, territories."

### *Pope Julius II Recommends Bartholomew and Diego Columbus to the King of Spain.*

On the death of Christopher Columbus (May 20, 1506) began for his heirs the difficulties which, aggregated by the characteristic tenacity of the family, occasioned the endless lawsuit, well known as Los Pleitos de Colon. With a hope of ending these difficulties, Bartholomew, the brother, and Diego, the son, of the discoverer, determined to join King Ferdinand, then at Naples. Passing through Rome, on their way thither, they were kindly received by Pope Julius II, and obtained from him a recommendation to Ferdinand, who seems already to have been favorably disposed toward them.

The documents from the secret archives of the Vatican, of which fac similes were furnished by Cardinal Rampolla for exhibition in the monastery of La Rabida, are as follows:

1.

985. Letter of Pope Innocent III, dated February 13, 1206, to the archbishop of Drontheim, confirming his metropolitan rights over the diocese of Greenland, which had been established by Pope Eugene III in 1148.

(Translation.)

Innocent III to the archbishop of Drontheim and his canonically appointed successors in perpetuity:

Although the power of binding and loosing was given to all, although one and the same command of preaching the gospel to every creature was given to all, nevertheless a certain distinction of dignity was decreed and one alone received above all the rest the care of the Lord's sheep, according to the Lord's words: Peter, lovest thou me? Feed my sheep. It was Peter likewise who obtained the preëminence among all the apostles; he who received a special command from the Lord to confirm his brethren, in order that posterity might thereby understand that though many should be ordained to govern the church, one alone was to hold the supreme dignity, one alone was to be over all the rest in authority and jurisdiction; hence, and in accordance with this design, a distinction of dignities is observed in the church, and just as in the human body the different members thereof are destined for different purposes, so also in the church different persons receive different orders for different ministries, for some are ordained for special churches, some for the government of different cities and the settlement of different affairs, others are set over special provinces, others have jurisdiction over their brethren for the trial of cases pertaining to their subjects. Over all these, however, the Roman pontiff, like Noah in the ark, is recognized as holding the first place, for he, by virtue of the privilege granted him from on high in the person of the prince of the apostles, judges and settles the causes of all, and ceases not to confirm in the Christian faith the sons of the church throughout the world, rightfully endeavoring to prove that he has heard the voice of the Lord saying, "and thou being once converted, confirm thy brethren."[4] The apostles and men who have successively risen to the government of the apostolic see since the blessed Peter have likewise striven with unfailing zeal to accomplish the same, and either personally or by means of their legates they have endeavored to their utmost to correct whatsoever needed correction and to decree whatsoever was required. Our predecessor of happy memory, Pope Eugene, following in their footsteps, was anxious, in accordance with the duty of his office, to correct in the kingdom of Norway all that seemed to demand correction, by sowing therein the word of faith, and what he himself was unable to do, owing to his care of the universal church, he entrusted for execution to his legate Nicholas, then bishop of Albano and later Roman pontiff, who, having gone to that country, loaned out, obediently to the commands of his master, the talent he had received, and like a faithful and wise servant endeavored to derive an increase therefrom. Among other things which he there accomplished to the glory of God's name and the credit of his ministry, according as he had been commanded by our aforesaid predecessor, he bestowed the pallium upon thy predecessor John, and lest the province of Norway should lack the supervision of a metropolitan he designated the city of Nidras, now under thy charge, as the metropolitan see in perpetuity of the said province and gave to it as suffrage sees in perpetuity Aslo, Amatrip, Bargen, Stavangri, the Orkney, Faröe, and Subraie islands, Iceland and Greenland, ordering the bishops of the same to obey him and his successors as their metropolitans. Lest, therefore, any one should ever presume to violate the order of the aforesaid legate, we, after the example of the above-mentioned Eugene, of happy memory, of Alexander and of Clement our predecessors and Roman pontiffs, confirm the same order by apostolic authority, and by the present ordinance decreeing that the city of Nidras is to be forever regarded as the metropolitan see of the above-mentioned cities; that their bishops are to obey thee and thy successors as their metropolitan, and to receive from your hands the grace of consecration; that thy successors, however, are to come to the Roman pontiff alone, in order to receive the gift of consecration, and that they are to be subject to the Roman church alone. Moreover, thy fraternity will use the pallium which has been given thee, the emblem of the plenitude of the pontifical office, within church only during the solemn celebration of mass throughout thy entire province, and on those days only which are written below, viz., the Lord's nativity, the Epiphany, the Lord's Supper, the Resurrection, Ascension and Pentecost, on the festivals of the blessed Mother of God, Mary, ever virgin; the feast of Saints Peter and Paul, the finding and exaltation of the Holy Cross, the nativity of Saint John the Baptist, the feast of blessed John the Evangelist, on the commemoration of all saints, when consecrating churches or bishops, blessing abbots or ordaining priests, on the anniversary of the consecration of thine own church, the feasts of the Holy Trinity and of Saint Olaf and the anniversary of thy consecration. Wherefore let thy fraternity perform all things with such diligence that the ornaments of thy conduct may be in keeping with the fullness of the great dignity thou hast received. Let thy life be an example to all who are under thee, so that they may learn therefrom what they should seek after and what they are obliged to shun; be distinguished for thy prudence, chaste of thought, pure in thy conduct, discreet in silence, useful in speech; seek rather to do good to men than to rule them. In thyself thou shouldst consider not the power of order, but the equality of thy condition. Have a care lest thy life render void thy teaching or thy teaching be in contradiction with thy conduct. Remember that the government of souls is the art of arts. Strive above all things to observe faithfully the decrees of the apostolic see, humbly obeying the same as thy mother and mistress. These, most beloved brother in Christ, are some among the many duties which pertain to thy archiepiscopal and sacerdotal office, all of which thou canst easily perform with Christ's aid, provided that thou hast charity, which is the mistress of all virtues, and humility, and that thou hast inwardly what thou seemest outwardly to have.

Accordingly we decree, etc, unto the end.

Given in Rome, at Saint Peter's, by the hand of John, cardinal, deacon of Saint Mary's, in Cosmedin, chancellor of the holy Roman church, on the 13th day of February, the sixth indiction, in the year of the Lord's incarnation 1205, and the 8th year of the pontificate of Pope Innocent III.

2.

986. Four letters from Pope John XXI to the archbishop of Drontheim, relative to the collection of tithes in Greenland for the Crusade, dated December 4, 1276.

(Translation.)

John XXI to the archbishop of Drontheim:

Having received, by apostolic brief, the commission to collect tithes in the kingdom of Norway for the Holy Land, and having been expressly commanded in the same brief to visit personally all the countries of the said kingdom for this purpose, thy fraternity informs us that such visitation seems in a measure impossible, for the diocese of Gardar, which belongs to thy province and kingdom, is so far from the metropolitan see and the difficulties of navigation are so great that five years are scarcely sufficient for the round journey; hence thou hast reason to doubt whether the apostolic mandate or thine will reach the aforesaid country within the period named for the payment of the tithes. Accordingly thou hast had recourse to the wisdom of the apostolic see for a remedy in this matter. We therefore, in our desire that the collection of the said tithes be diligently attended to, do wish and by apostolic letters do command thy fraternity, the above facts being true, to appoint certain capable and faithful persons, regarding whom we charge thy conscience, who shall go to that country and shall see to and diligently superintend the said collection. Thou shalt also zealously provide whatsoever shall seem expedient in the said matter, that thou mayest obtain thy reward of the Lord and merit for thyself more abundantly the favor of the apostolic see.

Given at Viterbo December 4th, in the first year.

To the same:

Having received by apostolic brief the commission to collect tithes in the kingdom of Norway for the Holy Land, and having been expressly commanded in the same brief to visit personally all the countries of the said country for this purpose, thy fraternity has informed us that several of the dioceses in that kingdom and belonging to thy province are so widely scattered over the sea and so extensive in territory that it would be difficult for thee to visit personally all the districts of the aforesaid dioceses within a period of about six years and without most serious expense to thy see, and since thou wouldst have to travel for some five or more seasons (?) through countries where, because there are no houses, thou wouldst be compelled to carry tents, thou hast asked to be authorized to depute, notwithstanding the apostolic brief to the contrary, certain prudent and capable commissaries to collect the tithes in the said countries. Wherefore, in order to spare thee and thy see such expense, we have concluded to grant thee, by tenor of these present, permission to appoint such commissaries for the collection of tithes in the said diocese, in case the above be in accordance with the facts, and if thou seest fit so to do, regarding which we charge thy conscience. We wish thee, however, to visit personally such of the aforesaid dioceses as thou canst, without great inconvenience, and to attend zealously to the collection of the said tithes, in order that thou mayest expect a recompense from the Lord, whose work it is, and mayest more abundantly merit the favor of the apostolic see.

Given at Viterbo December 4th, in the first year.

To the same:

Thou hast informed us that, owing to the great extent of the dioceses in the kingdom of Norway, wherein thou hast been appointed by apostolic letter collector of tithes for the relief of the Holy Land, the two collectors named, with apostolic permission, for every diocese, are not sufficient for the said work, nor can they attend to the matter without inconvenience and very great expense. By the advice and with the assent of thy suffragans in the said kingdom, thou hast appointed for the country districts of the different dioceses several other collectors, who by their own efforts and at their personal expense are to collect the tithes and then consign them to the two city collectors. Wherefore thou hast humbly besought us to consider the labor and expense to which these country collectors put themselves and to grant them some indulgence; hence, as we desire that these country collectors should derive some profit from their labors and expense, we grant them the indulgence which has been accorded to those who by their efforts and coöperation further the cause of the Holy Land.

Given at Viterbo December 4th, in the first year.

To the same:

Thou has informed us that in the kingdom of Norway, where thou hast been entrusted with the collection of tithes for the Holy Land, the current coin is so base as to be of no value beyond the frontiers of the kingdom, and that in certain parts of the said kingdom money is not used at all, besides no crops are grown and no fruits are produced, the people subsisting almost entirely upon milk, cheese, and fish; hence thou hast humbly asked us to tell thee what thou art to do with the tithes collected of the aforesaid milk, cheese, fish, and money. Accordingly, in our desire that whatever is most advantageous to the work to be done in the matter, we think it would be well, if the above be exact, to exchange, as circumstances will permit, all such coin and tithes for gold or silver. As for the nuns and other religious orders of the same kingdom whose incomes and ecclesiastical revenues are so small as to be inadequate for their support, thou canst observe that which is more fully set forth in the declarations concerning this collection of tithes.

Given at Viterbo December 4th, in the first year.

3.

987. Letter from Pope Nicholas III, dated January 31, 1279, to the archbishop of Drontheim concerning the collection of tithes in Greenland.

(Translation.)

Nicholas III to his venerable brother, the archbishop of Drontheim:

We have gathered from thy letters to us that the island on which the city of Gardar is situated is rarely visited by a ship because of the storminess of the ocean within which it lies; hence, when recently certain seamen set sail for the said island to the said city, thou didst avail thyself of the opportunity to send, in company with the said seamen, a prudent man whom thou didst depute to collect the tithes, and, relying upon our approval, thou didst authorize him to absolve clerics from the sentence of excommunication which they had incurred for not having paid the tithes within the appointed time, and to free them from whatsoever irregularity they might have contracted; hence thou hast humbly besought us to grant our gracious ratification. Since then we cannot favorably assent to this demand, inasmuch as it is not supported by reason, and wishing on this account to accede to thy desires by applying a ready preservative against dangers to souls, we hereby authorize thee to impart to those whom thou has sent or whom thou wilt hereafter send to the aforesaid islands to absolve clerics, whether in the above mentioned or in whatsoever other islands of the same sea, from the aforesaid sentence according to the form of the church, and to dispense them from this kind of irregularity.

Given in Rome, at Saint Peter's, January 31, 1279.

