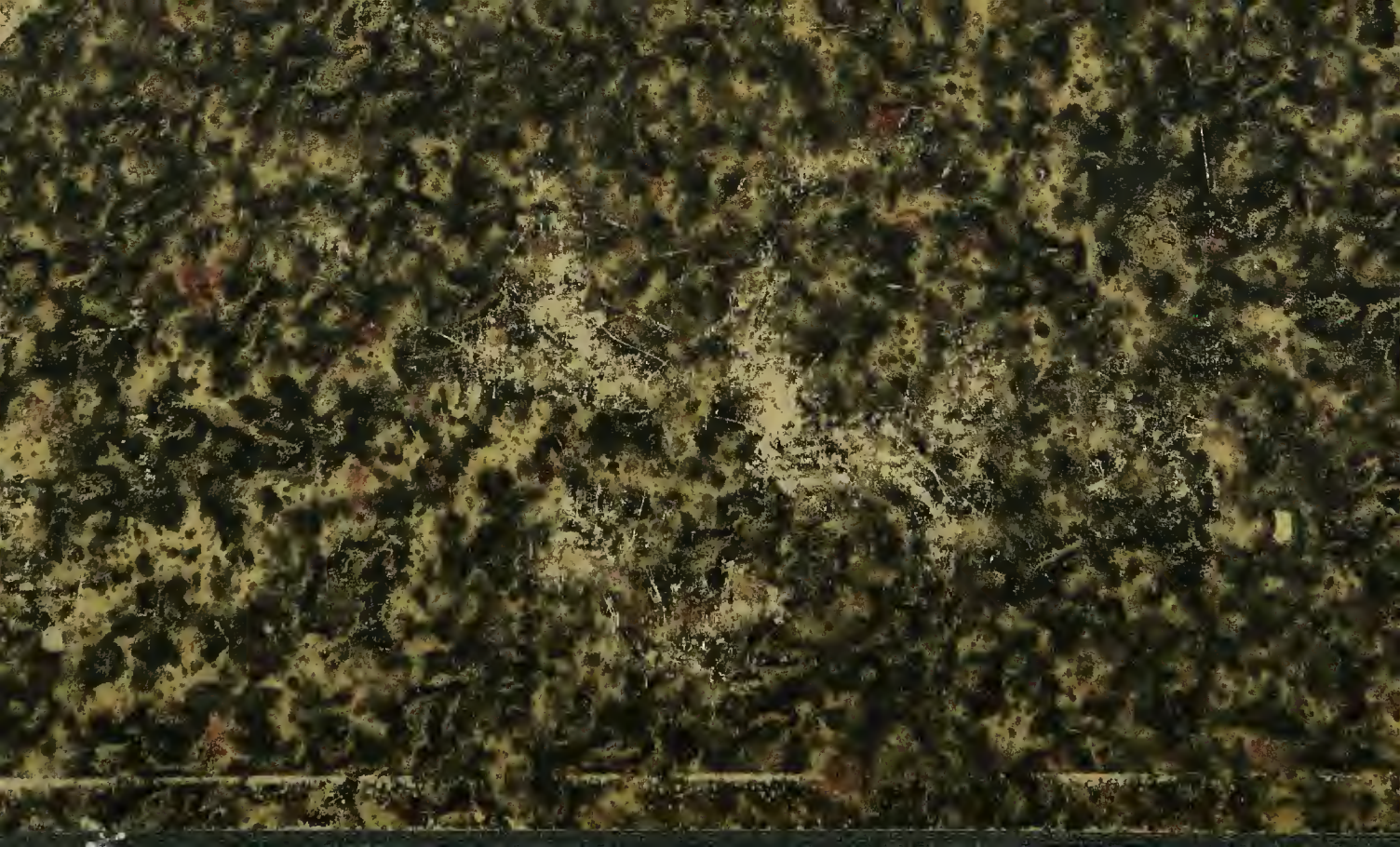


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GALEN AND PARACELSUS.

BY

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GALEN AND PARACELSUS.[1]

MR. PRESIDENT AND GENTLEMEN: As the agreeable duty has been assigned to me of offering to the Academy a paper this evening, I will venture to ask your attention, in the interval of more important business, to a brief sketch of two historical personages who may be considered as representing, each in his different way, two of the most remarkable phases of medical character.

These two persons are Galen and Paracelsus.

Galen was born early in the second century of the Christian era, at the city of Pergamus, near the western coast of Asia Minor, opposite the Ægean Archipelago. He was Greek by descent as well as by birth, the son of Nikon, an architect, who was a man of good fortune, and accomplished in his profession. Galen himself received a liberal education in the various branches of knowledge cultivated at the time. He studied medicine under several masters, and afterward resorted to Alexandria in Egypt, then the great centre of medical science,

[1] Read before the New York Academy of Medicine, March 20, 1873.

where he devoted himself more especially to anatomy. After completing his studies, he at first practised for a few years with credit in his native city of Pergamus; but afterward took up his residence in Rome, where the greater part of his professional life was spent, and where he took the most prominent rank among the physicians of the time. He was therefore for many years the most celebrated physician in the first city of the world. He was the representative man in the medical profession of his day, and he left an impress upon medical science and art which lasted for more than a thousand years.

It is not always easy to appreciate fully the intellectual calibre of men who lived in what we call the time of the ancients. We are separated from the ancient civilization and culture, by the dismal interval of the middle ages; and some of the links which would connect us with them are, no doubt, irrecoverably lost. Besides, as we have now accumulated so much more actual knowledge than they possessed, we are sometimes apt to think of the ancients as children in science, and out of the range, in this respect, of a comparison with ourselves. We should not commit such a mistake, if we remembered that the intellectual capacity of a people is not to be measured by what they know, but by what they have discovered; not by the knowledge which they have received from their predecessors, but by that which they have created and handed down to their posterity.

Judged by this standard, the physicians of the ancient time were at least fully the equals of the moderns; and it would be difficult to find, in any period of the world, a man more remarkable than Galen for all the essential qualities of professional and scientific preëminence.

