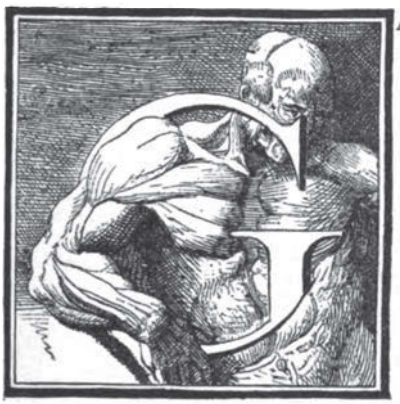
HISTORICAL AND BIBLIOGRAPHICAL NOTES.

A SERIES OF SKETCHES OF THE LIVES, TIMES AND WORKS OF THE OLD MASTERS OF ANATOMY AND SURGERY.

By GEORGE JACKSON FISHER, M. D.

XV.—CLAUDIUS GALENUS.

A. D. 130—200.



GALEN'S voluminous works were the grand and exhaustless repositories of facts, observations, and opinions, to which the entire profession of medicine of the whole civilized world resorted, and on which it placed its unquestioning confidence, and by which it was mainly governed in its practical operations, from age to age, through the long period of fourteen hundred years! An author who could thus sway the opinions of a great profession, and whose works furnished material, argument, and theory for a period of time so vast, must needs have been a man of rare genius, of extensive and accurate observation, and of untiring industry; and, moreover, his works must have fully represented, not merely his own original investigations, but have been a fair exponent of the entire

science of medicine as understood in the age in which he flourished.

Claudius Galen was born in the ancient city of Pergamus in Mysia, Asia Minor, about the autumn of the one hundred and thirtieth year of the Christian era, and the fifteenth year of the reign of the Emperor Adrian. His father, whose name was Nicon, was a man of wealth, influence and learning, being not only an architect and geometrician, but, as Galen himself in more than one place in his works informs us, was also, in addition to his knowledge of astronomy, grammar, arithmetic, and various other branches of philosophy, a man possessed of patience, justice, benevolence, and other virtues. His mother, however, was a woman of violent temper, scolding and sometimes even biting her maids. Galen, with more frankness than charity, records the degree of domestic infelicity in which his parents dwelt, telling us that his mother quarreled with her husband even "more than Xantippe with Socrates." While very few ancient authors have furnished us with many facts relating to the personal history of Galen, this deficiency is abundantly supplied by his own writings, which abound in personal allusions and anecdotes concerning himself and many of his contemporaries.

Galen's education was thorough, ample, and comprehensive. He received his first instruction from his father. In his fifteenth year (A. D. 144–5) he entered upon the study of logic and philosophy under a pupil of Philopater the Stoic, under Caius the Platonist, under a pupil of Aspasius the Peripatetic, and also under an Epicurean. His father had intended to make of him a philosopher, but changed his mind, in consequence of a dream, and chose for his son the profession of medicine. On what a delicate poise does the destiny of a great genius sometimes hang or turn! Thus a youth who became the most celebrated physician in the

whole world—one whose influence in the different branches of medical science has been more extensive and of far longer duration than that of any other individual either in ancient or modern times, had his helm put about, and a new chart, and new sailing directions given to him, in consequence of a whim suggested by a dream! The influence of the dream of Nicon hovered over the genius of medicine during many subsequent ages.

No expense was spared in his medical education. The names of several of his preceptors are preserved, among whom Æschiron, Satyrus, and Stratonicus were of his own country. At the age of twenty he was called to mourn the loss of his devoted father, and it was probably about this period that he went to Smyrna, where he continued his studies under Pelops the physician, and Albinus the Platonic philosopher. He also went to Corinth to attend the lectures of Numesianus, and to Alexandria for those of Heraclianus. He also studied under Ælianus Meccius and Iphicianus. Intent and zealous in the acquisition of the highest degree of culture in his profession, and not satisfied with the powerful assistance of such a corps of instructors as above mentioned, he traveled into other countries the better to witness the practice of men of eminence, to converse with experienced physicians, to observe the peculiarities of natural productions, and the influence of climate upon disease. He tells us that for such ends he visited Cilicia, Phœnicia, Palestine, Scyros, Crete, and Cyprus, Italy and Macedon. He visited Lemnos to examine its celebrated earth, and traveled into Syria to inspect the balsam for which it was renowned. The principal part of his journeys were made on foot, not with a view to economy, for he was possessed of ample means, but that his opportunities for careful observation would be thus increased.

Having in all these ways acquired an extensive and

thorough knowledge of the principles and practice of medicine and surgery, he returned to his native city, being now in his twenty-ninth year; and such was the estimation in which he was held in Pergamus, that on his arrival he was immediately appointed by the Pontiff, or high-priest of the city, physician to the school of gladiators—a position which he filled with great reputation, owing to his success in the treatment of fractures and wounds incident to the fierce combats there practiced.

Owing to some seditious disturbances and popular commotions which occurred about A. D. 163–4, Galen, being in his thirty-fourth year, felt compelled to leave his own country and settle himself in the city of Rome. Here he remained but five years, in consequence of the envy and jealousy which he excited among the Roman physicians. His enemies taunted him with being a grammarian, a reasoner—a mere theorist and not a practical physician—and as a final and overwhelming objection, accused him of being a magician.

When Galen went to Rome he found the medical profession divided into numerous divergent and contending sects: dogmatists, empirics, methodists, episynthetics, pneumatists, and eclectics. Alas! were he to revisit the earth again, and attempt to locate himself in any modern metropolis, how much of an improvement in the unity of medicine would he find to have taken place during the lapse of seventeen centuries!

Galen, imbued with the spirit and knowledge of his ideal master—Hippocrates—endeavored to lead the physicians of that city in the only true line of investigation and progress, which is the careful observation of nature. In this he met with poor success, as he never escaped the persecution of the medical sects, in consequence of which—and it is said also on account of the sudden breaking out of the plague—

he quitted Rome and again returned to Pergamus. While in Rome he gained a great reputation for an extensive knowledge of anatomy and medicine. It was here that he wrote his work, *De Hippocratis et Platonis Decretis*, the first edition of his work, *De Anatomicis Administrationibus*, and some other treatises.

He tells us that he excited so much envy and ill-will among the physicians there by his frequent and successful disputations, lectures, writings, and practice, that he lived in mortal dread of being assassinated or secretly poisoned by them.