4.

Letter from Pope Nicolas III to Master Bertrand Arnabrie, dated June 9, 1279, concerning the purchase of wine and altar bread for the churches in Greenland.

(Translation.)

Nicholas III to the same (Master Bertrand Amabric):

We have lately been informed by thee that certain revenues have been assigned by the piety of the faithful in the cathedral churches of Denmark and Sweden for the special purpose of procuring wine and altar-bread for the clergy of the churches within the said kingdoms. As, however, thou hast consulted the apostolic see as to whether tithes should be taken from such revenues, we, while commending thy diligence, do by apostolic letter leave the matter to thy discretion, so that, if the revenues be so considerable that thou art certain a large sum is left over after the furnishing of wine and altar-bread, we desire that tithes be paid thereof. If, however, little or nothing remains of the said revenues, nothing is to be paid, out of reverence for worship and the sacrament of the Lord.

Given in Rome, at Saint Peter's, June 9, 1279.

5.

988. Letter of Pope Martin IV to the archbishop of Drontheim, dated March 4, 1281, instructing him as to the skins and whalebone contributed as tithes by the people of Greenland.

(Translation.)

Martin IV to the archbishop of Drontheim:

Thy fraternity has informed us that the tithes which are being paid in the Iceland and Faröe islands, in the kingdom of Norway, consist of various articles which cannot easily be exchanged or sold, on which account the same cannot well be sent to the

Holy Land or to the apostolic see. Thou hast added, moreover, that the only tithes which can be collected in Greenland consist of skins (probably) of the elk or of the musk-ox or of seals (*coria bovina elphocerum*), teeth ropes of whales (*funes balnearum*), which, according to thee, can hardly be sold for any suitable price. Wherefore thou hast asked instructions of the apostolic see as to what thou shouldst do in the premises. Accordingly, whilst we praise thy zealous solicitude, we answer thy question to this effect: thou wilt endeavor to exchange the tithes of Greenland and the aforesaid islands to the best possible advantage, either for silver or gold, and will forward this same as soon as thou canst, together with the other tithes collected in the kingdom for the relief of the Holy Land, faithfully informing as to the nature and amount of what thou sendest. We likewise write to our most dear son in Christ, the illustrious King of Norway, asking him not to prevent nor to allow any one to prevent the free exportation from his kingdom of the tithes which are to be applied, according as the apostolic see shall see fit, to the relief of the aforesaid Holy Land, and effectually to endeavor to repeal the prohibition decreed against clerics of the said kingdom, forbidding any layman of the same to sell sterlings or other silver.

Given at Orvieto, March 4, 1281.

6.

989. Letter from Pope Nicolas V, dated September 20, 1448, to the Irish bishops of Skalholt and Holar concerning the condition of the church in Greenland.

(Translation.)

Nicholas, etc., to our venerable brothers, bishop of Skalholt and bishop of Holar, health, etc.:

In directing the government of the universal church by virtue of the apostolic charge delivered to us from above, it is our solicitude in God's name to secure the salvation of souls redeemed by the precious blood of our Saviour, not only by calming the storms of impiety and error which sweep over them, but also by sheltering them when exposed to calamities and the whirlwinds of persecution. From the natives and inhabitants of Greenland, an island said to be situated in the most distant parts of the ocean off the northern coast of the kingdom of Norway, in the province of Drontheim, a mournful wail has reached our ears and saddened our heart. This people nearly 600 years ago received the faith from the lips of their glorious apostle, the blessed King Olaf, and preserved it unchanged and pure, guided by the ordinances of the holy Roman church and the apostolic see. In the lapse of time, burning with a constant devotion, they erected numerous churches and a splendid cathedral, in which divine worship was faithfully carried on until, 30 years ago, by the permission of Him who, in His inscrutable wisdom and knowledge, chastises those whom He loves in order to perfect them, barbarians from the neighboring pagan shores sent a fleet for the invasion of the island. The country was devastated with fire and sword; sacred temples were destroyed in the whole island, which is said to be of vast extent. Only nine parochial churches were left untouched, because they could not easily be reached on account of their situation among the mountains. Many of the miserable natives of both sexes who seemed able to bear the yoke of perpetual slavery, and on account of their physical endurance best fitted for the purposes of their tyrants, were led away by them captives. However, as the same report added, after some time many of them returned to their native shores, and having here and there re-erected what the barbarians had demolished, they desired to spread divine worship and restore it to its former splendor. But past calamities had left them in such a starving and destitute condition that they were without the means of supporting a bishop and priests, and unless, in their desire for religious services, they could undertake a journey of many days to the churches which had escaped the hands of the barbarians, they were for those 30 years in want of the solace of a pastor and the ministry of priests. Accordingly they have most humbly implored that in our paternal commiseration we would aid them in the gratification of their pious and salutary desire; that we would deign to satisfy their spiritual wants and show our benevolence and that of the apostolic see in this matter. Wherefore, moved by the just and lawful petitions and desires of the aforesaid natives and inhabitants of the island of Greenland and not having certain knowledge of the above facts and their circumstances, we by apostolic letters order one or both of you, whom we understand to be of the neighboring bishops, after having diligently examined and understood what we have said above, to ascertain whether it be true. If this is the state of affairs, and if you find the number and resources of the population sufficiently increased to make expedient the fulfillment of their desire, it is our wish that you ordain fitting priests of exemplary life, and provide rectors for the government of the restored parishes and churches and for the administration of the sacraments. Moreover, if to one or both of you it seem timely and expedient (having asked the advice of the metropolitan if the distance permit), we give you power to appoint and constitute as bishop for them some useful and qualified person in communion with us and with the apostolic see, to consecrate him in our name with the usual form of the church, and to concede to him the administration of spiritual and temporal affairs, after having received from him a fitting and customary oath of allegiance to us and the apostolic see. Making this a matter of conscience, we, by our apostolic authority, concede to one or both of you full and unrestricted power in this matter according to the tenor of these presents, all statites and constitutions, whether apostolic or of general councils or of any other kind whatsoever, notwithstanding.

Given at Rome, at Saint Potenciana's, in the year, etc., fourteen hundred and forty-eight, twelfth day before the kalends of October, the second year of our pontificate.

7.

990. Letter of Pope Alexander VI, 1492–'93, appointing Mathias, a monk of Saint Benedict, to the bishopric of Gardar, Greenland, and describing the condition of the people of that country.

(Translation.)

We are informed that the church of Gadar, on the confines of the world, in the country of Greenland, whose inhabitants are wont to subsist upon dried fish and milk on account of the dearth of bread, wine, and oil, and that because of the very rare voyages which can be made to the said country, owing to the freezing of the waters, no ship is supposed to have landed there during the past eighty years. We are told, moreover, that such voyages are not considered possible except in the month of August, after the thawing of the ice, and that no resident bishop or priest has governed the said church for some eighty years past; hence, because of the absence of the priests, it has happened that a great many of the inhabitants of that diocese who were once Catholics have, alas! denied the sacred baptism they had received. It is said that the people of that country have no other reminder of the Christian religion than a certain capa-ral which they show once a year and upon which the body of Christ was consecrated by the last resident priest, one hundred years ago. Owing to these and other considerations our predecessor, Pope Innocent VIII, of happy memory, wishing to provide an efficient and worthy pastor for the said church, which has for so long been deprived of such a consolation, in accordance with the advice of his brethren, of whom we were one, appointed to the said see our venerable brother Mathias, a professed member of the order of Saint Benedict and now bishop-elect of Gades, having been preconized at our request previous to our election. In his great zeal for the conversion of those who have fallen away and for the expiration of error, he now cheerfully resolves to set out upon his most dangerous voyage. Whilst most highly commending in the Lord his pious and laudable intention, we wish to assist him somewhat because of his poverty. Wherefore, of our own act, cognizance, and upon the advice and with the consent of our brethren, we command, under penalty of excommunication, to be incurred *ipso facto*, our beloved sons, the copyists, abbreviators, the solicitors, the officials of seals and registerator, and all other officials in the respective offices, whether of the chancery or the apostolic chamber, to forward and have forwarded promptly and entirely free of charge all apostolic letters concerning the promotion to the aforesaid church of Gades which have to be sent to the said bishop-elect. Moreover, by the same act, with like cognizance and under the same penalties, to be incurred by those who disobey, and all else to the contrary notwithstanding, we order the clerics and notaries of the apostolic chamber to deliver to the said bishops all such briefs and bulls without payment or exaction of any tax or of any of the fees or gratuities usually paid on like occasions. Let everything be done gratis in all the offices, because he is very poor, etc.

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This concludes the series of letters relating to the American continent on the files of the Vatican dated prior to 1492, and while they furnish presumptive evidence that the existence of unexplored lands and savage races west of Greenland was known to the church, they are equally strong proof that Columbus received no information or encouragement from them, particularly as he never expected or desired to discover new lands, but sought a shorter passage to the lands of opulence described by Marco Polo.

The remaining letters from the Vatican files relating to the early history of America, are of interest, and historical value.

8.

991. Letter of Pope Alexander VI to Ferdinand and Isabella, dated May 3, 1493, congratulating them upon the triumph of Columbus and granting to them full sovereignty over all lands discovered by him.

(Translation.)

Alexander, etc., to his most dear son and daughter in Christ, the illustrious Ferdinand and Isabella, King and Queen of Castile and Leon, Aragon, Sicily and Granada, health, etc.:

Among the works which are pleasing to the divine Majesty and dear to our hearts, none is so important as that of the exaltation and diffusion of the Christian religion and Catholic faith, more especially in these our times, the salvation of souls, and the repression and conversion of barbarous nations. Wherefore, when, by favor of God's clemency and despite our inadequate merits, we were elevated to this holy see of Peter, knowing that you, like true Catholic kings and princes, as we have ever known you to be, and as your famous achievements now prove, not only ardently desired the same end, but strove to attain it with all zeal and diligence, allowing yourselves to be deterred by no labors, expenses, dangers, nor even the effusions of your own blood, and being, moreover, aware that you had for a long time dedicated all your thoughts and efforts thereunto, as is shown by the recovery of Granada from the Saracen yoke, accomplished by you in these days, to such great glory of God's name, we with reason concluded to grant you spontaneously and approvingly whatsoever would enable you to promote, with ever increasing zeal for God's glory and the propagation of christianity, an aim so holy, so laudable and so pleasing to the immortal God.

We have indeed heard that you, who had long been determined to search for and find certain remote and unknown continents and islands, which no one had ever discovered, in order to convert the natives and inhabitants thereof to the worship of the Redeemer and the profession of the Christian faith, being most earnestly engaged in the conquest and recovery of the said kingdom of Granada, were enabled to carry into execution your holy and laudable resolve. When at length, however, by God's will, the said kingdom had been reconquered you, in your desire to begin at once the accomplishment of your purpose, sent our beloved son, Christopher Colon, with ships and suitable crews and cargoes, prepared with great labor, risk and expense, to make diligent search for the said unknown and remote continents and islands in a sea whereon none had ever before sailed. Finally, with the divine assistance and by the greatest effort, your envoys, while navigating the ocean to the westward, it is reported, in the direction of the Indies, discovered certain most distant islands and continents also which had never before been found, the inhabitants whereof are numerous and peaceful and, according to rumor, go naked and eat no meat. Moreover, as your said envoys have reason to think, the inhabitants of these islands believe in one God, the Creator, in heaven, and appear sufficiently disposed to embrace the Catholic faith and to become imbued with good morals, and it is hoped that by means of instruction the name of our Lord Jesus Christ can easily be introduced into the said islands. The said Christopher has already erected a sufficiently fortified citadel, in which he has placed a garrison of his fellow-voyagers, who are to search for other distant continents and islands. In those already discovered gold, spices and a great number of other precious products of different kinds and qualities are to be found. Wherefore you, on diligent consideration of all these facts, being, like your great and royal ancestors (as becomes Catholic kings and princes), most of all concerned with the exaltation and diffusion of the Catholic faith, have resolved with God's merciful assistance to subdue the aforesaid countries and to convert their inhabitants to the Catholic faith.

