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Fisher (G. J.)

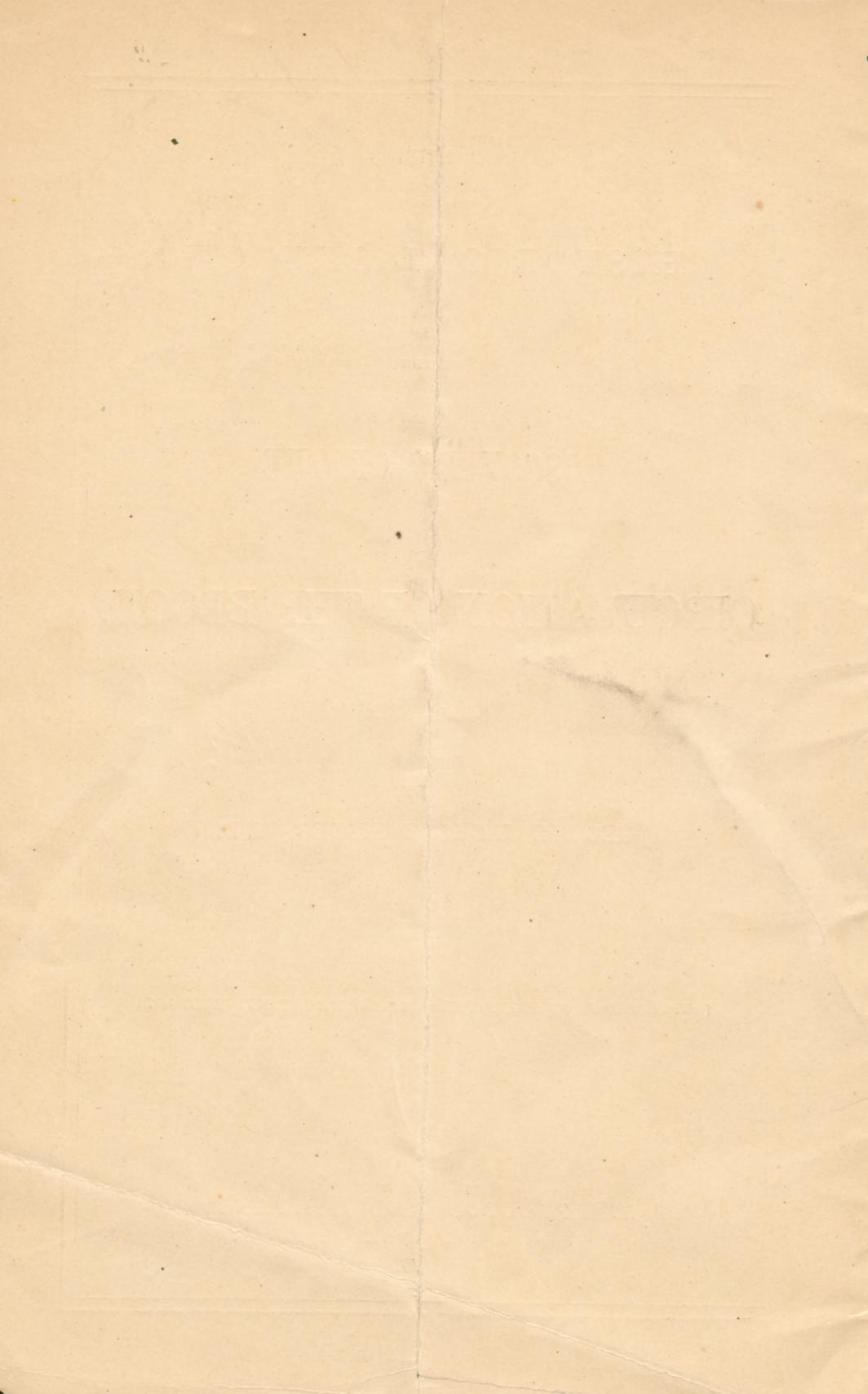
A BRIEF
HISTORICAL SKETCH
OF THE
DISCOVERY OF THE
CIRCULATION OF THE BLOOD.

BY
GEORGE JACKSON FISHER, M. D.



[REPRINTED FROM THE POPULAR SCIENCE MONTHLY, JULY, 1877.]

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A BRIEF HISTORICAL SKETCH OF THE DISCOVERY OF THE CIRCULATION OF THE BLOOD.

AMONG the great discoveries which the genius and patient research of man have developed, none lay us under more grateful obligations, in view of its practical value and admirable simplicity, than that of the circulation of the blood. Historians record the rise, progress, and decline of nations, the discovery of new countries, and the exploits of conquering heroes, and yet pass almost unnoticed the achievements of men of science. Few persons are at all acquainted with the history of when and how, through a series of successive revelations, this truly wonderful function came to be thoroughly understood. It is a long and delightful story if followed through all its details, which I shall, however, endeavor to cut short in relating it to persons outside of the medical profession. We are obliged to glance back through several centuries and make the acquaintance of nearly a score of anatomical celebrities, who have each contributed some observation or discovery leading to the final comprehension and complete interpretation of God's beautiful but simple method of circulating the vital fluid and keeping it ever replenished and pure.