He, however, made the acquaintance, and acquired the friendship, and secured the patronage of many of the most influential families in Rome. Among others, Eudemus, a celebrated peripatetic philosopher, whom he cured of a dangerous fever; Sergius Paulus, prætor of Rome; Barbarus, uncle of the Emperor Lucius; and Severus, the consul, and subsequently Emperor. Above all, he was esteemed by Bœthus, a consul, for the recovery of whose wife he received the handsome fee of four hundred pieces of gold. In the presence of this person he made some dissections, and demonstrated the organs of respiration and of the voice. In one of his works he gives a full account of his first visit to Rome, and of some of his most remarkable cures. He says that he was at last called, not only "the wonder-speaker," but also "the wonder-worker."

He had scarcely settled himself into the routine of his ordinary course of life in Pergamus, when he received a summons from the joint Emperors, Aurelius, the pure and excellent, and Verus, the profligate and licentious, to attend them at Aquileia, in Venetia, the chief bulwark of Italy on its north-eastern frontier, whither they had gone in person to make preparations for the war with the northern tribes, and where they intended to pass the winter. Galen per-

formed a part of the journey through Thrace and Macedonia on foot. He arrived at Aquileia about the close of the year 169, shortly before the plague broke out in the camp with great fury and violence. The two Emperors, with their court and a few of the soldiers, made a hasty retreat to Rome, and on their way Lucius Verus died of hæmorrhage, or apoplexy, being but thirty-nine years of age. Galen followed Marcus Aurelius to Rome, but excused himself from accompanying the Emperor into Germany, whither he was going to conduct the war on the Danube. This great physician felt that he must obey the will of the god Æsculapius, who had warned him in a dream never again to leave the city of Rome. Having escaped the journey with the Emperor and the dangers and hardships of the campaign, he was placed in charge of Aurelius Commodos, then nine years of age, son of the Emperor, whose health during his studies under Pitholaus, and during the absence of his father, was intrusted to Galen. The prince was attacked with a severe fever, from which he made a complete recovery. Galen was equally fortunate in his treatment of Sextus, another son of the Emperor, and afterwards Emperor himself, who was suffering from the effects of repletion, and not from ague, as his other physicians had predicted. This diagnosis of the royal dyspepsia did much to establish his fame, for the Emperor exclaimed: "We have but one physician; Galen is the only man of the faculty." Rome was his residence for the remainder of his life. The physician of the present day who can make a diagnosis independently of malaria deserves imperial honor and patronage.

On the death of Demetrius, A. D. 170, Galen was commissioned by M. Aurelius to prepare for him the celebrated compound medicine called *Theriaca*, of which the Emperor was accustomed to take a small quantity daily. About thirty years afterwards he was employed to make up the

same medicine for the Emperor Septimus Severus. Galen probably died in the year 200 or 201. There is, however, much discrepancy among writers as to both the time and place of his death. The place of his death is not given by any Greek author. Some affirm that he returned to his native city at the age of eighty and died there; others that he died in Palestine; and Cælius Rhodiginus states that he lived to the extraordinary age of one hundred and forty years. Suidas says he died at the age of seventy, which is the time generally accepted. Medals were struck in his honor by his native city, Pergamus. There have been many engravings of Galen; they are all without the least authority and are purely ideal, and, of course, differ from each other according to the fancies of the artists.

Galen's personal character, as it appears from many passages in his works, places him among the brightest ornaments of the age in which he lived. His writings, now extant, furnish the strongest proof that he was a man of profound learning and of the highest accomplishments. Perhaps his most glaring faults were his inordinate vanity, and his bitterness and contempt for some of his adversaries. He has not hesitated to recite his own cures and vaunt his own praise. These may have been the result of the opposition, envy, and persecution of his numerous enemies, and have been but a reflex of the antagonistic spirit of the medical sects. Can we not afford to excuse all this in Pagan Galen, when we consider that even in our Christian civilization those faults are still found not to be eradicated from the human heart? Galen, though a Pagan, did not fail to recognize the power, wisdom, and goodness of an Almighty Architect. The following fine and oft-quoted passage is to be found in his admirable work, *De usu Partium:*

"In writing these books, I compose a true and real hymn to that awful Being who made us all; and, in my opinion,

true religion consists not so much in costly sacrifices and fragrant perfumes offered upon his altars, as in a thorough conviction impressed upon our own minds, and an endeavor to produce a similar impression upon the minds of others, of his unerring wisdom, his resistless power, and his all-diffusive goodness. For, his having arranged everything in that order and disposition which are best calculated for its preservation and continuation, and his having condescended to distribute his favors to all his works, is a manifest proof of his goodness, which calls loudly for our hymns and praises. His having found the means necessary for the establishment and preservation of this beautiful order and disposition, is as incontestable a proof of his wisdom as his having done whatever He pleased is of his omnipotence."

This is language worthy to have been written by the most devout of the holy fathers.

The remainder of this sketch will be devoted to the consideration of the works of Galen.

[To be Continued.]

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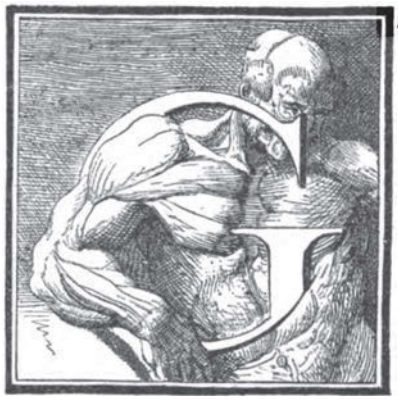
XV.—CLAUDIUS GALENUS (CONTINUED).

A. D. 130—200.



GALEN was a prolific medical writer. A portion of his manuscripts, which were deposited in the Temple of Peace, together with others which were in his own house, were destroyed by fire; not a few have perished by the lapse of time, and yet the aggregate amount of his writings which have survived, and are now extant, is something enormous.

Curiosity has led me to make an estimate of the comparative bulk of Galen's writings with that of the sacred Scriptures, including both the Old and New Testaments. Making a careful allowance for uniformity in the size of type, measuring the length of lines, counting the number of lines on a page, calculating the space lost by incomplete lines in a paragraph Bible, and the same in the Greek edi-

tion of Galen (5 vols. folio, Venice, 1525), I find that the united lines of the Bible amount to three miles and two hundred and forty feet. The united lines of the works of Galen extend to sixteen and one-half miles. In both cases the text is taken exclusive of all headings, references, notes or commentaries—they stand as sixteen thousand feet to eighty seven thousand, Galen's extant works being nearly five and one-half times more voluminous than the entire Bible. What a mass to read! What a vast mass to have been copied and recopied, with the pens of patient and industrious scribes, for a period of nearly fourteen centuries! Who can duly appreciate the value of the printing press?