Hence, whilst we most highly commend in the Lord your holy and laudable purpose and desire that it be duly accomplished, and that by this means our Saviour's name be made known in those countries, we most earnestly exhort you in the Lord and demand of you, in virtue of holy baptism, by whose reception you have bound yourselves to obey our apostolic orders, and through the bowels of the mercy of our Lord Jesus Christ, that, inasmuch as you intend of your own free will and out of zeal for the orthodox faith to undertake this expedition, you will diligently and out of a sense of duty induce the inhabitants of the said countries to embrace the Christian religion. We moreover exhort you not to allow yourselves to be deterred by dangers or trials and to remain firm in the hope that Almighty God will prosper your efforts; and, in order that you may the more willingly and courageously set about so great an undertaking, after having received of the abundance of apostolic bounty by our own act, without being moved thereunto by any petition presented to us by you or by another in your behalf, but out of our sheer liberality, with certain cognizance, out of the fullness of apostolic power by the authority of Almighty God given us in blessed Peter, and of the vicegerency of Jesus Christ which we exercise upon earth, we, by tenor of these presents, give, grant and assign in perpetuity to you and your heirs and successors, the kings of Castile and Leon, all the aforesaid unknown continents and islands that have been or shall hereafter be discovered by your envoys which are not actually under the temporal dominion of any Christian prince, together with all their territories, cities, castles, towns and villages, all their rights, jurisdictions and possessions. We moreover create, constitute and appoint you and your heirs and successors aforesaid lords of the same, with full, free and universal authority. We decree, however, that by this our grant, donation and assignment no acquired right of any Christian ruler is to be understood as taken away, nor is it to be taken away. We moreover command you, in virtue of holy obedience (according to your promise, which we feel certain you, in your great devotion and royal magnanimity will fulfill), to appoint with all due diligence virtuous, God-fearing, learned, experienced and tried men, who shall instruct the natives of the aforesaid islands in the Catholic faith and imbue them with good morals. Moreover, we strictly forbid, under penalty of excommunication, to be incurred in the act of disobedience, all persons of whatsoever rank, be it even imperial or royal, state, degree, order or condition, to presume to go, whether for the purpose of trade or for any other whatsoever, to the aforesaid islands and continents after they have been discovered by your envoys or by those sent for the purpose by you without your special permission and that of your aforesaid heirs and successors. And, inasmuch as certain kings of Portugal also have, by an apostolic grant made to them, discovered and acquired other islands in the countries of Africa, Guinea and the Gold Coast, and have been accorded different privileges, favors, liberties, immunities, exemptions and indults, we wish you to use, possess and enjoy all and every one of the same favors, privileges, exemptions, liberties, faculties, immunties and indults, all whose tenors we desire to be considered as though inserted word for word in the present letter, and to be regarded as sufficiently expressed and inserted in the same just as if they had been granted to you and your heirs and successors by the same act, authority, knowledge and fullness of apostolic power and by special gift of favor. We extend and give the same in all respects to you, your heirs and successors aforesaid, notwithstanding apostolic constitutions and orders, and all which has been granted in the above letters, and all else whatsoever to the contrary, trusting in Him from whom empires, governments and all good things come that under His guidance of your actions your labors and endeavors will soon reach a most happy result, to the joy and glory of all christendom, if you do but continue in this holy and praiseworthy (resolve) enterprise. Since, however, it would be difficult to send the present letter to all those places in which it would be expedient to have it published, we wish and by the same act and with like cognizance we decree that the same be copied by public notary thereunto deputed and sealed by some ecclesiastical dignitary, and that the same value be attended to the said copies, whether in or wherever else soever out of court, as attaches to the present original should they be shown or exhibited. No one shall go counter to our exhortation, requisition, donation grant, assignment, investiture, act, constitution, deputation, order, inhibition, indult, exemption, gift, will and decree, etc. Whosoever, etc.

Given in Rome, at Saint Peter's, in the year, etc, 1493, third of May, in the first year of our pontificate.

Coll. A. de Campania.
N. Casanova.

By order gratis.
B. Capocci.
D. Sorrano.

9.

992. Letter of Pope Alexander VI to Ferdinand and Isabella, dated May 3, 1493, granting them sovereignty over all unknown continents and islands in the Indies that may be discovered by the explorers of Spain and confining to Portugal the newly discovered lands of Africa.

(Translation.)

Alexander, etc, to his most dear son and daughter in Christ, the illustrious Ferdinand and Isabella, King and Queen of Castile, Leon, Aragon and Granada, health, etc:

The sincere and extraordinary devotion and the perfect faith with which you honor us and the Roman church truly deserve that we approvingly grant you whatsoever may enable you to promote more speedily and effectually your holy and laudable undertaking of discovering remote and unknown continents and islands for the glory of Almighty God, the extension of Christ's dominion, and the exaltation of the Catholic faith. Accordingly, by our own act, with full cognizance and in virtue of the plenitude of apostolic authority, we have this day given, granted and assigned to you and your heirs and successors, the sovereigns of Castile and Leon, in perpetuity, as is more fully set forth in our letter on this subject, all and every one of the remote and unknown continents and islands lying towards the west and the ocean and not at present under the temporal authority of any Christian princes which have been or shall be discovered by yourselves or your envoys, who have been equipped for the purpose with great pains, risks and expense. We have included in the same donation all the states of the aforesaid continents and islands, their cities, castles, towns, and villages, rights, and all jurisdictions whatsoever.

As, however, on another occasion, different privileges, favors, liberties, immunities, exemptions, faculties, briefs and indults were granted by the apostolic see to certain kings of Portugal, who, after obtaining a like apostolic donation, discovered and acquired other islands in the regions of Africa, Guinea and the Gold Coast, we also, wishing, as is proper, to bestow equal favors, prerogatives and benefits upon you and your heirs and successors aforesaid, by a similar act, without being moved thereunto by any petition presented to us by yourselves or by another in your behalf, but out of our sheer liberality, with like cognizance and fullness of apostolic power, by apostolic authority and by gift of special favor, do hereby grant you and your heirs and successors aforesaid the free and legitimate exercise, possession and enjoyment in the islands and countries thus far discovered or that shall hereafter be discovered by yourselves or in your name of all the favors, liberties, privileges, exemptions, faculties, immunities, briefs and indults which have been accorded to the kings of Portugal. We desire that the tenors of all the aforesaid concessions be considered as inserted, word for word, in the present letter, and as sufficiently inserted and expressed to signify that the said favors are specially granted to you and your heirs and successors aforesaid. In like manner and form we give in perpetuity all the above to you and your heirs and successors aforesaid, apostolic decrees and ordinances and all of a similar nature that is contained in letters to the kings of Portugal to the contrary notwithstanding, etc.

Given in Rome, at Saint Peter's, May 3, 1493, in the first year of our pontificate.

10.

995. Bull of the Pope Alexander VI, dated May 12, 1493, establishing the line of demarcatian between the dominions of Spain and Portugal.

(Translation.)

Alexander, etc, to his most dear son and daughter in Christ, the illustrious Ferdinand and Isabella, King and Queen of Castile, and Leon, Aragon, Sicily, and Granada, health, etc :

Among those works which are pleasing to the divine majesty and dear to our heart none is so important as that of the exaltation and diffusion of the Christian religion and Catholic faith, more especially during our times, the salvation of souls, and the repression and conversion of barbarous nations. Wherefore, when by favor of God's clemency and despite our own inadequate merits, we were elevated to this holy see of Peter, knowing that you, like true Catholic kings and princes, as we have ever known you to be and as your most famous achievements now prove, not only ardently desired the same end, but strove to attain it with all zeal and diligence, allowing yourselves to be deterred by no labors, expenses, dangers, nor even the effusion of your own blood, and knowing, moreover, that you had for a long time dedicated all your thoughts and efforts thereunto, as is shown by the recovery of Granada from the Saracen yoke, brought about by you in these days, to such great glory of God's name, we with reason concluded to grant you spontaneously and approvingly whatsoever would enable you to promote, with ever-increasing zeal for God's glory and the propagation of christianity, an aim so holy, so laudible, and so pleasing to the immortal God. We have, indeed, heard that you, who had long been determined to search for and find certain remote and unknown continents and islands which no one had ever discovered, in order to convert the natives and inhabitants thereof to the worship of the Redeemer and the profession of the Christian faith, being most earnestly engaged in the reduction and recovery of the said kingdom of Granada, were unable to carry into execution your holy and laudable resolve. When at length, however, by God's will, the said kingdom had been reconquered you, in your desire to begin at once the accomplishment of your purpose, sent our beloved son, Christopher Colon, a worthy and most commendable man and well fitted for so great an undertaking, with ships and suitable crews and cargoes, prepared with great labor, risk and expense, to make diligent search for the said remote and unknown continents and islands in a sea whereon none had ever before sailed.

Finally, with the divine assistance and by dint of the greatest care, your envoys, while navigating the ocean, discovered certain most distant islands, and continents also, which had never before been found, the inhabitants whereof are numerous and peaceful and, according to report, go naked and eat no meat. Moreover, as your said envoys have reason to think, the inhabitants of these islands believe in one God the Creator, in heaven, and appear sufficiently disposed to embrace the Catholic faith and to become imbued with good morals, and it is hoped that by means of instruction the name of our Lord Jesus Christ can easily be introduced into the said islands. The said Christopher has already erected a sufficiently fortified citadel, in which he has placed a garrison of his fellow-voyagers, who are to search for other distant continents and islands. In those already discovered gold, spices and a great number of other precious products of different kinds and qualities are to be found. Wherefore you, after diligently considering all these facts, being, like your great and royal ancestors (as becomes Catholic kings and princes), most of all concerned with the exaltation and diffusion of the Catholic faith, have resolved with God's merciful assistance to subdue the aforesaid countries and to convert their inhabitants to the Catholic faith.

Hence, whilst we most highly commend in the Lord your holy and laudable purpose and desire that it be duly accomplished, and that by this means our Saviour's name be made known in those countries, we most earnestly exhort you in the Lord, and demand of you in virtue of holy baptism, by whose reception you have bound yourselves to obey our apostolic orders, and through the bowels of the mercy of our Lord Jesus Christ, that inasmuch as you intend of your own free will and out of zeal for the orthodox faith, to undertake this expedition, you will diligently and out of a sense of duty induce the inhabitants of the said countries to embrace the Christian religion. We moreover exhort you not to allow yourselves to be deterred by dangers or trials, and to remain firm in the hope that Almighty God will prosper your endeavors.