The pathway to the climax of this discovery was not only long but rugged, hedged in by deeply-rooted errors, and obscured by rank prejudices ancient and wide-spread. The errors must be destroyed, the clouds dispelled, parts carefully observed; the explorers must work slowly and cautiously, and what is discovered must be explained. Thus it came to pass that anatomists discovered one thing after another, and little by little the light of truth dawned upon their minds, wherewith they saw and gave the world sensible ideas of the uses of parts, when eventually "the immortal Harvey," the crowning light, the clear-headed philosopher, the Newton of physiology, drew the simple chart of the double circulation. This event took place two

hundred and fifty-seven years ago, for it was in 1619 that Harvey completed the discovery. He made no haste to tell the world what he had done, except what the individuals of his classes learned from his lectures, for he taught his discoveries ten full years before he published his modest but wonderful little book "Concerning the Motion of the Heart and Blood in Living Creatures," printed in Latin at Frankfort-on-the-Main, in a thin quarto of only seventy-two pages, in the year of grace 1628.

I propose to give a brief account of the antecedent errors and discoveries to the time of Harvey—that of Erasistratus, who taught that the arteries were air-vessels; of Galen, who demonstrated that they are blood-vessels as well as the veins; of Vesalius, who convinced the world that Galen erred in declaring that holes existed in the partition between the two sides of the heart; of Servetus, Columbus, and Cæsalpinus, who, quite independently of each other, discovered the circulation through the lungs; of Fabricius, who discovered the valves in the veins; of Harvey, who first comprehended the entire circulation; of Asellius, who discovered the lacteals; Pequet, the receptacle of the chyle; Rudbeck, the lymphatics of the liver; and, lastly, of Thomas Bartholin, who discovered the lymphatics of the whole body.

ERASISTRATUS (300–260 B. C.), a Greek physician and anatomist, of Iulis (the modern Zea), in the island of Ceos, was the grandson of the illustrious Aristotle, being the son of one of his daughters. It is said that he was so fond of anatomical pursuits that he retired from his practice in Alexandria, where he had settled, the better to gratify his taste. He wrote several treatises which are lost, and all we possess of his writings are a few fragments preserved in the works of Galen. From these we learn that he gave names to the auricles of the heart. He declared that the veins only were blood-vessels, and that the arteries, as their name implies, were air-vessels. The sole purpose of breathing was to fill the arteries with air; the air distended the arteries and made them beat, the air caused the pulse. The air, once in the left ventricle of the heart, became the vital spirits. The office of the veins was to convey blood to the extremities. When the veins carried blood only and the arteries were filled with vital spirits, then perfect health was maintained; but the entrance of blood into the arteries, which he admitted to sometimes occur, was abnormal and the source of disease—fevers when it entered some noble part or into a great artery, and inflammations when it was found in the less noble parts or in the extremities of the arteries. Thus it is seen that a stupendous error was established on a mighty authority. This error was destroyed by Galen four hundred years subsequently to the time of Erasistratus.

CLAUDIUS GALEN (A. D. 131), next to Hippocrates the most celebrated physician the world ever produced, was born at Pergamus, in

Asia Minor, about the year of our Lord 131, and educated in anatomy and medicine at Alexandria, then the most famous school in the world. At the age of thirty-four he settled at Rome, where he distinguished himself as a skillful practitioner, and became the physician to the Emperor Marcus Aurelius. The period of his death is not known, but it is stated that he was still living in the reign of Septimius Severus. Galen was a voluminous writer. A considerable number of his works are lost, and yet eighty-two treatises, more or less complete, survive and are in print. The writer of this sketch felicitates himself in the possession of a fine copy of the "Editio Princeps," in five ponderous folios, printed in Greek, by the celebrated Aldine press, at Venice, 1525. For a period of nearly fourteen centuries this vast mass—more voluminous than the entire Bible—was copied and recopied with the pens of scribes! Who can duly appreciate the value of the press? Galen proved that the arteries are blood-vessels, and thus destroyed the error of Erasistratus. He said, when an artery is opened, blood alone gushes out and no air. He tied an artery at two places a little distance apart, and on opening the vessel found it filled with blood only. The followers of Erasistratus wanted to know how the air from the lungs entered all parts of the body, to whom Galen replied that the air entered the lungs to cool the blood, after which it was expelled. This theory was held so late as the last century, even by the renowned physiologist Albrecht von Haller. Galen declared the pulse to be the dilatation of the artery by the contraction of the heart, which is the truth.