It is supposed that he wrote no less than five hundred distinct treatises. We now have existing and in print no less than eighty-three treatises written by Galen, the genuineness of which is now fully admitted. To these are to be added eighteen of rather doubtful origin; forty-five undoubtedly spurious; nineteen fragments, more or less extensive in size; and fifteen commentaries on the works of Hippocrates. To these printed works must be added forty or fifty treatises, or parts of treatises, which still exist in manuscript in the public libraries of Europe. Of the number of works which are lost, including about fifty on medical subjects, it is supposed that they amount to one hundred and sixty-eight. Galen wrote not only on medicine, but also on grammar, mathematics, logic, ethics, and other branches of philosophy. Galen was familiar with all the dialects of the Greek language, which enabled him to communicate freely with the people and the profession of every country through which he traveled for information. The greater part of his writings are in the Attic, though he sometimes employed the Latin, the Ethiopic, and the Persic, in which he was well versed. His style is elegant, but diffuse and prolix, and he abounds in allusions and

quotations from the ancient Greek poets, philosophers, and historians.

As an example of the familiar style in which Galen relates his experience, records his cases, and sets forth his own claims to perception, tact, and skill, I will here introduce Dr. Watson's translation of a case from Kühn's edition of Galen,[1] the *Medical Profession in Ancient Times*, by John Watson, M. D., 8°, N. Y., 1856, p. 153–156: "Soon after my arrival in Rome, Glauco the Philosopher took a great fancy to me, in consequence of my reputed skill in diagnosis. Meeting me accidentally in the street and shaking hands with me, he remarked, 'I have fallen upon you opportunely. I wish you to visit with me a patient in this neighborhood whom I have this moment left—the Sicilian physician whom you saw walking with me some days since, and who is now ill.' I enquired of him what ailed his friend; when with his habitual candor he replied, that Gorgias and Apelas had spoken to him of my skill in diagnosis and prognosis, which appeared to them more like the result of divine inspiration than of medical science; and that he wished to know for himself whether I really was thus skillful. He had hardly done speaking before we reached the door; so that I had no opportunity of replying to his request—as I have often said to you—that on some occasions the signs of disease are certain, at other times they are ambiguous, and require to be considered again and again. But, as we entered, I observed a servant carrying from the sick chamber a vessel containing a thin bloody sanies, like the recent washing of flesh, a sure evidence of diseased liver. Without appearing to notice this circumstance, I proceeded with Glauco to the patient's apartment, when placing my fingers on the wrist of the sick man, I examined his pulse in order to determine whether the attack was inflammatory, or simply a weakness

[1] Vol. 8, p. 361. *De Locis Affectis*, lib. v., c. 8.

of the affected viscus. As the patient was himself a physician, he remarked that he had recently been up, and that the effort at rising might have accelerated the pulse; but I had already discovered the evidences of inflammation; and seeing on a recess in the window a jar containing something like a preparation of hyssop in honey and water, I knew that he had mistaken his disease for pleurisy; in which, as in inflammations of the liver, there is usually pain under the false ribs. He had been led to this opinion, as I at once perceived, by experiencing this pain, by his short and hurried breathing, and by a slight cough. Understanding the case, therefore, and turning to good account what fortune had thrown in my way, in order to give Glauco a high opinion of my ability, I placed my hands over the false ribs, on the right side of the patient, and at the same time declared this to be the seat of pain, which the sick man admitted to be correct. Glauco, supposing that I had made this discovery merely by examining the pulse, began to express surprise. But to increase his astonishment, I added: 'Inasmuch as you admit the existence of pain at this spot, I wish you further to say whether you are troubled with a slight cough, and whether your cough is not dry, without sputa, and occurring at long intervals?' While I was yet speaking, the sick man was seized with a cough such as I had described; whereat Glauco was exceedingly excited, and no longer able to contain himself, began to vociferate in praise of my abilities. 'Do not think,' said I, 'that these are all the discoveries my art enables me to make; there are others yet to be mentioned, which will elicit the testimony even of the patient.' Then turning to the latter, I resumed: 'Is not the pain in this part increased, and accompanied with a sense of weight in the right hypochondrium, whenever you take a full breath?' At hearing this the patient also was surprised, and was as loud in my praise

as Glauco. Seeing fortune still smiling upon me, I was desirous of making some remark in reference to the shoulder, which appeared to be drawn downwards, as often occurs in severe inflammations as well as in induration of the liver; but I did not venture to speak on this point, fearing to diminish the admiration which I had already excited. Nevertheless I touched upon it cautiously, saying to the patient, 'You will not long feel the shoulder drawn downwards, if perchance you do not find it so already.' When he admitted this symptom also, seeing him greatly astonished, I said, 'I will add but one other word to show what you conceive to be the nature of your complaint.' Glauco declared he would not be surprised if I should do even this. But the patient, overcome with wonder at such a promise, observed me closely, waiting for what I should say. I told him he had taken his disease to be a pleurisy. This, with a further expression of surprise, he admitted to have been his opinion, as well as that of his attendant, who had been fomenting his side with oil for the relief of that disease. From this time forward Glauco entertained the highest opinion both of me and of our art; for, having never before come in contact with a physician of consummate ability, he had hitherto formed but an humble estimate of the profession. I have related to you these particulars," he adds, as if addressing a class of medical students, "in order that you may understand that there are symptoms peculiar to particular diseases, and others common to several diseases; and, further, that there are some symptoms inseparable from the disease, some usually accompanying it, others again of uncertain character or of rare occurrence; so that if fortune at any time offers to you a good opportunity, as in the instance just related, you may know how to take advantage of it; remembering that fortune often presents to us the means of acquiring fame, which, through ignorance, many are unable to turn to good account."

Excusing the conceit of our author, it is extremely interesting to listen to his fluent sentences which have come down through the long lapse of ages, as fresh and familiar as if spoken but yesterday. The methods of acquiring fame which he has here taught continues in use, and proves very serviceable to not a few of the modern disciples of Galen.