And in order that you may the more willingly and courageously set about so great an undertaking, after having received of the abundance of apostolic bounty by our own act, without being moved thereunto by any petition presented to us by you or by another in your behalf, but out of our sheer liberality, with certain cognizance, out of the fullness of apostolic power, by the authority of Almighty God given us in blessed Peter and of the vicegerency of Jesus Christ, which we exercise upon earth, we by tenor of these presents give, grant and assign in perpetuity to you and your heirs and successors, the Kings of Castile and Leon, all the islands and continents that have been or shall be found and discovered westward and southward of a line drawn from the Arctic pole, or the north, to the Antarctic pole, or the south, whether these continents or islands that have been or shall be found lie in the direction of India or of any other country, the said line to be one hundred leagues distant to the west and south from the most western and most southern of the islands commonly called the Azores and Cape Verde—that is to say, all the islands that have been or shall be discovered west or south of the aforesaid line which were not actually owned by any other Christian king or prince prior to the last feast of the nativity of our Lord Jesus Christ, from which the present year, fourteen hundred and ninety-three, began, at the time when some of the aforesaid islands were discovered by your envoys and captains, together with all their territories, cities, castles, towns and villages, all their rights, jurisdictions and possessions. We moreover create, constitute and appoint you and your heirs and successors aforesaid lords of the same, with full, free and universal authority. We decree, however, that by this our grant, donation and assignment no acquired right of any Christian ruler who was in actual possession of any of the said islands prior to the above-mentioned feast of the nativity of our Lord Jesus Christ is to be understood as taken away, nor is it to be taken away. We moreover command you in virtue of holy obedience (according to your promise, which we feel certain you in your great devotion and royal magnanimity will fulfill) to appoint, with all due diligence, virtuous, God-fearing, learned, experienced and well-tried men, who shall instruct the natives of the aforesaid islands in the Catholic faith and imbue them with good morals. Moreover we strictly forbid, under penalty of excommunication, to be incurred in the act of disobedience, all persons of whatsoever rank, be it even imperial or royal, state, degree, order or condition, to presume to go, whether for the purpose of trade or for any other whatsoever, to the continents or islands that have been and shall be discovered to the west and south of a line drawn from the north to the south poles, whether in the direction of India or of any other country, the said line to be one hundred leagues distant to the west and south from the most western and most southern island of those commonly called the Azores and Cape Verde, as has already been set forth, without the special permission of yourselves and your aforesaid heirs and successors, apostolic constitutions and decrees and all else to the contrary notwithstanding. We trust in Him from whom empires, governments and all goods things proceed that if you persevere in this your holy and laudable purpose your labors and endeavors will under the divine guidance be speedily crowned with a most fruitful result, to the joy and glory of all christendom, etc.

Given in Rome, at Saint Peter's, in the year of the Lord's incarnation 1493, May 12, in the first year of our pontificate.

11.

996. Bull of Pope Alexander VI, dated Rome, June 25, 1493, confirming Bernard Boil as the first missionary to the New World.

(Translation.)

Alexander, etc., to our beloved son, Bernard Boil, friar of the order of Minors and vicar of the said order in the kingdom of Spain, health, etc.:

By virtue of apostolic authority, with certain cognizance and by tenor of these presents, we grant to thee, who art a priest, full, free and universal faculty, permission power, and authority, and the same to any members of thy own or another order, to be selected by thyself or by the King and Queen. viz., Ferdinand and Isabella, without any necessity of permission unto this end from thy superiors or from any others whatsoever, to go to the aforesaid islands and countries, and to reside therein at your pleasure, to preach and sow the word of God, of thyself or by means of another or other suitable priests, whether secular or regular and of whatsoever orders, and to bring into the Catholic faith the said natives and inhabitants; to baptize and instruct them in that faith, and to administer to them as often as necessary the sacraments of the church; to hear them, one and all, in their confessions, whenever requisite, either in person or by means of another or other priests, whether secular or regular, and, after having carefully heard them, to grant them the required absolution from their crimes, excesses and transgressions, even from such as may demand consultation of the apostolic see, in anywise whatsoever, and to enjoin upon them salutary penance; to commute to other works of piety all their temporal vows, excepting only those of pilgrimage to Jerusalem, the tombs of the apostles Peter and Paul, Saint James of Compostella, and the vows of religion; to found and erect, provided nobody's right be infringed upon thereby, any churches whatsoever, chapels, monasteries, houses of any religious orders whatsoever, even of mendicant orders, whether for men or women; holy places, with belfries, bells, dormitories, cloisters, refectories, orchards, gardens and any other necessary adjuncts; to receive into houses of the professed of mendicant orders erected by thee for the same and to grant permission to dwell permanently therein; to bless the said churches, and as often as they and their respective cemeteries chance to be desecrated, whether by the shedding of blood, pollution or otherwise, to bless and rededicate them through any Catholic priest, after the customary manner; to eat, freely and lawfully and as often as necessary, meats and other kinds of food that are forbidden thee and thy associates by the rules of the said orders, with regard to which matter we charge your consciences, and to execute and dispose all things and everything in the above and all things necessary thereto. Moreover, in order that the faithful may the more willingly go to those countries and islands out of devotion and in the hopes of securing the salvation of their souls, we grant to all and every one of the aforesaid faithful, of either sex, who personally go to the aforesaid countries and islands, by order and with consent, however, of the above-mentioned king and queen, the choice of a suitable confessor, either secular or regular, who shall have power to absolve them all or any one of them, after the manner above stated, from their crimes, transgressions and even such sins as are reserved to the said see; to commute their vows and to impart to them, in virtue of the aforesaid authority, once in life and at the hour of death indulgence and remission of all their sins for which they shall be heartily sorry and which they shall have orally confessed, continuing steadfastly in the sincerity of faith, in union with the holy Roman church, and in obedience and fealty to us and to the Roman pontiffs, our legitimate successors. We also grant to the monasteries, establishments and houses which may be founded and to the monks, brethren and temporary sojourners therein the full and lawful exercise, possession and benefit of all and every one of the favors, privileges, liberties, exemptions, immunities, indulgences and concessions which have been given in general or which may hereafter be given to the monasteries, establishments, houses and to the monks and brethren of the orders to which the aforesaid places and persons belong. We bestow the above as a mark of special favor, notwithstanding the decrees of our predecessor of happy memory, Pope Boniface VIII, forbidding mendicant friars to accept new houses without special permission of the said see, etc.

Given at Rome, from Saint Peter's, in the year 1493, June 25th, in the first year of our pontificate.

12.

997. Pope Julius II commends Bartholomew, the brother, and Diego, the son, of Columbus to the favor of King Ferdinand, dated April 10, 1507.

(Translation.)

Our most dear son in Christ, health, etc:

Our beloved son, Bartholomew Colum (sic), the brother of Christopher, who of late years discovered those islands of India which were unknown to our forefathers, being on his way to see your majesty, tarried with us in order to show his devotion to our person. We kindly received him and heard him because of his long sojourn in those islands. We were, moreover, pleased to give him our recommendation, inasmuch as Christian governments appear to have greatly profited by the discovery of the said islands. Wherefore we beseech your majesty, whose aim and desire has ever been the good of the Catholic faith, to consider Bartholomew himself, and his nephew, the admiral of the said islands, as most highly recommended, though we are of the opinion that you will do this of your own accord.

Given at Rome, April 10, 1507, in the fourth year of our pontificate.

13.

998. Bull of Pope Leo X, August 28, 1513, appointing John of Quevedos of Santa Maria del Antiqua (Darien), the first bishop on the American continent; also letters to the people of that diocese and to Queen Johanna of Spain.

(Translation.)

Leo X to our beloved son John of Quevedos, elect of S. Maria del Antiqua, health, etc:

The debt of our pastoral office requires that amidst the divers cares by which we are constantly harassed this above all should occupy our attention; that over all churches, and especially those which, like young plants budding forth in the garden of the Lord, are most exposed to the misfortunes of vacancy, by our diligence those pastors be appointed, through whose fruitful care the same churches may with the Lord's help be able to receive a happy increase in spiritual and temporal affairs. A short time ago we reserved to our appointment and disposal provisions for all churches which were then vacant or which from that time forward should become vacant, declaring thenceforth null and void all attempts made to the contrary, no matter by whom or by what authority, whether designedly or not. Afterwards, however, the church of S. Maria del Antiquà became vacant, which we to-day, counselled by our venerable brothers and in the plenitude of our apostolic power, have erected in that newly discovered land of primeval India, liberated from pagan tyranny under the auspices of our beloved son in Christ, Ferdinand, illustrious king of Aragon and both Sicilys. We then, to provide quickly and happily for the same church, concerning which none but us could or can provide on account of our reservation and decree to the contrary, with paternal and solicitous care, carefully deliberated with our venerable brothers regarding the choice of a useful and zealous person to place over the same church, lest it be subjected to the ravages of a long vacancy; and finally we directed our mind's eye to you, a priest and professed member of the order of Friars Minor, known as observants; you, of whose zeal for religion, literary requirements, purity of life, regularity of morals, providence in spiritual and circumspection in temporal affairs, and many other virtuous gifts, suitable testimony has been given; all which things having been duly considered by the counsel of the same brothers, we, with the aforesaid authority, make provision for that church in your person, you who for your merits have proved acceptible to them and to us, and we appoint you its bishop and pastor, committing entirely to you its care and the administration of its spiritual and temporal matters; and confiding in the giver of mercies we hope that, God directing your actions, that church, under your wise and happy government, may with the help of God's grace be usefully and prosperously ruled and receive a gratifying increase in temporal and spiritual affairs. Receive, then, with alacrity the yoke of the Lord which we place on your shoulders; strive to care for and administer that church with such fidelity, solicitude and prudence that it may rejoice in being committed to so provident and profitable an administration, and that you, besides a reward in eternity, may merit henceforth more abundant blessings and grace from us and the apostolic see.

Given at Rome, at St. Peter's, in the year of the incarnation of our Lord one thousand five hundred and thirteen, the fifth day before the ides of September, the first year of our pontificate.

In like manner to our beloved children, the people of the city and diocese of the church of S. Maria del Antiqua, health, etc:

Today, advised by our brothers and in the fulness of our apostolic authority, we provide for the church of S. Maria del Antiqua, in the island of India, which has been vacant since its first erection, in the person of our beloved John, elect of S. Maria del Antiqua, acceptable to us and to our brothers for his merits, and we appoint him bishop and pastor of the same, committing entirely to him its care and administration in spiritual and temporal matters, according as is more fully expressed in our letters written to this effect. Wherefore we earnestly ask and exhort you all; we order you by apostolic letters to receive the same John elect as your father and pastor of your souls with grateful honor, to pay him devout and fitting reverence, humbly to obey his salutary admonitions and commands, so that he may rejoice to have found in you dutiful sons, and you in consequence to have found in him a benevolent father.

Given as above.

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In the same manner, to our beloved daughter in Christ, Johanna, illustrious Queen of Castile and Leon, health, etc, grace, etc:

Since then, beloved daughter in Christ, it is the work of virtue to act with benign favor towards the ministers of God and to revere them by word and deed for the glory of the eternal King, we earnestly request and exhort your royal serenity, out of love for us and the apostolic see, to consider the same John elect andhis church of S. Maria del Antiqua as most heartily commended, etc.

Given as above.

14.

Letters from Pope Leo granting authority for the confirmation of John of Quevedos as bishop of Darien.

(Translation.)

M. XX XIX de Campania.

Leo X to our beloved son, John of Quevedos, elect of S. Maria del Antiqua, health, etc:

Since we by apostolic authority, counselled by our brothers, have thought it proper to provide for the church of S. Maria del

Antiqua, in a certain manner bereft of the solace of a pastor, in your person acceptable to us and to our brothers, as your merits require, appointing you its bishop and pastor according, as is contained more fully in our letter written for that reason, graciously attending to what may be to your greater convenience, we grant your request, conceding to you full and free leave, according to the tenor of these presents, to receive consecration at the hands of whatsoever Catholic bishop you wish, in favor and communion, and we grant to the same bishop leave by our authority, freely and lawfully, to perform the aforesaid function after having received from you, in our name and that of the Roman church, the usual oath of fidelity, according to the form indicated by these presents. However, we wish and by the aforesaid authority command and decree that if the same bishop presume to confer on you that charge without having received from you the aforesaid oath, and if you dare to accept it, that bishop be suspended from the exercise of his pontifical office and both he and you be suspended, by that very fact, from the administration of your churches in both spiritual and temporal matters. We desire, moreover, that you see to it that the form of this oath taken by you be sent to us as soon as possible, through your own nuncio, word for word, by your letters patent, signed with your own seal. This is the form of the oath which you will take: I, John, elect of S. Maria del Antiqua, from this hour henceforth will be faithful and obedient to blessed Peter and the holy Roman church and to our Lord Pope Leo X and his successors canonically constituted, so help me God and these His holy gospel.