One of his most striking traits was the respect which he entertained for his predecessors in medical discovery. Hippocrates was his admiration and his model, and he followed his precepts and ideas more closely than those of any previous teacher. But this was not a servile and barren admiration. He believed that the highest tribute he could pay to such a master would be in carrying out and developing his method, so as to increase the knowledge already attained.

"There are many physicians," he says, "like the athletes, who would like to win prizes in the Olympic games, and yet will not take the pains necessary to gain them. For they are loud in their praises of Hippocrates, and place him in the highest rank among physicians; yet never think of imitating him themselves. . . . It is certainly no small advantage on our side to live at the present day, and to have received from our ancestors the arts already brought to such a degree of perfection; and it would seem an easy thing for us, after learning in a short time every thing that Hippocrates discovered by many years of labor, to employ the rest of our lives in investigating what still remains unknown."[1]

Galen was devotedly fond of anatomy, and insisted upon it, in opposition to some of the medical sects of the time, as an indispensable basis for rational medicine. He constantly expresses his admiration for the manner in which all parts of the body are adapted to their functions; and even the study of the articulations, and the form of the bones and their attachments, have an unceasing attraction for him. "In my view," he says, "there is nothing in the body useless or inactive; but all parts are arranged to perform their offices together, and have been endowed by the Creator with specific powers."[2]

His ideas in physiology were thoroughly scientific, and entitled to the highest consideration in the history of the subject. Of course it was impossible for him to master the physiological details to be learned from chemistry, which was then unknown, nor by the microscope, which had not been invented. But in every part of the subject which was accessible by the means at his disposal, his views will bear the closest criticism; and, in every thing connected with his own personal acquirements, his superiority is beyond question.

He was an enterprising and judicious investigator, and an industrious and successful teacher. He was the first great experimental physiologist—as no one, before his time, so far as we can learn, habitually resorted to experiments upon animals, as a means of discovery in physiology. Galen not only

[1] "Galen, Quod optimus Medicus et quoque Philosophus."

[2] "De Usu Partium," iv., 2.

did this, but also frequently illustrated his points by public demonstrations. The result of this was a large accumulation of physiological facts, many of them of the highest value; and it is a most curious thing to see how, in the subsequent periods of European history for many hundred years, not only was there no one to rival or even to continue his discoveries, but the profession was not able even to retain them; so that some of the most important, though expressly contained in his writings, were practically forgotten, and had to be discovered over again, centuries afterward.

Perhaps the single discovery for which he is better known than for any other is that of the true function of the arteries as vessels containing blood. In Galen's time and for several centuries before,[1] it was the prevalent opinion that in respiration a vital air or gas penetrated into the pulmonary veins from the lungs, was carried to the left ventricle of the heart, and thence distributed all over the body by the arteries. This vital air or "spirits," derived from the atmosphere, was what called into play the organic forces of the system, and thus maintained the life of the animal frame.

But Galen did not believe that the air penetrated as a mass into the heart and arteries. He considered that it was rather a quality than the substance of the air, which entered the blood in the lungs, and thus communicated to it an element of vitality; so that what circulated in the arteries, according to him, was not air or "spirits," as formerly believed, but arterial blood, vivified and animated by the qualities which it had absorbed from the air in the lungs.

He based this opinion on the positive phenomenon that, although when the arteries are opened in the dead body they appear empty, yet, if opened during life, it is blood that escapes from them and not air. This was so palpable a fact, that the older observers could not help knowing it; but they explained it by saying, that when an artery is opened during life, it first empties itself of the air which it contained, and then blood passes into it by transfusion from distant parts. Galen declared that this explanation was untenable. "For if

[1] Since the time of Praxagoras of Cos (B. C. 250), who first made the distinction by name between arteries and veins.

you prick an artery," he says, "even with the finest needle, blood escapes from it at the very first. Now, it seems to me that, though the air supposed to be contained in the arteries might escape instantly from a large wound, yet that it would require considerable time to be expelled from one of moderate size, and therefore could not help becoming perceptible to the senses. It is said that blood is not discharged from the vessel until all the air has escaped, and that the transfusion of blood begins from the remoter vessels. But this involves two improbabilities: first, that all the air in the arterial system should be so quickly discharged through a mere needle-puncture as to escape detection; and, secondly, that the animal should continue to live after losing all the vital air in his arteries."[1]

But though Galen went through with all these arguments in discussing the question, his own convictions evidently rested upon the results of direct experiment. He exposed a large artery in the living animal. Now, if the vessel, on being opened, gave exit to blood, this blood must either have been contained in it beforehand, or must have passed into it from elsewhere. To test this point, he first included a portion of the vessel between two ligatures, and so shut off all communication with other parts. Then by opening it between the ligatures he showed that in reality it contained blood and not air. From that time the existence of arterial and venous blood, in two sets of blood-vessels, the veins and the arteries, was a permanently-established fact.

There are other points in regard to the circulation which he treated in an equally successful manner, such as the action of the pulmonary and aortic valves, and the movements of the heart in pulsation. One of his most remarkable observations relates to a terminal communication between the arteries and veins. He even uses, for this communication, the same word, "anastomosis," which we now employ.

"The arteries and the veins," he says, "anastomose with each other throughout the whole body, and exchange with each other blood and spirits by certain invisible and exceedingly minute passages."[2]

[1] Galen, "An Sanguis in Arteriis Natura contineatur."

[2] "De Usu Partium," vii., 10.

When we remember that even in Harvey's time this capillary connection between the arteries and the veins had not been made visible by the microscope; and that its absence was even thought a serious objection to his doctrine of the circulation, it seems a singular fact that it should have been taught by Galen fifteen hundred years before.

His description of the movements of the heart is hardly, if at all, inferior to that given by Harvey, and shows how much he relied upon direct observation.