It is not within the limited scope of these "sketches" to attempt an analysis of all the works of Galen. I will hence confine myself to a brief notice of the more practical treatises, and particularly those which relate to anatomy and surgery. The treatise *De Usu Partium*, which is in seventeen books, and is preserved entire, written soon after his return to Rome, was not intended for a mere professional text-book, but was rather a dissertation on final causes, to disprove the doctrines of Epicurus, and to demonstrate the existence of a superintending Providence, as manifested in the marvelous adaptation of means to ends which the structure of the human body so admirably displays. It is full of anatomical detail and physiological opinions. It is here we find those hymns and pious ejaculations to the all-wise and omnipotent Deity — sentiments worthy not only of the heathen philosopher and moralist, but of the most devout worshipper of the Christian's God. While it would be obviously absurd to set up a high claim for the amount and accuracy of the anatomical knowledge possessed by the ancients in the time of Galen, as compared with that of modern times, yet it ought to be known that most of the descriptive terms both in physiology and pathology, as well as in anatomy, which are now in use, were employed by him in the same sense as they are employed by modern authors.[1]

[1] Vide *Kidd*. A cursory analysis of the works of Galen, so far as they relate to anatomy and physiology. Trans. of the Provincial Med. and Surg. Asso., vol. vi, p. 299–336, to which I am much indebted.

Whether Galen's familiarity with practical anatomy was derived from human or comparative dissections, is an open question, but his familiarity with the dissecting-room and the physiological laboratory cannot be doubted. We find him directing the dissector, in examining the blood-vessels of the liver, to insert a probe into the "vena portæ," and from thence into any of its several larger ramifications; then gently advancing the probe further and further, to dissect down to it. And thus, he says, you may trace the minutest branches; removing with the knife the intermediate substance, called by Erasistratus the "parenchyma." He also directs the division of the cellular tissue by the finger or the handle of the scalpel. The blow-pipe and various other instruments and contrivances made use of in dissecting are described by this old master in anatomy.

Galen did not confine his observations to the dead body, but exhibited a remarkable degree of dexterity, boldness and originality in experimental anatomy. He observes that although a ligature on the inguinal or axillary artery causes the pulse to cease in the leg or in the arm, yet the experiment is not seriously injurious to the animal on which it is made, and adds, that even the carotids may be tied with impunity. As another evidence of his accuracy, we find him correcting the error of those less skilled in surgical anatomy, who in ligating the carotids failed to separate the contiguous nerves, and attribute the consequent loss of voice to the mere compression of those arteries, and not of the involved nerves. The term "peptic" he applies to the organs of assimilation. The nutritive portion of the food which is appropriated for conversion into blood he calls by the indiscriminate terms "chyme" or "chyle." We find the words *vena porta*, *esophagus*, *vena cava*, *uterus*, *brachialis internus*, *biceps flexor cubiti*, and many other anatomical names which are in use at the present day.

From frequent vivisections he observed that the pylorus acts as a valve *only* during the process of digestion, after which it relaxes; and but for this, he remarks, how would rings and coins of considerable size, etc., pass from the stomach to the intestines, as is frequently found to be the case? He speaks of "heart-burn," which he correctly says is due to an acrid sensation at the upper orifice of the stomach, adding, that no one who is acquainted with the writings of the ancients supposes that the term "cardialgia" signifies pain in the heart; for the ancients applied the term "cardia" to the mouth of the stomach as well as to the heart; in proof of which he quotes Thucydides, who, in his account of the plague of Athens, employs this word. Galen says, "cardia" was more anciently used for the mouth of the stomach than "stomachus."

Galen recognized the constitutional origin of local diseases, and points out the pernicious effects of unwholesome food and unhealthy chylification in the production of ulcers, and in retarding their cure. He observed that the process of digestion is completed in the intestines, and adds that the numerous convolutions of the intestines are to afford an extensive surface for the absorption of nutriment, which he conceived to be chiefly done by the veins. It is evident that he had observed the "lacteals;" for he remarks that in addition to the mesenteric veins which unite to make the portal vein, there are visible in every part of the mesentery other vessels proceeding from the intestines, which terminate in glands; he, however, did not comprehend their true function, as he supposed they were the proper nutrient vessels of the intestines. He ridicules some of his contemporaries for asserting that, upon exposing the mesentery of a sucking animal, several small vessels may be seen filled *first* with air, but *afterwards* with milk. It is probable that they had mistaken colorless lymph for air.

[To be Concluded.]

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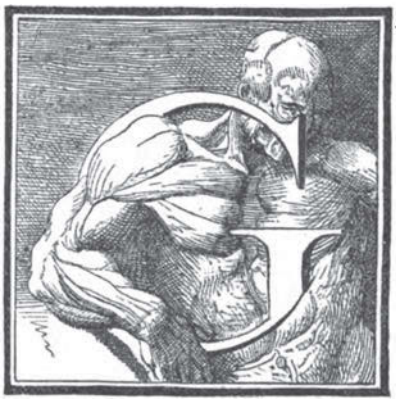


GALEN observes, in regard to the physical characters of the blood, that both the arterial and venous blood coagulate within as well as out of the body. He agrees with Aristotle as to its cause being due to the existence of certain fibrous particles in this fluid, the absence of which prevents the blood from coagulating. He considered the aqueous serum to be the vehicle of the nutriment of the several parts and organs of the body, and that the superabundant aqueous particles are separated by the kidneys. He taught that every organ of the body is endowed with a special sensibility whereby it attracted what was useful to itself, and rejected or expelled whatever was useless or injurious. Galen describes clearly the form and position of the tricuspid and mitral valves, and also the sigmoid valves of the aorta and

pulmonary artery. Erasistratus and his followers taught that the arteries are air-vessels, being filled with the vital spirits and never properly with blood. He admitted that they anastomose with the extremities of the veins, and that, under certain morbid conditions, blood found its way into the smaller arterial branches. Galen denied that they are air-tubes essentially—believed that the vital spirits were mixed with the arterial blood, and flowed thus together. While he regarded wounds of the veins as dangerous, he held that wounds of the arteries were, for the most part, mortal.