Given at Rome, at Saint Peter's, in the year of the incarnation of our Lord one thousand five hundred and thirteen, the fourth day before the ides of September, in the first year M. XX de Campania.

15.

Letter from Pope Leo X granting absolution to John of Quevedos, bishop of Darien.

To our beloved son, John of Quevedos, professed member of the order of Friars Minor, known as Observants, health, etc:

The customary clemency of the apostolic see employs opportune remedies, according as is fitting, in order that the dispositions made by it for the time being regarding cathedral churches may not meet with opposition, but that the persons to be placed over them may be able to preside over the same with pure heart and sincere conscience. Whereas, then, we this day, with the advice of our brothers, provide in your person, acceptable to us and to our brothers, as your merits require, for the church of S. Maria del Antiqua, which, vacant from its early erection till now, we by apostolic authority and counseled by the same brothers have this day erected; and whereas we intend to place you over it as its bishop and pastor, desiring that this provision and appointment meet with no opposition on account of any ecclesiastical sentences or censures which you may have been under, we, according to the tenor of these presents, by apostolic authority do absolve you and do declare you absolved henceforth from any excommunication, suspension, etc., to this end only that the aforesaid provision and appointment and all the apostolic letters written above obtain their effect, notwithstanding apostolic constitutions and ordinations and whatsoever others to the contrary; no one therefore to infringe on our absolution and declaration, etc. If any one, etc.

Given at Rome, at Saint Peter's, in the year of the incarnation of our Lord one thousand five hundred and thirteen, the fifth day before the kalends of September, in the first year.

M. XX de Campania.

16.

1002. Letter from Pope Clement VII, dated Rome, June 7, 1526, to Friar Francisco de los Angeles, minister-general of the order of Saint Francis, bestowing upon him the apostolic benediction upon his departure for America.

(Translation.)

Clement VII to Brother Francis of the Angels, minister-general of the order of Saint Francis, beloved son, etc:

In our recent conversations with you we have had the occasion to admire your spirit of religion and sanctity, your learning and prudence, and your zeal for the honor of God and His worship, and we are of opinion that such dispositions on your part fully deserve our paternal love and favor. Being minister-general of the order of Saint Francis because of your virtues and services to religion, you desire to see the Christian faith preached and propagated in the new world among the nations of those countries recently discovered by our most dear son in Christ, Charles, emperor-elect of the Spains, etc., and Catholic king. Not content with having sent your brethren and religions to those new nations, you wish to go to them in person, and like God's holy apostles devote your whole strength to infusing into their minds the truth of the gospel, and extending the limits of christendom to those distant regions by means of the most holy sign of the cross. You are now preparing yourself for your apostolate and are on the point of taking your departure. We pray God to bless your holy dispositions and the zeal which impels you to so salutary a work, upon which we congratulate you exceedingly. We exhort you to persevere with hope and confidence in this undertaking, which you have chosen to direct in person. We pray Almighty God, who inspires you with so much zeal, to aid you with His heavenly light that you may the more easily induce those nations now lying in darkness to accept the truth. We give you our apostolic benediction, in the name of the Father and of the Son and of the Holy Ghost. After the example of Jesus Christ our Savior, we send you, as He sent His apostles, to conquer for heaven, which will be your reward, those countries and nations in the name of the same Jesus Christ our Lord.

Given at Rome, the 7th of June, 1526, in the third year of our pontificate.

17.

1003. Letter from Pope Clement VII to Charles V of Spain, dated October 19, 1532, authorizing missionaries to be sent to America.

(Translation.)

To our dearest son in Christ, Charles, ever august emperor of the Romans :

Our dearest son in Christ, health, etc. You have recently made known to us that by the blessing of the Lord you have subjected to your authority some other islands of the new world and a savage people living therein unacquainted with the name of our Lord and Savior Jesus Christ and the orthodox faith, and that, unable to provide for the salvation of the souls of the natives and to procure their instruction in the faith, you desire that there be appointed some professed members of an approved religious body who shall preach and make known the word of God in these islands and direct and guide the natives in the way of the Lord's commandments. Accordingly in God's name we most heartily approve your pious desire and in the plenitude of our apostolic authority grant you by these presents full and unrestricted power to assign for this work 120 minorites of the order of Preachers and 10 professed Jeronymites, whom you, beloved son, or your representatives in those islands shall ascertain to be qualified for the undertaking and willing to assume it. We grant, moreover, to those professed religions liberty to repair thither even without having asked or obtained the permission of their superiors; to preach there the word of God, and for this purpose to reside there, living, however, in a manner becoming the religious and wearing the habit of their order. It is also our wish that these religions have free and lawful possession, use and enjoyment of each and every one of the privileges, immunities, exemptions, prerogatives. favors and indults which other members of the same orders dwelling in their own houses and monasteries possess, use and enjoy by law, custom or any other title, and this we concede notwithstanding constitutions and provisions of the apostolic see, statutes of the aforesaid orders confirmed by oath, apostolic letters to these orders and to their superiors, prelates and members, no matter of what tenor they may be, what form they may have, and what clauses or decrees they may be furnished with, even if granted freely and spontaneously, with certain knowledge and in the form of a brief, and though conceded repeated times, approved and renewed; all of which and all other provisions to the contrary we especially and expressly annul in this case, though otherwise they are to remain in full force.

Given at Rome, etc, the 19th of October, 1532, 9th year Blosius.

# EARLY VOYAGES ON THE NORTHWESTERN COAST OF AMERICA

BY

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(*President of the Geographical Society of the Pacific*)

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## *Preliminary Remarks.*

The geodetic work of the United States Coast and Geodetic Survey was extended to the Pacific seaboard in 1850, at a time when the geography of the coast was very imperfectly known, and when the names of capes, bays, rivers and islands were in much confusion.

Part of my duty, in the initiation of this public work, consisted in the determination of the latitude and longitude of the headlands, islands, harbors, rivers, rocks and dangers, and in the geographic reconnaissance of the coast line from the Mexican boundary to the forty-ninth parallel.

While in command of the surveying brig *Fauntleroy* I entered upon the self-imposed task of writing a Coast Pilot for California, Oregon and Washington. Very naturally my early interest in the old explorations became intensified as I sought to give the authority for each discovery and for each name; and I made many special examinations of the narratives that were then available for the identification of doubtful localities. This work continued with more or less directness until I was gathering the material for rewriting the fourth edition of the Coast Pilot,* and when I had familiarized myself with every mile of our own coast and had a fair acquaintance with the ocean coast of Lower California as far as San José del Cabo. Along the whole seaboard

* United States Coast and Geodetic Survey. F. M. Thorn, superintendent, Pacific coast. Coast Pilot of California, Oregon and Washington. By George Davidson, assistant U. S. Coast and Geodetic Survey. Fourth edition. (Entirely rewritten.) Washington; Government Printing Office, 1889. 4to; 721 pp. and 464 views.

I had sketched the landfall, the headlands and the notable features of the coast to be able to recall their peculiarities.

### *Collation of the Old Narratives.*

In order to preserve some of the results of these investigations, incidental to my official duties, I determined to collate the narratives of Ulloa, 1539; Cabrillo and Ferrelo, 1542–'43; Drake, 1579, and Vizcaìno, 1602–'3, and later authorities; and in the extended record thereof I am satisfied that most, if not every one, of the discrepancies of the old Spanish and English navigators have been reconciled.

The inaccuracies of the earliest discoverers arose principally from errors of their crude instruments, ignorance of the coast currents, errors of judgment in estimating distances, unreliable compasses, etc. Among the Spanish discoverers the meagerness of detailed descriptions, a failure to seize the salient points for determining their positions, the want of minute accuracy in most of their plans, sometimes giving importance to general features, and sometimes to details without distinction, and a human weakness to exaggerate certain discoveries, and yet to overlook completely others as or more important, have much involved the locating of many of their landfalls, headlands, bays and anchorages. Even with the accuracy of Vizcaìno, personal acquaintance with parts of the coast is absolutely necessary to establish identification.

The earlier navigators had not the education to carry through extensive and orderly narratives, and we can easily imagine that the priest, who invariably accompanied these expeditions, was the principal author of the reports. Moreover, the effects of the ever-present scurvy harassed the commander and lowered the whole nervous tone of the strongest men and the wretched Indians. Vizcaìno returned with half his crew, and but two or three men able to do ordinary duty. The broken records of Drake's two anchorages on our Pacific coast are very meager and unsatisfactory until carefully weighed and elucidated by personal knowledge and the assembling of nearly contemporary material.

The minuteness of record in the full and faithful narratives of Cook and Vancouver, of comparatively recent date, has enabled me to follow their track day by day, and to correct their positions by personal knowledge of the localities which they describe; but while giving these great discoverers the fullest credit for surveys unparalleled before or since their time (when all the attendant circumstances are considered), I cannot withhold my admiration for the indomitable courage and perseverance of the older Spanish navigators who, in ill-conditioned and ill-supplied vessels, with crude instruments and methods, and with crews nearly destroyed by scurvy, fought their way from the tropics to the wildest parts of the Alaskan coast regardless of seasons. "There were giants in the earth in those days."

The records of such of these earlier voyages as have been published are too short and meager to be of much more value than isolated statements of what was done on given dates; and the inaccuracy of the observations for the determination of the geographic positions has led many writers to judge that all these men were touched with the spirit of Maldonado, de Fonte and de Fuca. In comparatively recent controversy, which was unfortunately marred by national feelings, Cabrillo and Ferrelo have been placed not only at the latitudes which their erroneous instruments presumably gave, but located on the immediate coast, when they were storm-driven far to seaward, while Drake has, even at this late day, been carried as far north as the island of Vancouver.

But with the present knowledge of our coast it is possible to locate Ulloa in his heroic struggle north of the gulf of Sebastian Vizcaìno; to track Cabrillo and Ferrelo in their discoveries in the terrific "southeasters" of our mid-winter; to place Drake under cape Ferrelo and Punta de los Reyes, and to fix with certainty the most of Vizcaìno's positions. Later than 1603 I have not undertaken identifications in this short paper, except to incidentally mention Father Taraval's visit to point Eugenio, and his landing upon Natividad and Cerros islands, which has been so much misapprehended by a recent author.

### *The Voyages of Cabrillo and Ferrelo, 1542–'43.*

I was particularly interested in the voyages of Cabrillo and Ferrelo, and in studying their narratives have endeavored to put myself in their places. Understanding the character of the seasons and the difficulties of the winds, currents, swell and fogs which they encountered, I have tried to follow them day by day in their exciting discoveries. The two narratives had to be collated and studied as a general statement; then every word and idiomatic phrase had to be carefully weighed and defined. The mistranslation of certain words in Cabrillo, Ferrelo and Vizcaino had misled previous investigators.

I based my translation of the narrative of Cabrillo upon the condensed, unconnected and unsatisfying chapters of Herrera corrected several mistakes and deciphered one or two obscure passages. Ferrelo's narrative is in moderate detail, and presents several critical passages where important issues are involved, yet I feel satisfied that every case of doubt has been elucidated. These two narratives are of unequal value. The original of Cabrillo has certainly been lost, and as he died during the exploration the statements after the first ten days are extremely meager. Discoveries like that of San Diego bay are not mentioned; once there is a difference of date with Ferrelo, and occasionally particular expressions are common to both narratives.

For Drake's share of discovery on this coast we have "The World Encompassed," printed by the Hakluyt Society; the "Arcano del Mare," of Dudley; the "English Hero," and later productions.

For the narrative of Vizcaino I have used the "Noticia de la California," etc, by the Father Miguel Venegas, of which the published English translation is unsatisfactory.