"We can also," he says, "see the arrangement and action of the fibres of the heart under two conditions, either by examining the organ when just taken out of the animal and still pulsating, or by removing the sternum in the manner which I have described in the 'Treatise on Dissections.' For when, the longitudinal fibres being in contraction, and all the others relaxed, the length of the heart is diminished, while its breadth is everywhere increased, at that time you will see that the organ as a whole is dilated; on the other hand, when the longitudinal fibres are relaxed, and the transverse contracted, you will then see the heart again drawn together, while betweeu these two motions there is a short interval of quiet, during which the organ is everywhere exactly constricted about its contents, all the fibres acting together and especially the oblique. The contraction of the heart is also in great measure aided by the strong bands in the interior of the ventricles (*the columnæ carneæ*), which in contracting draw its walls inward. For between the two ventricles there is a sort of septum, to which these bands are attached, forming in this way a connection between it and the external walls. When these walls, therefore, approach the septum, the heart is extended in the direction of its length, but contracted in the direction of its breadth. When the sides of the organ, on the contrary, recede from the septum, its lateral width is increased and its length diminished."[1]

But the most curious point of all, in the history of the circulation, is connected with the fœtal condition of the heart and pulmonary vessels. Late in the sixteenth century, Leonardo Botali, who was a physician of considerable eminence in

[1] "De Usu Partium," vi., 8.

Paris, happened to examine a heart, in which the foramen ovale, in the septum of the auricles, had remained open. He published this as a most remarkable discovery, a vascular canal which nobody had seen before, by which the blood naturally passed from the right auricle to the left. Afterward it was found that this was simply a blunder; for the foramen only exists exceptionally in the adult, and is really characteristic of the fœtal condition, becoming closed within a short time after birth. But it still retains the name of its mistaken discoverer, and is often called, to this day, the "foramen of Botal."

Now, Galen knew all about the foramen ovale, and the ductus arteriosus also. He described them both, as physiologically associated with each other, and as peculiarities belonging to the fœtal condition. And he gives as a reason why the functions of the pulmonary artery and vein are interchanged at this time, that before birth the lungs merely require ordinary blood for their nourishment and growth, and it is only after birth that they enter on their functional activity. This passage is so important that I must ask the privilege of quoting once more:

"Here," he says, "we again have reason to admire the provisions of Nature. For so long as the lungs require only to be nourished and grow, they are supplied simply with blood; but when the time comes that they are to assume an active motion, their substance becomes lighter and adapted for dilatation and compression with the movements of the chest. For this reason there is a direct communication, in the fœtus, between the vena cava and the commencement of the pulmonary vein (*arteria venosa*). But since this latter vessel performs for the lung at this time the office of a vein, the necessity of the case requires that its companion (the *vena arteriosa*) should assume the function of an artery, while the pulmonary artery (*vena arteriosa*) also communicates with the aorta. As these last two vessels, however, are situated at some distance apart, they are connected by means of a third narrow canal (the *ductus arteriosus*) running from one to the other. In the case of the vena cava and left auricle (*arteria venosa*) on the other hand, which are situated in immediate contact with each

other, the communication is made by an opening or foramen common to both; and at this point there is placed a membranous valve opening toward the left auricle (*ad pulmonis vas*), so that it readily yields to the impulse of the blood flowing from the vena cava, but will prevent its regurgitating in the opposite direction."[1]

He immediately goes on to describe, in the most graphic manner, the closure of the foramen ovale after birth, and the manner in which its valve becomes agglutinated to the walls of the auricle.

There is no doubt that Galen and others of his time knew and practised the ligature of arteries for the arrest of hæmorrhage, a method afterward lost, and again invented by Paré in the sixteenth century. He describes the ligature of arteries as a regular operation,[2] and expressly mentions its being done by a surgeon of Rome in a case where the brachial artery was divided, and where he speaks of it, in a passing way, as if it were the recognized mode of stopping the flow of blood in such cases.[3] He even says that where an artery of moderate size, like one of the intercostals, is opened during an operation, the hæmorrhage may be stopped by cutting the vessel completely across, as its divided ends then retract and their orifices are closed.

But Galen's favorite field of investigation was the nervous system; and his acquirements in this department alone are sufficient to place him in the foremost rank of experimental physiologists. He knew that the brain is the central organ of the nervous system, that the spinal cord is an offshoot from it, and that the nerves are the organs of communication for the nervous influence, the action of the muscles being regulated by them "as chariot-horses are managed by the reins." "The muscle," as he expresses it, "is the *instrument* of voluntary motion; and we have seen whence the principle of this motion originates and by what path it travels. It comes *from* the brain, and *through* the nerves."

The spinal cord, according to him, derives its powers from

[1] "De Usu Partium," xv., 6.

[2] "De Methodo Medendi," v., 3.

[3] "De Administrationibus Anatomicis," iii., 9.

the brain; "for, if the cord be divided in any part, the region of the body above the point of section remains uninjured, while that below loses altogether the powers of motion and sensation."[1] These doctrines, at the same time, were not theoretical with him, but were all based on the direct results of investigation.

He followed out in detail the effects produced upon respiration by dividing the spinal cord at various points in the neck and back—as affecting, together or separately, the intercostal and phrenic nerves; and he indicated fully the distinction between abdominal and thoracic respiration.

"If the cord," he says, "be divided between the third and fourth cervical vertebræ, the animal at once stops breathing and becomes completely paralyzed, not only in the chest, but in the whole body below the point of section; if between the sixth and seventh, the thoracic muscles are paralyzed, and the animal breathes by the diaphragm alone; and, the farther down among the lower vertebræ you make the section, the greater the number of thoracic muscles you will leave uninjured."[2]

Finally, he knew that division of the cord at its point of origin was instantly fatal; and, like modern experimenters since the time of Flourens, he was accustomed to kill his animals, when he desired to do so for certain purposes, either by suffocation, by strangling, by opening the larger blood-vessels, or by section of the medulla at the level of the first cervical vertebra.[3]

His researches on the spinal cord were all characterized by great fulness and accuracy. Besides the experiments already mentioned, he was accustomed to make a division of one lateral half of the organ, the other half remaining untouched. He says that "transverse sections of the cord up to the median line do not paralyze all the parts below, but only those on the corresponding side—the right side of the body when the right half of the cord is divided, and the left side after division of the left half."[4]

[1] "De Hippocratis et Platonis placitis," vii., 8.
[2] "De Administrationibus Anatomicis," viii., 9.
[3] "De Administrationibus Anatomicis," viii., 10.
[4] "De Locis affectis," iii., 14.