It seems that the teachers of anatomy in Galen's day continued to instruct their students to believe the erroneous doctrines of Erasistratus concerning the aerial function of the arteries. Galen relates a very entertaining anecdote with reference to the final decision of this question. Though somewhat lengthy, I cannot forbear to quote it: "There are some teachers who are in the habit of advancing opinions which they are not prepared, and therefore not inclined, to put to the test. Such was the case with a certain teacher of anatomy who, having declared that the aorta contains no blood, and having been earnestly desired by several ardent pupils to exhibit the requisite demonstration, they themselves offering animals for the experiment, declined, after various subterfuges, to satisfy them without a suitable remuneration; on which the pupils immediately raised among themselves a sum of money amounting to one thousand 'denarii'—or 'drachmæ,' being probably about one hundred and twenty-five dollars of our money—and placed it before him as an inducement to prove his assertion. After much prevarication, when urged to proceed by all present, he took the scalpel in hand and began by making an incision in the left side of the chest, where he imagined the artery could be exposed; but such was his want of anatomical

skill that he cut directly down upon the bone. One of his associates, however, having opened through the intercostal spaces, he, again proceeding, injured in the first place the artery, and afterwards the vein. The young men who had deposited the money with the spectators, now, laughing at him, undertook the experiment themselves. They dissected through the intercostal spaces, as they had been previously taught by me, in such a way as not to injure the vessels, and without delay surrounded the artery with two ligatures—one at its point of departure from the heart, the other where it rests upon the spine, just as these boastful teachers had promised to do, in order that when the animal was dead one might see, from so much of the vessel as lay between the ligatures, whether or not the artery was empty of blood. But when it was not found to be empty, they declared that an incision must have been made in it at the time of applying the ligature; as if some other individual, and not these teachers themselves, had promised the demonstration. For they had never tried the experiment in presence of witnesses, nor could they have had much skill in applying the ligatures, since they did not even know that the artery and vein both extend to the lower boundary of the ribs."

It is indeed wonderful to observe how nearly Galen approached to the discovery of the circulation of the blood. As we have seen, he knew that both the arteries and veins are blood vessels. He said the heart is evidently the source of pulsation, since if a ligature be made on any artery, pulsation continues in that part of the artery which is intermediate to the ligature and the heart; but ceases in that part of the artery which is intermediate to the ligature and the extremities. He describes the valves of the heart, and those at the roots of the great vessels, and saw their evident action. He knew, for he says he has often made the experiment, that by opening a large artery all the blood of the body

flowed out, not only from the arteries, but also from the veins; and he arrived at the inevitable conclusion that the arteries and veins must mutually anastomose. He fairly describes the double circuit of the blood, and yet failed to comprehend it. He observes that the blood which the heart receives into its *right* cavity from the *vena cava* it sends directly to the lungs through the *vena arteriosa* (pulmonary artery); and that from the lungs the blood is conveyed by the venæ arteriosæ (pulmonary veins) through the *left* cavity of the heart to the aorta; and from the aorta to every part of the body. (Kidd, *op. cit.*, p. 320. Kühn's ed. of Galen, vol. ii, p. 615, and vol. iv, p. 671.)

The reader may ask why, then, did he not understand the double circulation of the blood? It is very obvious that he did not when he confesses that he is totally unable to explain why nature, which does nothing vain or without design, should have made two different sets of vessels—arteries and veins—to contain the same fluid. This he attempted partially to explain by saying that the venous blood is heavy and thick, and the arterial blood spirituous and thin. That some organs require thin and others thick blood; that the thinness of the venous coats readily transmitted the thick blood, while the greater thickness of the arterial coats was required to restrain the too ready transmission of the thin and spirituous blood.

His theory of respiration was that the heart being the source of the innate heat of the body, which he compared to a stove that warms a whole house, the use of respiration is to moderate this heat. He describes two kinds of respiration—pulmonary and cuticular; the latter alone he believed to be sufficient for animals during the period of hibernation. He considered the diaphragm to be the principal muscle of involuntary respiration. He claims, however, to have been the first anatomist that ever pointed out the two sets of

intercostal muscles, and their mode of action, they being, in his opinion, chiefly concerned in forced or voluntary respiration, which he calls an animal effort.

Galen went further than to suppose that respiration merely cools the innate and constantly accumulating heat of the heart and blood; he affirms that this heat is also absolutely produced by respiration. He says if we could find out why flame is extinguished by absence of the air, we might then know the nature of that substance which imparts warmth to the blood during the process of respiration. This inquiry was suggested by Claudius Galen about the middle of the second century, and was solved by Joseph Priestley on the first day of August, 1774, by his discovery of oxygen gas.

Galen describes the effects produced on respiration and the voice by the division of certain thoracic nerves; and particularly the division of the recurrent branch of his sixth pair of cerebral nerves—the pneumo gastric of modern anatomy. He explains why the division of this branch, though made on both sides, does not entirely destroy the voice. He also explains why the diaphragm continues to act after the spinal cord has been divided below the lower portion of the neck; that it is in consequence of the origin of the phrenic nerve above this point. (Kühn's Galen, vol. ii, p. 699.)

Here, as in many other instances, we find Galen engaged in making physiological experiments on living animals, involving not only great delicacy of manipulation and accuracy of anatomical knowledge, but instituted for the purpose of determining important physiological and practical questions. It may be truly said that the anatomists of the fifteenth and sixteenth centuries were not the fathers and founders, but rather the restorers and improvers of anatomy and physiology. We ought never to withhold our admiration of the primitive masters of anatomy. Galen observed the large size of the renal blood-vessels, and knew that the kindeys

were organs of elimination and excretion. He traced the ureters, and noted the oblique direction in which they enter the bladder, and the valvular effect of this mode of insertion.

So complete was Galen's knowledge and descriptions in human osteology, that his only differs from a modern treatise on the subject in minor detail. As an example of the minute and systematic manner in which he treats the subject, in his description of the temporal bone, he divides it into squamous, styloid, mastoid and petrous portions. His is the first clear account we possess of the number and situation of the vertebræ, which he divides into cervical, dorsal and lumbar, and distinguishes from the sacrum and coccyx. He informs us that human osteology may always be studied with facility at the great public school of medicine in Alexandria, in Egypt; that the teachers of anatomy had long been accustomed to prepare human skeletons for the illustration of their lectures. He adds, that it will richly repay the trouble of any one to go to that city for the sole purpose of studying human osteology. The frontispiece of Cheselden's magnificent folio (*Osteographia*, or the anatomy of the bones, London, 1773) is a full-page steel engraving, representing "Galen contemplating the skeleton of a robber who, being killed by a traveller, had his bones picked in two days by vultures."