So far as I have learned, there are no charts of Ulloa, Cabrillo and Ferrelo extant. Learning that there was a manuscript chart in the Royal Museum of München exhibiting the line of coast as seen by Drake between latitudes 42½° and 38°, I obtained full-sized photographs of this invaluable record, which was evidently the basis for Dudley's chart of that part of the coast in his "Arcano del Mare" of 1647. Except the orientation of Drake's chart the shore-line from Rogue river, in 42½°, to Drake's bay, under 38°, is remarkably consistent with the general outline of the coast as laid down by the United States Coast and Geodetic Survey.

From the British Museum I obtained tracings of the Portus Novæ Albionis of Drake, and part of the hemisphere whereon is shown his northwesternmost position and the Crescent City reef (the Dragon rocks of Vancouver), never before connected with his landfall of the coast.

To trace Vizcaino's narrative I first followed his chart of California as given by Burney; but have since obtained from the State Department at Washington copies of the coast line, as drawn from his thirty-two plans, by the navigators of the Sutil and Mexicano, 1802, with all his names. This chart is of variable scale and without parallels of latitude, but when these are supplied through means of well recognized capes and harbors, it is a remarkably good work for that period.

The modern charts which have been consulted have all been made by the United States Coast and Geodetic Survey, and the coast pilots from San José del Cabo northward have been consulted for exactness of geographic position and for the views of headlands.

*The Errors of their Instruments.*

As the investigation progressed it became evident that there were large errors in the determinations of the latitude by Cabrillo and Ferrelo; these and the erroneous estimates of distances were at first very confusing for the identification of capes and harbors insufficiently described, and I had to rely upon my personal knowledge of the coast and seaboard to locate them. The navigators rarely gave the latitude nearer than half a degree, but the effect of this was not apparent at the outset, where their reported measures were very nearly in accord with the true positions. When I had established the large and constantly increasing errors as the vessels sailed northward the identification was much simplified.

There were several points on the coast of Mexico, and one or more near the southern extremity of Lower California, whose latitudes were doubtless known to all the navigators with a reasonable decree of accuracy, and evidently accepted by Cabrillo and Ferrelo.

The latitude of Puerto de Navidad, whence the *San Salvador* and *La Victoria* sailed, is 19° 13′ north, and quite naturally it is not mentioned by either of the captains. Cape Corrientes, which was well known, is distant thirty leagues from Navidad, in latitude 20° 25′, and although Ferrelo says they had a southeast wind, and estimated the distance at forty leagues, Cabrillo places the cape in latitude "twenty degrees and a half." At this time I assume he did not observe for the latitude, but adopted that given by previous authorities.

After crossing the gulf of California Cabrillo says: "On Sunday, the second of July, they found themselves in twenty-four degrees and more, and recognized the Puerto del Marquez del Valle, which they called la Cruz, which is the coast of California." Ferrelo says: "They anchored the following Monday, on the third of the same month, off the point of California," etc.

The easternmost land of the peninsula of Lower California is cape Pulmo, under which there is a good anchorage and fresh water. The eastern point of the land, which is a cliff 410 feet high and rises rapidly inland, is in latitude 23° 23′, and if Cabrillo observed for latitude, as we may feel assured he did when he made this landfall, the correction to his determination is —0° 37′ "and more."

At cape San Lucas, the southwesternmost point of the peninsula, the ships anchored in the comfortable bay and took in water. The anchorage is in latitude 22° 52′ and its position was already known. Cabrillo does not mention this harbor, and Ferrelo evidently did not observe for latitude, for his narrative states, "they say that this port is in twenty-three degrees." This indicates a correction of — 0° .08′ to the assumed position.

From cape San Lucas the navigators followed the coast, which Ulloa had discovered three years earlier. If they had copies of his chart or of his report they never refer to them or to him or use his names of capes and bays, except the island of Cedros. Northward of cape San Lucas we begin to find the large errors of latitude which began at the "Point of California." As they were reconnoitering the coast during the summer months, the weather was generally fair for observation, the winds adverse and sometimes quite strong, the swell heavy, and the fogs increasing as they advanced. Until well to the northward the fogs would rarely prevent a noon observation for latitude.

The two narratives refer to seventy-one positions that are subject to identification; yet it is somewhat singular that the Cabrillo narrative has only two independent observations for latitude, while the Ferrelo narrative has twenty-two. Whenever the latitude of a place is given by both narratives, which occurs eight times, the two statements are identical, except in the case of point Conception, where the correction to Cabrillo's determination is — 2° 3′ and to Ferrelo's — 1° 33′ "and more."

The corrections, with a gradual increase as the latitude increases, are fairly uniform for certain stretches, when we consider that the latitude was rarely stated closer than half a degree, except to add that it was "more" on four occasions and "scant" on another.

From latitude 23° 23′ to 28° 6′ the average correction to eleven determinations is — 0° 48′, with a range from — 37′ to — 58′; from latitude 28° 55′ to 31° 45′ the average correction to nine determinations is — 1° 4′, with a range from — 42′ to — 75′; from latitude 31° 51′ to 34° 27′ the average correction to nine determinations is — 1° 24′, with a range from — 60′ to — 123′. This line of coast includes San Diego, San Buenaventura and point Conception. From latitude 36° 3′ to 38° 31′ the average correction to eight determinations is — 1° 18′, with a range from — 79′ to — 91′, including the determination in the gulf of the Farallones and of the landfall of Cahto mountain, which are not closely located.

It is somewhat remarkable that the position of San Diego bay and of point Conception, which latter was to them a notable cape, should present larger errors of the instruments than any other places on the coast. At San Diego the correction to Ferrelo's determination is — 1° 40′; and at point Conception — 1° 33′ "and more" to Ferrelo, and — 2° 3′ to Cabrillo. In these extreme and infrequent cases I suspect erroneous readings of the instruments, amounting to not less than thirty minutes of arc, or of the whole diameter of the sun.

These corrections must govern the high latitudes which the navigators report to have reached when they were struggling for life in the great storms far from land, and almost up to the latitude reached by Drake less than thirty-seven years later.

### *Erroneous Estimates of Distances.*

The estimates of distances along the exposed seaboard, when the vessels were buffeted by the regular northwesters and the large swell and offshore adverse current, are, as a rule, so irregular and erroneous that they are almost useless for determining intermediate positions. When they reached the quieter waters of the Santa Barbara channel, with little wind, before the rainy season, with very small swell and little current, it was possible to proportion the erroneous estimate of distance between San Buenaventura and point Conception, and with a personal knowledge of localities I was able to fix every anchorage they made under that pleasant and populous coast, and where they held frequent intercourse with the friendly Indians.

*The Main features of the Discoveries of Cabrillo and Ferrelo.*

The general progress of the two ships may be first briefly stated by mentioning the more easily identified places and then by following their narratives in more or less detail.

The vessels sailed in company from cape San Lucas, in latitude 22° 52′, July 6, 1542; reached Magdalena bay, in latitude 24° 32′, July 13; Pequeña bay and point, in latitude 26° 14′, July 19; port San Bartolomé, in latitude 27° 39′, August 1; Cerros island, in latitude 28° 02′, August 5; point Canoas, in latitude 29° 25′, August 15; port San Quentin, in latitude 30° 24′, where they took possession of the country, August 21; point Santo Tomas, in latitude 31° 33′, September 8; San Diego bay, in latitude 32° 40′, September 28; Santa Catalina island, in latitude 33° 27′, October 7, and San Buenaventura, at the eastern entrance to the Santa Barbara channel, in latitude 34° 17′, October 10.

During these three months their progress had been very slow, because the prevailing summer wind was directly ahead, and they must have made many and many a tack to work their clumsy vessels to windward. With the modern vessel of the same size the time would have been less than a month. The weather was favorable, no storms of wind and rain, but generally clear skies, with fogs at night but absent by day. They reached the Santa Barbara channel in the pleasantest part of the year, after the long dry season, and the country apparently much parched. They had no difficulties with the natives, and we may well suppose that they looked forward with hope and confidence to continued success and the prospect of the discovery of precious metals. At San Buenaventura they established very friendly relations with the populous villages of that vicinity, with the river coming through the mountains on the west and the Santa Clara coming through the broad flat valley to the eastward. They readily obtained food from the natives, and perhaps had no need to draw the seine.

In their progress through the Santa Barbara channel, they must have been charmed by its beauty and by the friendliness of the natives, for they anchored half a dozen times, Cabrillo says: "They sailed little in several days on account of the too fine weather, and on Wednesday, the eighteenth of said month [October], they arrived at a long point which forms a cape, and on account of its length, like a galley, they named it el Cabo de la Galera." This is the point Conception of our charts.

The weather of the Santa Barbara channel at that season of the year is extremely lovely. When at point Conception for three and a half months, in 1850, I have seen sailing vessels five or six days "in irons," drifting slowly from Santa Barbara to point Conception, with the weak current to the westward, while outside the cape a steady ten-knot breeze from the northwest was blowing for weeks. A vessel bound to the northwestward and opening from under the lee of the cape would frequently be reduced to short canvas in an hour. At that season of the year the southeast storms which bring up the rain are due, and Cabrillo and Ferrelo soon experienced them.

Through this channel passage I have been able to locate every anchorage which the vessels made, and have disentangled the parallel range of the Santa Barbara islands, which from certain points of view overlap each other. Even the confusion of double names which they used has been made clear.

From point Conception the strong northwest winds forced the vessels down upon the westernmost of the Santa Barbara islands, twenty-three miles southward from point Conception, where they were compelled to remain in port Possession (Cuylers harbor) eight days because a southeaster had sprung up with rain and the weather "was very stormy." Here Cabrillo formally took possession of the country.

After leaving this island on the 25th of October for the mainland they met with very severe weather north of point Conception, and struggled heroically until the first of November, when they could not "carry a palm of sail," and sought shelter under that cape at the anchorage of the Coxo Viejo, where there was a large village called Xexo. Wood was scarce at this place and the vessels changed their anchorage to that off the Gaviota pass,* about ten miles to the eastward, where the Indians had two villages and there was an abundance of wood, water and fish. It is an open roadstead protected in part by large fields of kelp.

The intercourse of the Indians and the navigators was evidently very satisfactory to both parties, and the vessels remained

* Kohl says that the Puerto de las Sardinas (Gaviota anchorage) is to the eastward of point Conception, and yet he adds, in clear contradiction thereto, that it "is perhaps the place now known as the Bay of San Simeon," which is, however, 80 miles to the northwestward of the cape.

at anchor until the 6th of November, when they left for the cape with very light airs, which gave them no steerageway, for they were four days making twelve or thirteen miles. Off the cape another southeaster came up, and the vessels ran before it, making good progress, and sufficiently close to the land to assure themselves that there was no southeast anchorage. On the 11th of November the vessels were under the shadow of the compact, bold and precipitous mountain barrier of the Sierra Santa Lucia, which rises, in latitude 35° 54′, to an elevation of over 5,000 feet, at a distance of not quite three miles inland. Here the southeaster broke upon the vessels in all its fury.

"And at four o'clock in the night, being in the sea about six leagues from the coast, lying-to, waiting for daybreak, . . . so great a storm struck them from the southwest and the south-southwest, with rain and dark, cloudy weather, that they could not keep up a hand-breadth of sail, and it made them scud, with a small foresail, with much labor, all the night, . . . and a great sea that nearly engulfed them, and at dawn, the wind blowing tremendously, it was not possible to run before the wind, and on account of the strong sea, wind and dense clouds one vessel lost sight of the other, and that one vessel threw overboard everything that could lighten her from the deck, because the storm was very great, and on the *Capitana*, seeing themselves in the greatest danger, they vowed a pilgrimage to our Lady of the Rosary and the Blessed Mother of Pity for her mercy, and she favored them with a little fair weather." (Cabrillo, Ferrelo.)