But the most delicate of his experiments on the spinal cord is that of its longitudinal section in the median line, which he describes, with its results, in express terms: "If the spinal cord," he says, "be divided lengthwise from above downward by a straight section through the median line, none of the nerves going to the intercostal muscles are paralyzed, either on one side or the other, nor any of those going to the loins or the lower limbs." [1]

He showed in this way that there is no crossing of the motor influence in the cord from side to side, but that each lateral half, in this respect, is independent of the other. It is only within the recollection of all of us that our distinguished friend Dr. Brown-Séquard has shown that a longitudinal section of the cord in the median line, while it does not interfere with motion, does in reality destroy sensibility. Galen was evidently almost on the point of the same discovery; but his attention was confined, in this particular instance, to the paralysis of motion, so that he did not observe the effect produced upon sensibility; and it was only after the lapse of seventeen centuries that the experiment was completed, and the crossing of the sensitive fibres shown, by means, in great part, of this same longitudinal section.

But Galen was fully aware of the different and independent affections of motion and sensation, as well as of the paralysis of different parts. He makes the distinction of paralysis of the lower half of the body alone, or what we call paraplegia—paralysis of one lateral half, or hemiplegia—hemiplegia with or without facial paralysis—paralysis of motion alone, that of sensation alone, and that of both motion and sensation together.[2]

He was very clear as to the distinction between motor and sensitive nerves, and pointed out many, if not all, of the cases in which this distinction exists. He showed that the third pair of cranial nerves were the motor nerves of the muscles of the eyeball, while the optic was its special sensitive nerve of sight; that the tongue has a sensitive nerve of touch and taste, derived from the trigeminal, and distributed to its mu-

[1] "De Administrationibus Anatomicis," viii., 6.

[2] "De Locis affectis," iii., 4.

cous membrane, while its motor nerve is the hypoglossal, distributed to its muscles; and that the trigeminal is the general sensitive nerve of the face, while it also gives motor branches to the temporal and masseter muscles. His only mistake about this nerve was, that he considered it as also supplying motor branches to the nostrils and lips; but that is no more than Sir Charles Bell still did in 1821.

Galen regarded the two properties of sensibility and motion as differing in kind, and not merely in degree. On one occasion he was consulted in a case where a man had for some time lost the power of sensation in one of his hands, though he retained the power of motion. A discussion arose how it could be possible for one of these nervous faculties to be abolished without the other; and the reason given was that the power of sensation was a passive one, and so comparatively feeble, while that of motion was active and therefore stronger; and that, accordingly, an injury of a certain kind might abolish the weaker of these powers, or sensation, and leave the stronger, or that of motion, untouched. But Galen asked his colleagues how, in that case, they could explain instances in which the power of sensation remained, while that of motion was abolished;[1] it then being the stronger faculty which was affected, and the weaker left untouched. He maintained, on the contrary, that the two powers were exercised by different nerves, either of which might be paralyzed separately from the other.

Galen's idea of the distinction between motor and sensitive nerves, based on observation and experiment, was closely connected with their anatomical distribution. A motor nerve, according to him, was distributed to the muscles; a sensitive nerve was distributed to the skin. "If, therefore," he says, "the nerves distributed to the muscles be affected, motion disappears; if those going to the skin, sensation."[2] A long time afterward, physiologists generally adopted the opinion that this distinction included a radical difference in the nature of the nervous action—that there were two kinds of nervous filaments, namely, *sensitive* filaments, which were capable of communicating sensation alone, and *motor* filaments, capable only

[1] "De Locis affectis," i., 5. [2] Ibid.

of exciting motion—and that these two kinds of filaments were present in varying proportions in different nerves. It is singular that within a short time, from the experiments of Vulpian and Paul Bert, we have reason to believe that there is really no difference in the internal action of these filaments, but only in the result produced by the organ with which they are connected; and that, as Galen thought, a sensitive nerve is simply one distributed to the integument, and a motor nerve one distributed to the muscles.

His experiments on the pneumogastric and recurrent laryngeal nerves, and his discovery that division of the latter produces a loss of voice, are too well known to require repetition.

His love for demonstrative proof and scientific precision was accompanied by a liberal and active imagination, which is frequently shown in his writings. We seldom meet with a finer observation than this, in which he compares the glottis to a musical instrument.

"In the inner cavity of the larynx there is a structure of peculiar formation, which we have already shown to be the principal organ of the voice. It resembles the tongue or mouth-piece of a reed-pipe, especially when seen either from above or from below. . . . Instead, however, of comparing this organ (the glottis) with the tongue of reed instruments, it would be more appropriate to compare them with the glottis. For the works of Nature are both earlier in time, and more perfect in construction, than those of art; and, as the glottis is the work of Nature, while the reed-pipe is a production of art, it is possible that the latter might have been made in imitation of the glottis by some clever artist, able to understand and copy the structure of natural objects."[1]

On the whole, however, his most prominent quality was his constant employment of demonstration, and his exclusive reliance upon rational and intelligible evidence. He ridicules one of the medical sects of his day for their passion for dialectics, by which their writings, he says, were "filled with riddles, as hard to comprehend as those of the Sphinx." On the other hand, he praised Hippocrates for the opposite qualities, because

[1] "De Usu Partium," vii., 13.

he "did not think proper to describe the causes of disease in accordance with an assumed idea—believing positive phenomena to be always more worthy of credit than any imaginary conception."[1]

In his discussions and controversies he occasionally showed a strong vein of humor. Some of the critics had objected to his doctrine of the offices of the arteries and veins as connected with respiration, that it must be incorrect, because the same two sets of vessels existed before birth, at a time when respiration is not yet established.