Galen's plan for the study of anatomy seems to have been that the student should first pursue a course of comparative anatomy, dissecting those animals most nearly allied to the structure of man, as the different species of monkeys, apes, etc. When speaking of the structure of the liver, he refers to such preliminary studies, and announces his intention of preparing a systematic treatise on comparative anatomy. "I do not propose enumerating here the number of lobes which compose the livers of other animals, because I have not, as

yet, described the particular structure of any of their organs, except in a few passages in which I have been obliged to do so in order to illustrate what I have to say concerning man. If I live, however, I shall, at some time or other, describe the structure of the bodies of beasts, and furnish an exact anatomy of all their parts, as I have now done with respect to the various parts of the human body." Certainly, this does not look as if Galen had derived all his anatomical knowledge from dissecting the lower animals, and that he had never dissected the human cadaver, as has been frequently alleged. The following is an additional proof of his study of human anatomy: "It is not strange that they were deceived, since they only dissected the hearts and tongues of oxen; never considering that those parts are different in other animals from what they are in men."

Another method of acquiring anatomical knowledge which Galen recommends, is what may be termed fortuitous anatomy, which was the only mode tolerated by the Empiric school—viz.: such accidental opportunities as occasionally present themselves, and of which he availed himself a number of times in the course of his pedestrian tours, and which furnished the subject for Cheselden's frontispiece above alluded to. The following is Galen's own account of his personal experiences: "I have often," he observes, "examined human bones when decayed tombs or monuments have fallen in my way. A sepulchre, slightly built on the brink of a stream, having suffered from the violence of the torrent which had overflowed it, the body, carried away by the force of the current, stopped at last in a kind of a harbor bounded by pretty high banks. I had an opportunity of seeing this body, the flesh of which was already rotten, although the bones still adhered to each other, so that it resembled a skeleton prepared for the use of the student. At another time I saw the body of a robber lying on a mountain remote from any public road. He had been killed by a traveler whom he

attacked, and the inhabitants of the vicinity, conceiving so wicked a man a proper prey for the vultures, refused him the rights of sepulture; and two days after his bones were stripped of their flesh, and dry like those prepared for students."

In myology Galen made great advances on what was previously known. He was the first to study the muscles systematically, and to classify them according to their functions —a method which has continued in use to the present time. Previous to his investigations much confusion existed as to what constituted a single muscle; he adopted the general rule of considering each bundle of fibres that terminate in an independent tendon to be one muscle. He was the first to describe and give names to the platysma myoides, the sterno and thyro-hyoides, and the popliteal. He described the six muscles of the eye, two muscles of the eyelids, and four pairs of muscles of the lower jaw—the temporal to raise, the masseter to draw to one side, and two depressors, corresponding to the digastric and internal pterygoid muscles. He described also the brachialis anticus, the biceps flexor cubiti, the sphincter and levator ani, and the straight and oblique muscles of the abdomen. In short, he described the greater portion of the muscles of the body, his treatise differing chiefly from a modern one in the minute account of these organs and in the omission of some of the smaller muscles.

In the nervous system we have already seen that his researches were quite extensive. Galen made careful dissections of the brain, made many discoveries and gave names to many parts, which are still retained; among others, to the corpus callosum, the septum lucidum, the fornix, and the corpora quadrigemina. He gave the old world the erroneous dogma that the nerves of sensation are derived from the brain, and those of motion from the spinal cord. To some nerves he assigns both sentient and motor power. He de-

nied the decussation of the optic nerves, but admitted their junction at the commissure. He describes the par vagum and its connection with the sympathetic. He conceives that the soul is resident in the brain, and that sensation and the power of motion originate in this organ. He enumerates seven pairs of cerebral nerves, the same as are now admitted except the sympathetic and the external motor of the orbit; thirty pairs of spinal nerves, which he divides into four classes—viz.: eight cervical, twelve dorsal, five lumbar, and five sacral. He did not know that each had a double origin from the anterior and posterior columns of the spinal marrow. He claims to have discovered the ganglions of the nervous system. "Nature," he says, "has done an admirable thing, of which all anatomists, to the present time, were ignorant. When she conducts for a long distance a fine nerve, or one is destined to excite violent muscular movements, she locates a little mass on its track that resembles it in structure. Seen externally, this body appears to rest upon and surround the nerve; but when it is dissected, its substance is found to be in continuity with the nerve combining with its structure and resembling it in every particular. It is by means of this substance, which resembles a ganglion, that nerves augment in size." (*De usu partium.*)

Galen referred the degree of intelligence possessed by an individual rather to a just temperament of the body than to the complicated form or structure of any part of it. He observes that an unusually small or a remarkably large head are never accompanied by great talents. When, however, a large head corresponds with the just symmetry of nature, the latter rule does not hold; he then adds that Pericles furnished an example of such an exception. Galen did not refer all mental action and emotion to the brain; for while he considered it the seat of the rational mind, he regarded the heart to be the seat of courage and the angry passions, and the liver to be the seat of desire.

Very small, indeed, were the additions or corrections which were made to the anatomy and physiology of Galen for many centuries after the period in which he flourished. His doctrines were accepted without being questioned down to the beginning of the sixteenth century, when Vesalius entered so zealously into practical anatomy, and dissected the human body with so much care. Vesalius having found some of Galen's descriptions not to correspond with human anatomy, but much more closely with the structure of parts in apes and other lower animals, and, notably, that this discrepancy pertained to some of the tissues of the eye, he therefore at once concluded that Galen and his contemporaries must have derived their anatomical knowledge from the mere dissection of brutes. Vesalius was severely critical and unsparing in his derision of Galen. In the first edition of his grand work on anatomy (1543) Vesalius animadverted upon what he believed to be the errors of Galen to such an extent that eight folio columns of his index are entirely taken up by references to these corrections; and in the second edition of this magnificent work (1555) no less than twelve long columns of the index repeats the name of Galen hundreds of times. And yet Galen was not as erroneous as Vesalius supposed him to be. Among the defenders of Galen were Andreas Laurentius, Jacobus Sylvius, and Joannes Riolanus, of Paris. With such opponents it is not strange that the disputations were not of the milder sort, but ran high and hot. It was the effervescence of a revolutionary and reactionary fermentation between the advocates of ancient authority and the investigators of progressive science. This was the beginning of the great medical reformation.

Vesalius wrote an entire volume of annotations on Galen, which in a fit of vexation he committed with some other manuscripts to the flames. Perhaps it is just as well for the world that they were never published.

[To be Concluded.]

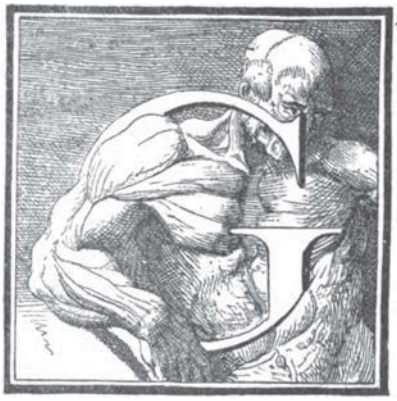
HISTORICAL AND BIBLIOGRAPHICAL NOTES.