Ferrelo continues: "That on Monday, the 13th of the said month of November, at the hour of vespers, the weather cleared up and the wind veered to the west, and immediately they made sail and went in search of their consort, steering toward the land, praying to God that they might discover her, as they much feared that she would be lost. They were running to the north and to the north-northwest, with the wind west and west-northwest; and the following Tuesday at daybreak they had sight of the land, and they were able to hold on until the evening, and they could see that the land was very high, and they cruised along the coast to discover if there was any port where they might take shelter, and so great was the swell of the sea that it was fearful to behold, and the coast was bold and the mountains very lofty, and at evening they lay-to for rest. It is a coast running northwest to southeast. They perceived the land at a point where it projects into the ocean, which forms a cape, and the point is covered with trees, and it is in forty degrees." He afterwards adds that these grand sierras were covered with snow and many trees.

I have given this long extract because this landfall is the farthest land they reached in this first attempt to trace the coast northward. In his description he does not refer to any jutting point of cliffs on the immediate shore line; it is the bold, high, transverse, wooded spur of the Coast mountains, nearly overhanging Fort Ross cove, in latitude 38° 31′, and gives a correction to Cabrillo and Ferrelo's determination of — 1° 29′. Cabrillo says, "they called it Cabo de Pinos, and observing the sun they found themselves in forty degrees, and more, to the northwest, from whence they recognized more than fifteen leagues of coast, all the land high, and the coast running from northwest to southeast." The vessels were evidently not near enough to this rocky, dark, and forbidding coast (in winter storms) to see the details of the high, jagged cliffs forming the shore line, which is fringed with outstanding rocks and hidden dangers marked by breakers. This bold shoulder, covered with the great forests of fir, was subsequently the distinguishing mark for the Russian otter-hunting ships when seeking the small northwest anchorage of Fort Ross cove. The massive character of the orography is well exhibited in the latest edition of the chart of the United States Coast and Geodetic Survey.

On the 15th of November the two ships had sight of each other, and their experience through the last storm compelled them to return to the southward.

On the 16th, "at daybreak, they were arrived at a great gulf that looked like a harbor and which was formed by a change of the direction of the shore, which appeared to have a port and a river, and they went beating about this day and the night and the Friday following, until they saw that there was no river nor any shelter, and to take possession they cast anchor in forty-five fathoms. They did not dare to land on account of the high sea. This gulf is in thirty-nine degrees and more, and it is all covered with pines to the sea. They gave it the name of la Bahia de los Pinos. The following night they lay-to until daybreak." (Ferrelo.)

The change of direction of the shore here mentioned is the projection of the great head of point Reyes more than twelve miles outside the general trend of the coast, and the great gulf under it is the present gulf of the Farallones, which is understood to embrace the area between point Reyes, the groups of the Farallones, and point San Pedro, including the Golden Gate to San Francisco bay, and the anchorage of Drakes bay under the eastern extremity of point Reyes head.

It is very interesting to note what Ferrelo states about this gulf, because it was evident to his nautical eye that the discolored water therein indicated the presence of a great river. As they were near enough the land to be satisfied that no landing could be made on account of the large swell, and as they lay particular stress upon the forests, I judge they were beating in the northern part of this gulf to secure an anchorage under the north shore, but failed.

These discolored waters were brought down by freshets from the Sacramento and San Joaquin rivers. They are known to all our vessels, and are particularly marked after great storms. From the summit of point Reyes I have watched them carried by the littoral drift or the Davidson inshore eddy current far to the northward of point Reyes, and they extend well outside of the Farallones. With more favorable conditions of weather such persistent efforts for exploration would have rewarded these men with the discovery of Drakes bay and doubtless the Golden Gate.

When they had decided that further search was useless they anchored and took possession of the country through the slender hold of their cable. With the depth of forty-five fathoms the vessels must have been either six or seven miles from the southeast Farallon, outside the line thence to point Reyes, or more likely five miles southeastward from the southeast Farallon, and in about latitude 37° 40′. Inside of these depths the plateau of the gulf decreases very gradually and regularly in depth toward the shores and toward the bar of the Golden Gate. In the position southward from the island the correction to Ferrelo's latitude is about — 1° 30′.

It is a rather curious fact that neither narrative refers to the two groups of the Farallones, close to which they must have anchored. The northwest group comprises four principal islets within an area of one mile by a quarter of a mile, and exhibits five or six high rocky peaks, of which the highest is 155 feet. The southeast Farallon has an area of about one mile by three quarters of a mile, is very irregular in outline, and broken into four or five bold granitic peaks, of which the highest is 340 feet above the sea, and is visible from a ship's deck at about twenty miles.

Drake, in 1579, anchored under the eastern point of point Reyes head, in the northernmost part of the gulf of the Farallones, and named the two groups of islets. From the southeast Farallon his vessel obtained a large supply of fresh sea-lion meat. Vizcaino does not mention the groups of the Farallones in his published narrative, but they are laid down on his plans.

The great storm which Cabrillo's vessels had encountered had covered the mountains of the peninsula of San Francisco with snow, and Ferrelo, in describing the coast from the great gulf southward, says: "All the coast they passed by this day is very bold, and there is a great swell of the sea, and the land is very lofty; there are mountains which rise to the sky, and the sea beats upon them. While sailing near the land it appears as if they would fall upon the ships; they are covered with snow to the summit. They gave them the name of las Sierras Nevadas, and the principal one forms a cape which projects into the sea, which they named el Cabo de Nieve. The coast runs north-northwest and south-southeast. It does not appear that Indians inhabit this coast. This Cabo de Nieve is in thirty and eight degrees and two-thirds, and always, when the wind blew from the northwest, it made the weather fair and clear."

Cabrillo says "they were seeking for a port," and hence the minuteness of the foregoing narration.

This snowy cape and the erroneous latitude, 38° 40′, has given rise to much speculation as to its identification. The description of the navigators, although somewhat exaggerated, is sufficiently good to satisfy one who is acquainted with the characteristics of this high backbone of the peninsula and with the occasional high cliffs; and is quite satisfactory to those who have encountered heavy snow-storms in the Coast range of mountains. In some very heavy southeasters, such as that we experienced in the Santa Lucia range early in January, 1880, the cold is quite severe, reaching 17° Fahrenheit, the force of the wind terrific, and the depth of the snow two or three feet.

This Cabo de Nieve, or snowy cape, is the massive western spur or buttress of the high mountains of this part of the peninsula of San Francisco and rises abruptly and immediately behind the low, rocky and dangerous point Año Nuevo. Mount Bache, or Loma Prieta, in the crest-line of the mountains, lies nearly east of this cape, in latitude 37° 6½′, and reaches an elevation of 3,825 feet twenty miles from the coast-line on the same parallel. A vessel passing three or four miles outside the shore would rarely notice point Año Nuevo, except from particular positions; but all vessels following the coast notice the mountain mass projecting beyond the lower hills to the north and south, although it does not break the regularity of the shore-line. This is another of those cases when the vessels laid great stress upon the large features of the coast and not upon any details of the immediate shore. I am thoroughly convinced of the identification of this cape. The correction to the determination of the latitude of both ships is — 1° 31′, where the average of this region is — 1° 25′.

The narratives mention no further details. Even with fair winds the vessels were not tempted to follow the gradually curving shore to the eastward, where under point Santa Cruz, in latitude 36° 57′, they would have found anchorage and protection from the northwest swell. Nor did the gulf of the present bay of Monterey allure them. Far to the southward the mountains of the northern part of the Sierra Santa Lucia were already looming up above the horizon, and on "the following Saturday they were running along the coast, and at night they found themselves off el Cabo de San Martin. . . . El Cabo de San Martin is in thirty-seven degrees and a half," which latitude must have been noted from what they observed on their trip to the northward.

We may very well conceive that the scurvy was among the crew, and that their provisions were not plentiful. Moreover, Ferrelo's vessel was leaking very badly and Cabrillo was suffering from his broken arm. They knew that in the port of Possession, on the north side of San Miguel island, the anchorage in that small bay was protected from the southeast gales. They anchored here on "Thursday, the twenty-third of November, and because it is a good port they repaired the small vessel and made her staunch, because she was going to sink. In the aforesaid port they remained until the end of December, on account of the bad weather, with great cold and snow, even to the sea-level, rain from heaven, and heavy clouds, and as the southeast storm was continuing there was so great a surf, although in a land-locked harbor, that sometimes for three or four days it was not possible to go on shore."

On the 3d of January, 1543, the brave Juan Rodriguez Cabrillo died from the effects of an accident at his first visit in October, 1542. He earnestly charged Bartolomè Ferrelo not to give up the voyage of discovery, but to continue his explorations to the northward. Who succeeded Ferrelo to the command of *La Victoria* is not mentioned, but we may suppose he was the pilot Bartolomè Fernandez.

On the 19th of January, 1543, Ferrelo and his consort set sail for the mainland under point Conception in search of provisions. The vessels were caught by a heavy northwest storm, and for eight days were driven about among the Santa Barbara islands, seeking anchorage " on account of the foul winds," when they again sought shelter in port Possession on the 27th of January.

They remained here two days, when the weather favored them and they sailed to the island of Santa Rosa to recover the anchors which they had left there when they slipped their cables in a storm. They recovered the anchors and took in a supply of water from Bechers bay, which is on the northeast face of the island, where they were protected from the southeast storm which brought much snow.

On the 13th of February they stood across the Santa Barbara channel to the Gaviota anchorage, which they were forced to leave after getting only one boat-load of wood. The southeaster brought up a very heavy swell, and they sought shelter under the island of Santa Cruz " because they were there more secure from the storms and they might be able to make sail and run out to sea."

On the 18th of February the vessels left this island in search of other islands reported to them by the Indians. These islands were doubtless San Nicolas and San Clemente, which had not been seen by them, and at dark they were about twelve leagues from Santa Cruz, and "saw six islands, some large and others small."

"At daybreak of the 19th they were about ten leagues to the windward of the islands, and with the wind west-northwest they were standnig off five days to the southwest, and after they had proceeded about 100 leagues they found the wind more violent and the sea high, and Thursday, the 22d of the said month of February, they again stood in shore to endeavor to reach Cabo de Pinos, with the wind south-southeast, which continued three days and was increasing each day."

This brief search, wherein it is doubtful if they made 100 leagues from the islands, has led Kohl to make the unaccountable blunder of supposing that the six islands of the Santa Barbara groups which Ferrelo mentions "were doubtless the Sandwich islands!" If we suppose that the course made by Ferrello was south, half way between Santa Cruz and San Nicolas, he would probably have seen, in all, the islands of San Miguel, Santa Rosa, Santa Cruz, Anacapa, Santa Catalina (with Santa Barbara in line and not distinguishable) and San Nicolas. He could not have seen San Clemente. Anacapa is small, but high, and Santa Catalina would at that distance appear small. San Nicolas would be seen moderately small, because he would make it endwise.

When the unusual "moderate wind from the northeast" changed and the west-northwest wind came up with the large sea always accompanying it, it is very unlikely that the ships proceeded even two hundred miles instead of one hundred leagues. Moreover, when Ferrelo changed his course to make his landfall, and the south-southeast wind continued with increasing force and with a necessarily heavy and broken sea, he must have made by his own account more than five hundred miles in less than three days under short sail. He got sight of the Cabo de Pinos, in latitude 38° 31′, at daybreak on the 25th of February. This alone should demonstrate the erroneousness of Kohl's supposition.