"Here," he says, "they think they have shown that there is no such natural provision as I have described, and that all I have said on this subject is without foundation. In reply, I will simply charge them with a neglect of anatomy, for it is only through ignorance of anatomical facts that they could ever have been led to make such an assertion. They are precisely in the position of the man who, in counting his donkeys, forgot to reckon the one he was mounted on, and accused his neighbors of stealing it; or like a man whom I recently saw myself, much to my amusement, making a great tumult and turning the house upside down, to find some money which he held all the while in one hand, in a piece of paper. Now, suppose that while these men were busy with their impotent vociferations, some by-stander had quietly pointed out to one of them the donkey he was sitting on, or had asked the other to touch his right hand with his left. In the same way I reply to my critics by simply showing them in the fœtus the ductus arteriosus and the foramen ovale."[2]

Archigenes, who lived a few years before Galen, belonged to the medical sect of the "eclecticists," and wrote a book of considerable celebrity on the pulse. His style was involved and obscure, and he had the foible of multiplying the subtleties of classification and definition, and of using words in an unusual and peculiar sense. He assigned to the pulse eight different qualities or modifications, which he designated by the word *διηχημεναι*—a term of his own invention. These

[1] Sprengel, "History of Medicine," Jourdan's translation, vol. i., pp. 311, 312.

[2] "De Usu Partium," vi., 20.

eight qualities of the pulse were its size, force, velocity, frequency, fulness, regularity, uniformity, and rhythm; and they were each subdivided into other varieties, of the two extremes and the natural mean, the long, the large, and the high pulse, and so on, to an excessive degree.

Galen objected to all this, that there was too much fancy in it, and too little reality.

"This is a mistake," he says, "that Archigenes makes at the outset, in enumerating the qualities of the pulse. For he does not attempt to offer any proof of their being eight in number, but only makes the assertion, point-blank, as follows: 'There are said to be eight qualities belonging to the pulse, called by the purists *διηχημεναι*.' As for me, however, I cannot even guess the meaning of this word '*διηχημεναι*,' neither do I know of such a term used by any of the Greek writers. Consequently, I have no idea what Archigenes means by it; especially as he has not written a book to explain his own idiom, as Chrysippus did about the new words in his 'Dialectics.' That would really have been the only way to help us understand him. To be sure, you might suppose, without the context, that he used the word in its ordinary and vulgar sense; but he takes good care to prevent this. For he says that the qualities of the pulse are so called, not by everybody, but only by the 'purists;' and we do not even know who these purists are. . . . Certainly it would have been much better if Archigenes had added to his statement, if not a positive demonstration, at least some plausible reason for it; so that the reader might not find himself, at the very outset, hearing the law laid down, without any evidence to support it." [1]

Above all, Galen was unalterably opposed to quackery in all its forms, whether intentional or mistaken. He would have nothing to do with arcana, or occult remedies, that is, medicines that act in some secret and unintelligible way, and are supposed to cure a disease because they are good for it. The only genuine specific known to medicine, was not yet discovered in his time, and for the pretended ones he entertained a thorough aversion. His remedies were directed

[1] "De Pulsuum Differentiis," ii., 4.

against the visible symptoms as they arose, or to counteract the morbid condition of the system, which was thought to have produced them. Since his time, the science of chemistry has, of course, added immensely to our knowledge of the constituents of the animal body; and his system of pathology and therapeutics, based upon the four elements, is no longer of any use to us. But his method of investigation was judicious and fruitful, and many, if not all, of his discoveries have retained their full value to the present day; and for his enterprise and indefatigable industry, his clearness of perception, and his genuine and scientific acquirements, he has never had a superior in ancient or modern times.

Paracelsus was born in the year 1493, in the lowlands of Switzerland, at the village of Einsiedeln, near Zürich. There is, however, a singular doubt, even about his name, birthplace, and family. One of the writers says that his real name was Höchener, and that he was of a low origin, and was born in the canton of Appenzell, near Lake Constance. He himself claimed that his family name was Von Hohenheim. It is given on the title-page of several of his works as Theophrastus Paracelsus, and he sometimes alludes to himself under the same designation. Erasmus addresses him in a letter as Theophrastus Eremites; but the entire list of his names and surnames, as given by himself, is Philippus Aureolus Theophrastus Paracelsus Bombastes von Hohenheim.

It does not appear that he had any liberal education, or that he went through any such complete course of medical studies as would entitle him to a medical degree. He travelled, however, over different parts of Europe, visiting various universities, devoting himself in great measure to the study of alchemy and astrology, and practising the medical art wherever he happened to be. This period of his life has little or no well-authenticated history, except that, in some way or other, he acquired great celebrity as a practitioner in different parts of Germany. His reputation, however, was already of that sort that the profession at present always regard with considerable suspicion; that is, he was noted as having performed a number of remarkable cures upon well-known and titled

personages. He claimed to have cured no less than eighteen princes, of royal or ducal blood, who had previously found no benefit from the treatment of their regular physicians.

The result of this was that in 1526, at the age of thirty-three years, he was made Professor of Medicine and Surgery in the University of Bâsle, where he at once began a course of most extraordinary lectures and publications. He taught a set of doctrines of his own, in which he denounced, in unmeasured terms, the accepted principles of medicine, as derived from the ancients, and claimed a supremacy above all other writers and teachers, whether previous or contemporary. His dictatorial manner, and his extravagant and insane boasting, were without limits; and he had a certain kind of eloquence which, during the height of his popularity, attracted the wonder and applause of his audience. One of the specimens of it is as follows:

He says that Philosophy, Astrology, Alchemy, and Virtue, are the four pillars of Medicine.

"And for the same reason," he continues, "that I call these the four pillars of Medicine, they are to be admitted as such by you. You are to be my followers, and not I yours. Me, me, I say, you will follow; you, Avicenna, Galen, Rhazes, Montagnana, and Mesues, I shall not be your follower, but you shall be mine; you, men of Paris, and Montpellier, and Cologne, and Vienna; you Germans, men of the Danube and the Rhine, and the maritime islands, Athenians, Greeks, Arabs, and Israelites, I am not to follow you, but you shall follow me; nor will any one hide even in the farthest corner, where the dogs shall not piss on him" (*quen canes non permingent*). "I am to be the monarch, and the monarchy will belong to me. . . . For I tell you boldly that the hair from the back of my head knows more than all your writers put together; my shoe-buckles have more wisdom in them than either Galen or Avicenna; and my beard more experience than your whole Academy. . . . Do not boast yourselves and say, 'We have Galen for our father, or Avicenna.' As for them, the stones shall fall upon them, and the sky shall produce other physicians, who will understand the four elements,

and magic, and the cabalistic art, that for you are only cataracts and a beam in the eye."[1]

At the same time he had no learning, and knew little or nothing of the medical sciences, even as they existed at the time. He miscalled medical terms, and misquoted Latin verses. He even gloried in his ignorance, and considered it as an evidence of originality.