A SERIES OF SKETCHES OF THE LIVES, TIMES AND WORKS OF THE OLD MASTERS OF ANATOMY AND SURGERY.

By GEORGE JACKSON FISHER, M. D.

XV.—CLAUDIUS GALENUS (Concluded).

A. D. 130—200.



GALEN'S surgical writings have not been as highly esteemed as those of Hippocrates, Celsus, and some others. He practiced surgery in his native city of Pergamus, but when he resided in Rome he appears to have followed the custom of the physicians of that city, and to have abstained from surgical practice. He, however, wrote commentaries on the surgery of Hippocrates—on fractures, dislocations, bandaging, etc. He suggested improved methods in the treatment of injuries of the nerves. He applied the trephine successfully to the sternum for evacuating the contents of an abscess behind that bone. On four occasions he treated anterior luxations of the femur; twice he cured what was supposed to be spontaneous luxation of that bone. He op-

posed the use of caustics and the cautery, which were employed so freely and were so much abused in ancient times. Galen was a copious blood-letter, a practice which he perhaps carried to excess, as he admits having taken no less than fifty ounces from one patient in a single day. Besides venesection and arteriotomy he employed cupping, but did not approve of the use of leeches; which, by the way, were first introduced into practice by Themison, and freely used by the Methodic sect.

In a neat little article of about half a dozen pages by Dr. Thos. K. Chambers, "The Blood-letting Question in Olden Times." (*Brit. and For. Med. Chir. Rev.*, vol. xxii. p. 475, 1858) is discussed, and some very interesting extracts from the works of Galen relating to this subject therein given. From this article I will furnish the reader with the following discourse of Galen, which illustrates not only his easy and familiar style, but also the opposition of the Romans to blood-letting, which was founded solely on the authority of Erasistratus, who had then been dead more than four hundred years.

Dr. Chambers says: "Let us, then, fancy ourselves in the metropolis of the world, prosperous and glorious under the rule of the Antonines, in the latter half of the second century, and let us hear Claudius Galen lecture the public in his pleasant chatty style 'Against certain Erasistrateans.' (*Kühn's Galen*, vol. xi, p. 187.)

"When I first came to Rome[1] I found some physicians who were so averse to venesection that sometimes when a man was scarce able to breathe from congestion they would not employ this treatment. There was a woman, just under twenty-one, who, after suppression of the catemenia, had a flushed face, with loose cough and dyspnœa, whom they treated by bandaging the limbs and depriving her entirely

[1] Viz., in the thirty-fourth year of his age, A. D. 165.

of food; but they would neither open a vein nor let me do so. And on account of their being acquaintances of the woman's household and senior practitioners, more faith was had in their opinion than in mine. I made no more attempts to persuade them to bleed, but I asked if there was any objection to set up a derivation of blood towards the uterus by means of drugs calculated for that object. And when they consented I immediately got the midwife usually employed by the patient and desired her to use them. But she said she had already applied remedies of this sort at the proper time—namely, when the catemenia might normally be expected; and she named the drugs—all of tried efficacy—which she had administered to the woman, so that no one could suppose that it was from the inefficiency of these medicines that relief had failed to be given. When I heard this, and moreover that the menses had been already suppressed four months, I had another consultation with the medical men to try and persuade them to bleed. When they refused, I wondered why, if they were anxious to evacuate the superfluous blood through the uterus by opening the mouths of the numerous veins there, yet they should think the evacuation injurious when it was made by opening any other vein. They stated that superfluous blood could be evacuated by fasting alone, without having recourse to treatment such as I proposed. So I held my tongue and took my leave in despair about the woman on account of the cough and dyspnœa. I expected that she would either spit blood from the chest or from the lungs by the bursting of a blood-vessel, or would have laryngitis, or pleurisy, or pneumonia; and my hope was, as a choice of evils, that she would have pleurisy, for I was afraid, in case of laryngitis and pneumonia, that the risk would be imminent, and that in case of hæmoptysis that the occurrence of it would be fatal. And such turned out to be the result. For as she was coughing very violently

blood was thrown up. And now some non-professional persons complained of the doctors who opposed the bleeding, and hopes were expressed that now at least, though not before, they would be shamed into permitting the treatment. When they would not give way, but desired the bandages round the limbs to be tightened, and persisted in the attempt at derivation towards the uterus, and in continuing the starvation, I took my leave, persuaded that I could effect nothing on account of the gentlemen's age and celebrity. And very shortly afterwards the patient was seized with an incurable difficulty of breathing, and died.

"Under the hands of the same physicians who opposed bleeding there also died several patients with laryngitis. And there was another patient, too, who through the whole Winter had been living high and taking no exercise, and in the Spring was as red in the eyes and face as a man kept for a long time with head on the ground and his legs in the air, and he died suffocated after five days' illness.

"Next there was a fourth patient—a woman—who was ill at the same time that the catamenia were suddenly stopped, whom those enemies to bleeding brought to death's door. They kept her for three days absolutely without food, because she had a continued fever; on the fourth day they gave her the smallest possible quantity of slops; on the fifth day they ordered fasting again, and then she got violently delirious, jumped up and ran screaming about out of doors, and the attendants had great difficulty in restraining her violence. She, however, was saved by nature through a copious effusion of blood from the nostrils.

"This was a circumstance which should excite our admiration and, at the same time, teach us what a powerful influence blood-letting has in such affections, for immediately after the hæmorrhage from the nostrils the woman was freed from all her symptoms.

"Now, previously to this, I had shunned having any communication with the medical men, guessing what they would say against the use of venesection. But since it was so very clear to all that the woman's life was saved by the evacuation of the blood, I recalled to their memory the fatal cases, expressing an opinion that perhaps those, too, would have been saved if they had been bled. And I gave sundry reasons for it. But these gentlemen involved the matter in a maze of words; twisting the argument round and round and up and down, and coming to no conclusion. However, they at last ended by taking refuge in Erasistratus, stating that it was shown by him in his First Book on Loss of Blood that it was better to apply ligatures to the limbs than to bleed."