When Ferrelo made the mountains behind Fort Ross at daybreak he continued his course to the northwestward, and the vessel "at dusk was twenty leagues to windward on a coast running northwest and southeast, and it is bold and without shelter; there was no smoke seen on the land, and they saw a point which formed the extremity of the land, which changed the coast to the northwest; in the middle of the night the wind suddenly shifted to the south-southwest, and they run to the west-northwest until day, and in the morning the wind shifted to the west-southwest with great violence, which held on until the following Tuesday [the 27th]; they ran to the northwest." This is Ferrelo's narrative, and he gives no latitude. The point which he saw at dark was point Arena, in latitude 38° 57′, where the shore-line which has been trending to the northwest makes a gentle sweep to the northeastward, with low shores and bold wooded mountains behind. The point is the extremity of a plateau sixty feet high, and rises by several steps in three miles to two hundred and fifteen. It is destitute of timber, but on the higher parts of the plateau the fir trees stretch to the mountains. He doubtless saw the high timbered crest line rising to 2,300 feet elevation behind and beyond the point.

Cabrillo's narrator does not write a word about the exciting experiences of the vessels from the time they left their anchorage at the Gaviota until the morning after Ferrelo saw point Arena, when he says: "And Monday, on the twenty-sixth of the said month [of February], they were at a point which they called Cabo de Fortunas [cape of Perils] on account of the many dangers which they had experienced in those days, and it is in forty-one degrees."

If the vessels scudded twenty leagues northwestward from Fort Ross in the short period of daylight they should have reached latitude 39° 30′, but if point Arena was what they saw at dark they could not have been up to Fort Ross at daylight, but had made it out at that time.

Granting, however, that they reached the latitude of 39° 30′, and supposing they kept their course, they may next day have seen some distance to the northeast the culminating peak of the Coast range of mountains just north of point Delgoda, where King peak, in latitude 40° 9′, rises to a height of 4,265 feet at two and a half miles from the coast line. This is probably too far north, for Ferrelo says:

"Tuesday, the 27th of the said month, the wind veered to the south-southwest, which held on all day. They ran to the west-northwest with the foresails lowered, for it blew violently. At the approach of night the wind shifted to the west. They ran all night to the south, with but little sail. There was a high sea which broke over them."

The shore north of point Arena retreats in a long curve to the eastward to the Ussal river, and then takes the old northwest course.

Before reaching so far north as King peak, "one of the great landfalls for this section of the coast to vessels well off shore is Cahto mountain, lying N. 85° E. (magnetic) from cape Vizcaino. It rises to an elevation of 4,076 feet, and should be visible at a distance of sixty miles from the coast. It is in latitude 39° 41′." (Davidson's Coast Pilot.) This would give a correction of — 1° 19′ to Cabrillo's position.

The vessels were now well out at sea, and Ferrelo says: "The Wednesday following, the 28th day of the said month, at daybreak, the wind shifted directly to the southwest, and it did not blow hard. This day they observed the latitude in 43°." With the average instrumental correction from identified points this would place the vessels in latitude 41½°, and far out to sea. Ferrelo continues:

"Toward night the wind freshened and shifted to the south-southwest. They ran this night to the west-nothwest with much difficulty, and Thursday [March 1] at daybreak the wind shifted to the southwest with great fury, and the seas came from many quarters, which harassed them much, and broke over the ships, which, not having the decks (as in a man-of-war), if God should not succor them, they could not escape, and not being able to lay-to, of necessity they scudded northeast toward the land; and now, holding themselves for lost, they commended themselves to Our Lady of Guadaloupe, and made their promises [or offerings], and ran thus until three o'clock in the afternoon with much fear and labor, for they saw they were going to be lost, and already they perceived many signs of the land, which must be near, as small birds and logs, very fresh, which had floated from some rivers, although from the dark and cloudy weather the land did not appear. At this hour the Mother of God succored them with the grace of her Son, and there came a very violent rainstorm from the north, which made them scud all that night and the following day until sunset to the south, with the foresails furled, and because there was a high sea from the south it broke over them each time at the bow and swept over them as if over a rock."

On the first of March Cabrillo's narrator says: "When the weather cleared up they observed the sun in forty and four degrees, with so much cold they were freezing." This observation, corrected by the average instrumental variation, would place the vessel in 42° 30′ of latitude, more or less, and well out to sea, because the landfalls in this region can be seen sixty and more miles from seaward.

Another important statement is made in relation to the indications of discolored fresh water from rivers. In latitude 42° 25′

is the mouth of Rogue river, which discharges an enormous volume of water in the winter storms; Pistol river, in 42° 17′; Chetko river, in 42° 03′, and Smith river, in 41° 57′, besides smaller streams. In the winter freshets these streams bring down great quantities of large trees torn from the banks. How far these signs have been seen seaward we have at present no record.

Ferrelo continues his narrative and says: "The wind shifted to the northwest and the north-northwest with great fury, so that it made them run until Saturday, the third of March, to the southeast and to the east-southeast with such a high sea that it made them cry out without reserve that if God and His blessed Mother did not miraculously save them they could not escape. Saturday at noon the wind moderated and remained at the northwest, for which they gave many thanks to our Lord. They suffered also in provisions, as they had only biscuit, and that damaged."

And apparently reviewing the last few days' experience, he says: "It appeared to them that there was a very large river, of which they had much indication, between forty-one degrees and forty and three, for they saw many signs of it."

These determinations relate to the coast between latitudes 39° 30′ and 41° 30′, in which are the following streams: Klamath river, in latitude 41° 32′, a large stream; Little river, under Trinidad head, in 41° 02′; Mad river, in 40° 56′; Humboldt bay entrance, in 40° 45′; Eel river, one of the largest rivers in California, in 40° 39′; Mattole, in 40° 18′; Ussal, Ten Mile, Noyo and other streams farther southward.

Ferrelo continues: "This day [March 3], in the evening, they recognized the Cabo de Pinos, and on account of the high sea which prevailed, they could do no less than run along the coast on the return course in search of a shelter. They experienced much cold.

"Monday, on the fifth day of the said month of March, 1543, at dawn, they found themselves off the island of Juan Rodriguez [San Miguel], and they did not dare to enter the port on account of the great storm which prevailed, which broke the sea at the entrance of the harbor in fifteen fathoms. The entrance is narrow; they ran under the protection of the Isla de San Salvador on the southeast side."

This Puerto de la Isla de San Salvador is Smugglers cove on the short southeast side of Santa Cruz island. The dangers which he reports in fifteen fathoms are Wilson reef, one mile in extent, which lies in deep water off the northwest shores of San Miguel island, two and a quarter miles westwardly from the entrance to Cuylers harbor or port Possession. The Coast Pilot gives particular warning about these dangers. Smugglers cove is an open roadstead, with partial protection from heavy northwest weather.

Ferrelo, in continuing his narrative, goes back a day or more and says: "And the night before coming with a violent tempest, with only two small foresails, the other ship disappeared, so that they suspected that the sea had swallowed it up, and they could not discover it any more, even after daybreak. They believe they must have been in forty-four degrees when the last storm overtook them and compelled them to run to leeward."

Cabrillo's narrator says that on account of the foregoing storm "they were forced to go to la Isla de la Posesion [San Miguel island], where they arrived on the fifth, and on account of the heavy breaking at the mouth of the harbor they sought protection under the Isla de San Sebastian, under the side presented to the south-southeast; and that night [of the great tempest] the flagship disappeared."

After the vessels met at Cerros island Ferrelo says: "That ship passed la Isla de Juan Rodriguez at night, passing through some breakers, so that they thought they must be lost, and the mariners promised to go in procession naked to her church, and our Lady delivered them."

This is the first time the Cabrillo narrative has mentioned this island of San Sebastian. As the *Fragata* was off Cuylers harbor at night, probably eight or ten hours after the *Capitana* had passed it, with the heavy northwester still blowing, he was very naturally afraid to approach the old anchorage of port Possession, and probably steered through the San Miguel passage, and found protection and anchorage under the southeast shore of Santa Rosa island, between South Point and East Point, which he calls el Puerto de San Sebastian, now known as Johnsons lee. He must have remained at this anchorage fourteen days, while the other vessel lay three days in Smugglers cove, under Santa Cruz island, and then searched for her consort at San Buenaventura, again at Smugglers cove, at San Diego bay, port San Quentin, and finally at the south end of the island of Cerros on the 24th of March, 1543. On the 26th the consort arrived. When she had started to search for the *Capitana* "the whole crew made their demands that they should return to New Spain, as we had nothing that we could eat; and because this was in reason, they ordered the return, searching for their consort." (Cabrillo's narrator.)

Some question has arisen about the probability of these small, badly equipped vessels, with mixed crews of Spaniards and Indians, broken down by scurvy, making such good time. It seems quite reasonable that they reached the latitude observed, and that they commenced to scud before the northwester from latitude 42° 30′ to a position off Fort Ross, making about 275 miles between the morning of March 1 and the evening of March 3, or about five miles per hour. From the last position to San Miguel island the *Capitana* sailed not less than 315 miles in about thirty-eight hours, or more than eight miles per hour, with an evident increase in the force of the wind. Cabrillo's narrator says that "in five days they ran 200 leagues with reefed foresail;" and his vessel reached San Miguel island on the same day as the *San Salvador*, but later. It was a run for life, and these masterful navigators must have handled their craft with consummate skill and decision. I have no doubt whatever of their statements.

## *Concluding Remarks.*

This is a condensed review of this heroic voyage or voyages of discovery and exploration in the very heart of our winter gales. The whole story is ingenuously told; there is no complaint of sickness or of the incapacity of the crews. To the seamen the narrative is full of pathos.

I have endeavored to point out only a few of the identifications of the two principal actors; I have not quoted from Ulloa, Drake or Vizcaìno. To exhibit the details of the narratives of these five remarkable men, I drew up, in 1885, their statements in parallel columns, following the localities from the south toward the north, preserving the entire narratives of Cabrillo and Ferrelo, and using such parts of the others as related to the positions of the former or to new localities intermediate. I then appealed to my personal knowledge of the localities, and to my descriptions from the manuscript for the Coast Pilot of 1889, and to the Coast Pilot of Lower California. During the investigation doubtful cases of identification were left in abeyance until well authenticated locations to the north and to the south were fixed; then the doubtful cases were harmonized without straining. Many minor and interesting statements noted in the narrations have been verified, such as the seventeen villages which Ferrelo names from the Gaviota anchorage to point Conception. On the Coast Survery chart there are seventeen arroyos, where we found the remains of old rancherias as we traveled this part of the coast in 1850.

It is proper to mention that upon the return of the vessels to the Santa Barbara islands in March, on their final retreat, the confusion of new names to the islands was added; but fortunately I had learned from my colleagues, who had made the detailed surveys of these islands, the advantages and disadvantages of the anchoring grounds around Santa Cruz and Santa Rosa islands under different conditions of summer blows and winter storms, and I am satisfied that the last anchorages of these navigators have been identified.

Of the identification of Drake's anchorages on the coast of California and Oregon I have not spoken, because I propose to elsewhere present a separate paper upon the former; nor have I referred specially to the accurate work of Vizcaìno, but I may mention that, upon the authority of his narrative, it has been long asserted that a great forest covered the Loma that lies between San Diego bay and False bay to the northward. This erroneous statement has arisen from the mistranslation of "el monte," which in the narrative signifies a hill; that is the point Loma of the modern charts.

Such instances as these have satisfied me that all the narrators made truthful records, so far as they wrote, and this conviction has enabled me to clearly explain in my monograph several apparent inconsistencies in parts of Vizcaìno's narrative.

The mass of details presented in the monograph cannot be given in this short paper, but I presented in the Report of the United States Coast and Geodetic Survey, 1886, appendix No. 7, a tabulation of the results, which establish the identification of the seventy-one landfalls, capes, points, bays, anchorages and islands mentioned by Cabrillo and Ferrelo. I also appended a chart to exhibit in graphic and still more condensed form these identifications.

It will be noted that in this list and chart there is no mention of the groups of the Farallones off the entrance to San Francisco bay, although Cabrillo and Ferrelo must have seen them. Drake mentions and names them; Vizcaìno has them on his chart, but does not mention them in his narrative.

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# INDEX.