"My own writings," he says, "are enough to prove this; for in this book I shall bring forward no less than six hundred new inventions, and not one of them is admitted by any philosopher or physician, ancient or modern, nor can be, unless he is willing to abandon the writings of the ancients altogether. There are plenty who know that my whole library is so small that I could hardly make out of it a dozen written pages; and, beside, my secretaries will testify under oath that they have written every thing from my own dictation. The fact is, that in the last ten years I have not read a single book. . . . Hence that notorious and widely-known dexterity in curing the sick, which I have employed to such wonderful advantage, both in the kingdom and the provinces, beyond all other physicians, with their teachers and their books; performing, as I have, cures that they could not imitate, with all their books, if they were to try forever."[2]

He pretended to have a remarkable power of perception and diagnostic skill. According to him, a man's body "ought to be, to the physician, as transparent as a distilled dew-drop, where not the slightest particle can escape the sight. The eye of the physician ought to penetrate through a man's body as it would through a limpid and sparkling fountain, where he can distinguish every pebble and grain of sand with its natural shape and color. . . . All the members of the body ought to be as transparent to him as a polished crystal, where not even a hair could be concealed without his knowing it."[3]

His practice was of the heroic character. He discarded most of the milder and simpler remedies previously in vogue, and treated his patients with a variety of arcana, or specifics,

[1] "Prefatio in Librum Paragranum."

[2] "Fragmenta varia, Theophrastus ad Lectorem."

[3] "Liber Paragranum, I."

extracted by alchemy from different mineral and organic bodies. Opium, a drug which no school of practitioners seems able to dispense with, was one of the few older remedies which he retained in his pharmacopœia. His specifics and essences, of various grades, were some of them inert, but others very powerful; and he seems to have used them all indiscriminately, without much caution or intelligence. The well-known story about the antimony and the monks, which is sometimes attributed to him, is probably an instance of this. He still continued to perform extraordinary cures; but, as sometimes happens in such cases nowadays, soon after the wonderful cure had been published to the world, the disease took an unfavorable turn, and the patient died.

This happened in the case of Froben or Frobenius, an eminent printer of Bâsle, whom he cured of an attack of gout, probably about the time when he first came to the university. His success in this case gained him great credit. But the next year, in 1527, the patient had another attack; and either that or a repetition of the treatment proved fatal. Frobenius was a great friend of Erasmus, the theologian; and, between the first and second of his attacks, Erasmus also became a patient of Paracelsus. There was a correspondence between them, and the two letters are rather curious, as illustrating the peculiarities of both personages.

The first is from Paracelsus.

Theophrastus Paracelsus to his good friend, the most learned Chief of Theologians, Erasmus Roterodamus:

What the learned Muse and Alstoos (probably referring to Frobenius and some other person) have attributed to me in medicine really belongs to me. I am certainly the author of these opinions. The region of the liver (in your case) does not need any medicines, nor do your two other complaints require laxatives. The medicine for you is Magistrale, an arcanum, extracted from a strengthening, specific, and abstersive, that is to say consolidative, syrup. For the troubles of the liver it is a Second Essence, and in gravel of the kidneys it is esteemed a royal medicine. I know that your system cannot bear colocynth, nor any disturbance, or at any rate very little, from (purgative) drugs. I know that I am more clever and skilful in my art than that; and I know what, in your system, will secure a long, quiet, and healthy life, and that you do not need evacuations. Your third disease (to speak plainly) depends upon a matter of some kind, either an

ulcerated putrefaction, or phlegm, perhaps produced on the spot, or accidentally collected, or else the excrement of the urine, or the tartar of a vessel, or mucilage from other parts of the sperm, or a viscous or bituminous state of the blood. It is a liquid gravel, coagulated by the potency of salt (in which the coagulating power resides), as it is in flints or beryl. This is the way it is generated, and I have seen it in your case. But whatever I have decided on, I have made up my mind that there are calcareous mineral grains in the kidneys, under the form of coagulated matter.

If my specific practice, O excellent Erasmus! should please your excellency, I will take care that you have both a physician and physic. Adieu. THEOPHRASTUS.

This reminds one of the Ojibway medicine-man in Longfellow's "Hiawatha:"

> "Then a magic drink they gave him,
> Chanted singly and in chorus,
> Mystic songs like these they chanted,
> Beat their drums and shook their rattles:
> 'I myself, myself, behold me,
> 'Tis the great gray eagle talking,
> I myself, myself, the prophet,
> When I speak, the wigwam trembles,
> I can cure you, Hiawatha,
> I can blow you strong, my brother.'"

There is not very much difference between this and the rigmarole of Paracelsus.

The reply of Erasmus shows that he was a little puzzled by the professor's pathology, but still had great confidence in his treatment.

Erasmus Roterodamus to the most skilful Doctor of Medicine, Theophrastus Eremites:

There is nothing inappropriate in wishing mental happiness to the physician by whom the Lord restores us to bodily health. I am surprised at your knowing my case so well after having seen me only once. I recognize the truth of your obscure hints, not from any knowledge of the medical art, which I have never learned, but from the painful experience of the senses. I have already in times past had pains in the region of the liver, without being able to guess at the source of the malady, and have for several years seen gravel in my urine. What the third disease (which you allude to) is, I do not quite understand, but still think it probable it may be as you say. At this time I have not much leisure for taking medicine, nor for being sick or dying, I am so taken up with the labor of

my studies. However, if there is any thing that can alleviate my malady without disabling me for the time, I beg you to let me know of it. And, if you cannot do that, then explain a little more fully, in a few words, what you have already said in a rather excessively laconic manner, and prescribe other remedies which I can take as soon as I have leisure. I cannot promise you a reward equal to your energy and skill, but I will certainly promise you my gratitude. You recalled Frobenius from the shades of death, and he was a part of myself. If you now cure me also, you will restore each one of us to the other. I hope matters will so turn out that you will remain at Bâsle. I fear you may not be able to read this letter, it is so hastily written. Adieu.