The works of Galen have never been translated into any modern language. The only English translation of any part of Galen's works of which I have any knowledge, is that by Thomas Gale under the following title: "Certaine Workes of Galens, called Methodus Medendi, with a briefe Declaration of the worthie Art of Medicine, the Office of a Chirurgion, and an Epitome of the third booke of Galen, of Naturall Faculties: all translated into English by Thomas Gale, Maister in Chirurgerie. At London. Printed by Thomas East, dwelling betweene Paules Wharfe and Baynards Castle. 1586." These embrace the third, fourth, fifth and sixth books of the *Methodus Medendi* and *De Tumoribus Præter Naturam*. Besides these, Gale translated the third "booke of Galen of the Composition of Medicines," and also "The fourth booke of the Theraperticke of Claude Galen, Prince of Phisicke." These were published by East, at London, 1579, together with "Guydo, his Questionaries of Chyrurgerie," and some other surgical works translated by Gale. They are in small quartos, printed in black-letter. I esteem my copies among my most valuable curiosities of rare old medical literature.

The work of J. Redman Coxe, "The Writings of Hippoc-

rates and Galen, epitomized from the original Latin translations" (Phil., 1846, 8°, pp. 681), is not a translation of any portion of the works of Galen; it consists of little more than a brief analysis of the general contents of the several Galenic treatises, and yet it is a valuable work for reference.

The Greek text has been published four times—twice alone, and twice with a Latin translation. The first edition was the Aldine, published at Venice in 1525, in five folio volumes, which contain an aggregate of over three thousand pages (1514 folios of 58 lines each). It was ably edited by Jo. Bapt. Opizo, and yet it is not without numerous errors and omissions, as is almost unavoidable in so large a work. It contains the Greek text without translation, notes or indices. The writer prides himself in the possession of a fine copy of this, the *Editio Princeps*, which is not only quite rare, but is an exceedingly handsome book, and one of the choicest specimens of the splendid Greek typography for which the Aldine press, in the early part of the sixteenth century, was so famous.

The next Greek edition was published in 1538, Basil, apud Andr. Cratandum, in five volumes folio, edited by L. Camerarius, L. Fuchs and H. Gemusæus. This edition is improved by the collation of Greek MSS. and the comparison of the Latin versions. It is also a very handsome edition.

The third Greek edition is that of René Chartier, and is one undertaken and carried out on such a magnificent scale that I feel disposed to devote a few lines to an account of it. It was published in connection with the works of Hippocrates, in thirteen huge folios, double columns; one being the Greek text, the other the Latin translation. The entire works occupy over eight thousand pages (8,082). It was published at Paris, and was forty years in passing through the press. The first volume was issued in 1638, the last in 1679. This stupendous work was undertaken by Chartier, a

French physician, when he was already over sixty years of age. After having edited ten volumes, and having impoverished himself in their publication, he died in 1654. Blondel and Le Moine edited the three remaining volumes, which have the imprint of 1679. The last four volumes were published at the expense of Chartier's son-in-law. This edition is, in every respect, superior to the preceding ones, and, in some respects, to that which followed it. There has never been but one edition of Chartier's Hippocrates and Galen; the dates and title-pages have been changed to suit the booksellers. The volumes of my copy bear various dates, some of which have been pasted over others—as 1679 over 1638, etc.

The last and most convenient edition is that of C. G. Kühn, in twenty octavo volumes (in twenty-two parts), Greek and Latin, Leipzig, 1821–1833. Not only did Kühn propose to furnish the world with an improved edition of the works of Galen, but he had the enthusiasm to conceive the immense undertaking of editing complete series of editions of the extant works of all the Greek medical writers. He was already sixty-four years of age when he began this enterprise, and he succeeded in editing not only Galen's works, but also those of Hippocrates, Aretæus and Dioscorides. Dr. Wm. A. Greenhill, the very learned English scholar of ancient medical literature (Art. *Galenus*, in *Smith's Dict. of Greek and Roman Biog. and Mythol.*, vol. ii, London, 1873), after noticing the above editions of Galen, observes: "Upon the whole the writings of Galen are still in a very corrupt and unsatisfactory state, and it is universally acknowledged that a new and critical edition is much wanted."

According to Choulant (*Handb. der Bücherkunde für die aeltere Medicin*) one Latin version of all Galen's works was published in the fifteenth century, twenty (or twenty-two) in the sixteenth, and none since.

Galen's works were first published in a Latin translation by *Philipp. Pintium de Caneto*, 2 vols., folio, *Venet.*, 1490. It is in black-letter, and extremely scarce. The next Latin edition was from the press of the *Juntas*, fol., *Venet.*, 1541, which was reprinted with additions and improvements eight (or nine) times within one hundred years. The most valuable of these are said to be those of 1586, 1597, 1600, 1609 and 1625, in five volumes. Another good Latin edition was published by *Froben*, fol., in nine vols.; *Basil*, 1542, and in 1549 and 1561; the last is considered to be the best. The last Latin edition is that published by *Vinc. Valgrisius*, fol., 5 vols., *Venet.*, 1562.

The octavo edition, "Venetus Ex Officina Farrea, Anno. MDXLV," is illustrated with a large number of quaint wood engravings, exhibiting a great variety of apparatus for the reduction of fractures and dislocations, and the ancient system of bandaging. In these pictures we see the patients, the surgeons and the assistants. Some of the patients are stretched on beds, while others are hanging over doors and ladders. In one place we see the process of reducing dislocation of the shoulder-joint by the heel in the axilla; and, altogether, these engravings, made over three and one-third centuries ago, afford us a vivid impression of ancient practical surgery. The bibliography of Galen's works and the separate treatises, is too extensive to be embraced in an article of this character, and hence I refer the reader to Haller. *Bibliotheca Med. Pract.*, Eloy. *Dict. Hist. de la Med. Anc. et Mod.*, Dezeimeris, Portal and other medical bibliographers.

The following are the chief authorities which have been consulted in the preparation of this article: *J. Kidd. A cursory analysis of the works of Galen, so far as they relate to anatomy and physiology*, in *Trans. of the Provin. Med. and Surg. Assoc.*, vol. vi, 1837. *Thompson.* Arts. "Anatomy and Galen," *Encyclop. Britt.*, ninth ed. *Greenhill.* Art. "Galenus," *Smith's Dict. of Gr. and Roman Biog. and Myth., Lond.*, 1873. *Watson. Med. Prof. in Ancient Times, N. Y.*, 1856. *Renouard's, Meryon's, Moir's* and other Histories of Medicine. *Coxe. The writings of Hippocrates and Galen epitomized, etc.*, 8°, *Phila.*, 1846.