ERASMUS ROTERODAMUS
(By his own hand).

From an expression in the latter part of this letter there seems to have been already a doubt whether Paracelsus would continue in the university. In fact, he had excited by this time a violent opposition among a large part of the profession, which he attributed to jealousy of his superior skill and success. He was nicknamed *Cacophrastus* by his opponents, and he sometimes alludes to this in his writings with considerable irritation. Even the crowds of hearers, who were at first attracted by the novelty of his style and doctrines, had considerably fallen off; and many of them began to perceive that the magnificent promises of his theory were not realized in practice. His habits, too, were irregular, and his career as professor was terminated by an indiscretion which may have been partly due to intoxication.

It seems he had been called to an eminent ecclesiastic suffering from gout, and had bargained to cure him, as he maintained, for a hundred florins. He gave the patient a few doses of his specific, and, when the pain was relieved, considered the cure as effected, and demanded his hundred florins. The patient refused to pay, and Paracelsus sued him in court for the money; but, on the case being heard, he was only awarded the regular fee for his visits, according to the customary medical tariff. He was so irritated at this that he assailed the judge with vituperation, and was obliged to leave Bâsle to escape the punishment for this offence.

This was in 1527, less than two years after he had been called to his chair in the university. It is said that his de-

parture excited but little interest, as his local popularity as a teacher had already shown a marked decline. He continued, however, to practise and write in the same manner as before; and his doctrines were maintained by a large number of enthusiastic partisans.

His ideas in medicine were a mixture of astrology, alchemy, and mysticism. Anatomy seems hardly capable of being treated in this way; and yet his anatomical notions may be judged by the following description, taken from his chapter, "De Anatomia Oculorum."

He divides the consideration of the anatomy of the eyes into that of the *substance*, the *material*, and the *form*, of which the substance is from without; the material from within, and the form in both:

"1. *Substantia.*—The eyes are twins; that is, two fruits, or products, joined in the form of a cross, with reference to a centre, in order that they may have, as nearly as may be, the same integral composition. They are united in the middle, and thence look downward with the stem, and upward with the root. These trunks give off no branches, but only fruit; that is, they produce a blossom which is the material, and bear fruit which is the sight. The flower is white, the fruit is purple, and each of them has a bark, which forms the tunics. The wood is what intervenes between the tunics and the root. In the pith is situated the sight; that is, the substance of the eye.

"2. *Materia.*—The material consists of three things: namely, sulphur, salt, and mercury." (According to Paracelsus, these three were the ingredients of every thing.) "Sulphur is the flower and fruit, in all colors, according to the mode of resolution, outside the visual body. The visual body is Mercurius, in which is contained the perfected sight, without any other material. Salt is the solidification of both, since it reduces the parts into one form; that is, it completes the essence of the visual body.

"3. *Forma.*—The form is that of a cross, because the central part bears twins. Afterward, each twin passes into its own form, or rotundity, since the eyes in the body fill the place of the sun, as in a microcosm."

By "anatomy," therefore, Paracelsus did not understand the internal structure of an organ, as it may be learned from dissection, but a fanciful enumeration of vague similitudes and analogies, which might be filled out by the imagination. Even a list of the headings of his chapters would show a large proportion of similar subjects. There are chapters—

On the Mystery of the Microcosm;

The Philosophy of Theophrastus, or the Generation of the Elements;

On the Occult Philosophy;

The Treasury of Treasuries of the Alchemist;

On the Fifth Essence, or Quinta Essentia;

On Magisteria;

On Specifics;

On Elixirs; and

On the Signatures of Natural Things.

Alchemy formed a large part of the medical science of Paracelsus. The alchemists had already been busy, for perhaps a century, in their endeavors to transmute the baser metals into gold. Chemistry, as we understand it, had no existence at the time; but from the earliest periods it had been easy to see that the metals were a class of bodies having peculiar physical qualities, which gave them a certain family relationship, and separated them from other natural substances. This readily gave origin to the idea that the baser metals might all be impure conditions of the nobler or more indestructible ones, of which gold was evidently the purest and most perfect; and the object of the alchemists was to expel by some means their impurities, and so obtain from them the metal in its most perfect and valuable form. For this purpose they subjected the natural earths, the metals and their salts, to all sorts of chemical manipulations, apparently with very little regular plan, and without at all understanding the nature of the changes which took place. But in this fruitless search after transmutation they produced, in the course of time, many substances which afterward became of real value. They were already in possession of nitric, muriatic, and sulphuric acids, aqua regia, metallic antimony, terchloride of antimony, red precipitate, sulphuret of potassium, bismuth, and sugar of lead

The alchemists, however, did not value these substances for themselves, but only as a means of finding the philosopher's stone, or tincture, which would have the power of producing gold. By the sixteenth century this embryonic science had become largely tinctured with charlatanism. The writers on alchemy used the strangest terms to describe chemical substances, and employed various signs to designate them, which were not always the same for the same substance.

Thus gold was represented either by the *Sun*, the *Lion*, or the *Swan;* silver by the *Moon* and the *Owl;* copper by *Venus;* iron by *Mars* and the *Wolf;* tin by *Jupiter*, the *Eagle*, and the *Stag;* and lead by *Saturn* and the *Mole.* Traces of this practice still exist in our own materia medica, as when we use the term "lunar caustic" for nitrate of silver, or "Saturnine preparations" for the salts of lead.

One of their most singular freaks was the general habit of using this studiously obscure language, in order to guard their secrets from discovery, even by the reader. It is not easy to comprehend why, if an alchemist wrote a book to teach us how to make the philosopher's stone, he should not tell the story so that we could understand him; or, on the other hand, if he did not wish his secret to be known, why he should write a book about it at all. But, as a matter of fact, this was a very prominent feature of nearly all the works on alchemy.

Paracelsus of course was an alchemist, and has much to say about the production and virtues of the great elixir. He claimed to be superior to the other alchemists, and to have more efficacious means of success. Here is

"*A quick and easy way to make the philosopher's stone:*

"The old Spagyrites would not have needed to go through with all this labor and tedious reiteration if they had studied in my school; they would have accomplished their object equally well, but at far less labor and expense. And now at this time, when Paracelsus is the monarch of the arcana, the period has arrived for that discovery which before me was hidden from all the Spagyrites. Wherefore, I say: Take only rose-colored blood from the Lion, and glue from the Eagle, and after you have mingled them together, coagulate them according to the old process. You will then have the *philoso-*

pher's tincture, which men without number have sought for, but very few have found."[1]

If we try to interpret this lucid prescription, we should remember that the "Lion" is one of the cabalistic synonymes of gold, and the "Eagle" one of those of tin. If gold be dissolved in nitro-muriatic acid, evaporated and heated, and the product dissolved in water, it forms a solution of the terchloride of gold. This was probably the alchemists' "rose-colored blood from the Lion." On the other hand, protochloride of tin, which is a gray, resinous-looking, and easily-fusible substance, was perhaps what they called "glue from the Eagle." It will precipitate the gold from a solution of its terchloride in the form of a brown powder.

The recipe of Paracelsus, if translated into modern language, would then read as follows:

"Take only a solution of terchloride of gold and a solution of protochloride of tin, and coagulate them;" that is, make a precipitate by mixing them together.

We should thus have, at the end of the operation, the same gold, in a different form, which had first been dissolved in the nitro-muriatic acid.

Now that we have the precious article, however, it seems that it is not yet quite ready for use, according to Paracelsus; and the operation which still remains necessary can hardly be called an inexpensive one.

"If the philosopher's tincture," he says, "is to be used for transmutation, a pound of it is first to be projected over a thousand pounds of melted gold. Then, at last, the medicine will have been prepared which is able to transform the leprous humor of the metals."[2]

Of all the arcana, or occult remedies which Paracelsus depended on in practice, the most valuable was his *Quinta Essentia*, or fifth essence, which he extracted from all sorts of substances, animal, vegetable, and mineral. He considered this quintessence as containing, in a concentrated form, all the life, power, and occult medicinal properties of the substance from which it was derived. Some of these were of extraordi-

[1] "De Tinctura Physicorum," chapter iv.

[2] Ibid., chapter vi.

nary virtue. For example, he said that the quintessence of pearls, extracted by himself, had such power that with it he had restored to life and strength men who were already in the agony of death.[1] Of course, the quintessence of gold was more valuable than any of the others; and his process for extracting it is a fair sample of the laborious and fruitless prolixity of the operations of the alchemists:

"Take pure gold, reduced to the smallest grains and rubbed to a powder with plumbago. Add to this, of the best white wine that can be procured, 100 parts, and white resin of the pine, 10 parts, and macerate in a glass vessel forty days. Pour off the wine, add the same quantity over again, and macerate as before. Repeat this a third time. Then take all the wine from the three successive macerations, place it in a glass vessel, well covered, and distil with a strong fire, so that it may come over rapidly. When the distillation is complete, place the liquid in a glass vessel, well covered with a blind alembic, upon a bed of ashes hot enough to burn the hand. Keep it in this condition until nine parts of the liquor are consumed or dried up, and only the tenth part remains. To this remaining liquid add an equal quantity of the white of egg, shake the mixture and distil together. At first distil slowly and a white liquid will come over, which should be set aside. Then increase the heat until the vessel is red-hot, when there will come over a material of thin, honey-like appearance and a strong odor. Keep this, for it is the fifth essence of gold, and a royal medicine." [2]

I have the highest chemical authority for saying that the result of this process would be only ammoniacal and empyreumatic substances from the destructive distillation of albumen and some ingredients of the wine. His "fifth essence" would not contain the least particle of gold, nor any thing derived from it.

The medicine of Paracelsus was also deeply imbued with the cabalistic doctrine, which was then very much in vogue, and which was the most senseless and futile of all the many delusions of the period. This was the science of correspond-

[1] "Archidoxorum," liber iv., "De Quinta Essentia," p. 4.

[2] "De Quinta Essentia," pp. 5, 6.

ences and sympathies in Nature; the macrocosm and the microcosm, or the imaginary relations between the planets and terrestrial objects; and the signatures of things, or the external marks by which their occult sympathies and relations were supposed to be indicated. The cabalistic writings are even more difficult to comprehend than those of the alchemists, although they undoubtedly contained ideas which were more or less understood at the time. But they were all mystical in character, and never in the least degree connected with any thing like scientific research or observation.

Some of the writers on the history of medicine speak of Paracelsus as a reformer, and of the propagation of his ideas in the sixteenth century as a reformation. This reformation was the abandonment of the principles of the Galenic school, as to the temperaments and the four elements, and the adoption of more powerful remedies extracted by chemistry from mineral substances. The writings of Paracelsus himself show how little this movement deserves the name of a reformation. Chemistry did not begin its development, as an intelligible science or art, until at least a century and a half after his death. He employed chemical manipulations, and used their products in the treatment of disease; but it was in the blindest and most reckless manner, without any rational study of the symptoms, the natural history of the malady, or the real action of the medicines. His pharmacopœia was a collection of arcana, magisteria, quintessences, and specifics, based mainly on the doctrines of alchemy and the cabalistic art. As Daremberg said, reformations in medicine are not made by men who are strangers to anatomy and physiology, mystics in chemistry, and empirics in practice; they come only from the gradual development of medical science by slow and laborious investigation.

If we take all his qualities together, Paracelsus may be regarded as, on the whole, the most complete and typical representative in history of the thorough-paced charlatan. A rampant, blatant, boasting, ignorant vagabond, with a face of brass and a tongue like a race-horse, it is difficult to say whether he did not really believe himself, in his blind way, the medical enchanter he pretended to be. Unable to com-

prehend the existence of genuine qualities in others, he loudly claimed the possession of superior knowledge, without ever deigning to show how he had obtained it, except by a confused kind of intuition, which we know has no place in the natural sciences. He imposed for a time on the credulity of a credulous generation, and has left his name as a curious monument of mystification and folly in the history of medicine.