Galen also taught that there are two kinds of blood, the *spiritual* blood of the arteries and left ventricle, and the *venous* blood of the right side of the heart and veins, the red and the black blood. These were great strides in the right direction, and yet this wonderful genius was the author of some grave errors. He believed it necessary that a certain portion of spirit should be mixed with the venous blood to render it fit for nutrition, and this he conceived took place by the transmission of arterial blood through little holes in the ventricular septum which he called "foramina." He taught that the arterial blood nourished organs of a light and delicate texture such as the lungs, while the venous blood nourished the grosser organs, such as the liver.

The early modern anatomists believed the septum was perforated, and saw with the eyes of faith the "foramina" on account of their unquestioning confidence in the infallibility of Galen as an authority. Mondinus, who flourished in the fourteenth century, the first anatomical writer after Galen, said the septum was perforated, and twenty others reiterated it.

Berrenger de Carpi, who wrote and published his anatomical work in 1521, was the first to waver, and say that the openings in the septum *were only to be seen with difficulty.*

That I may pass no one who has been credited by any writer with even the least knowledge of the circulation, or who has even hinted a better understanding of it than those already mentioned, I come next in the order of time to NEMESIUS, who was Bishop of Emissa, a city of Phœnicia, at the latter end of the fourth century. He was not properly a medical writer, though he wrote a treatise concerning the "Nature of Man." The editor of the Oxford edition of this work (1671) contends that Nemesius understood and described the circulation of the blood in plain terms; while Dr. Freind, in his "History of Physic," denies that he had anything more than a vague notion of this function. I copy the words of Nemesius as translated by Freind for the benefit of the curious:

"The motion of the pulse takes its rise from the heart, and chiefly from the left ventricle of it; the artery is with great vehemence dilated and contracted, by a sort of constant harmony and order. While it is dilated, it draws the thinner part of the blood from the next veins, the exhalation or vapor of which blood is made the aliment for the vital spirit. But, while it is contracted, it exhales whatever fumes it has through the whole body, and by secret passages. So that the heart throws out whatever is fuliginous, through the mouth and the nose by expiration."

Thus it appears that Nemesius had a little insight of the circulation 1,500 years ago, yet so imperfect that he neither comprehended it himself nor made it understood by any who followed him.

ANDREAS VESALIUS, OF BRUSSELS.—The next great actor on the stage, comes the renowned Vesalius, the Luther of anatomy, the bold and defiant reformer, who, by persevering diligence and pains-taking observation, corrected the numerous errors of all his predecessors, and notably those of Galen. This wonderful young man, before he attained the age of thirty, published the most extensive, accurate, and in every sense the most magnificent work on human anatomy the world ever saw; wealth was lavished on its illustration and sumptuous publication. Jan Stephan van Calcar, the favorite pupil and wonderful imitator of the world-renowned Titian (not Titian himself, as some have declared), was employed to design anatomical figures, and the best engravers cut them in wood to adorn that massive and splendid old folio—that *opus magnum*, which was published in Basel, in the year 1543, three and a third centuries ago.

It is the delight of the medical bibliomaniac to procure a good copy of this rare book. The writer of this essay sought vigilantly for a score of years, failing to secure it until quite recently, and then from the library of a deceased friend, who was an ardent lover of the medical classics. He too had sought in vain for this book, and at last, after long rummaging the dusty and mouldy antiquarian book-stalls of many an ancient city in Europe, laid his hands upon a fine copy of the "Corporis Humani Fabrica," which he ever after regarded as the gem of his collection, as it certainly now is (almost sacred by melan-

choly association) the greatest treasure of my own. I wish we had time to stop just here, that I might give you a sketch of the life of Vesalius. Henry Morley, Professor of English Literature in the University of London, has written a lively and lovely little biography of this great anatomist, which is far more fascinating than any romance.

The great Vesalius, justly styled "the father of modern anatomy," subjected the septum, between the right and left cavities of the heart, to a thorough scrutiny, and found that no holes existed in it, and then had the boldness to declare the truth in spite of the previously unquestioned authority of Galen, whose writings were sacred in the estimation of all physicians. Thenceforth anatomists ceased to believe and teach this great error which Vesalius dispelled and swept away, and thus it came to pass that the second great step was taken toward the discovery of the circulation of the blood.

On the 27th day of October, in the year 1553, on a hill not far from the old Swiss city of Geneva, could be seen a motley gathering of anxious and excited men, women, and children, and among them a goodly number of learned doctors of divinity, chiefly Protestants, conspicuous among whom was John Calvin, all assembled to witness a scene of extreme horror. There stood, lashed to a post, a scholar past forty years of age, who in his time had imbued himself in the learning of three professions—law, divinity, and medicine. Of his attainments in jurisprudence I know nothing; of his anatomical and physiological knowledge I will say more anon, merely premising that it was truly marvelous and in advance of the times; in theology, according to the opinion of Calvin and others, he was a heretic, since he entertained antitrinitarian notions. He had written two books, the respective titles of which are, "De Trinitatis Erroribus" (1531) and "De Christianismi Restitutio" (1533), which latter he had the frankness to send to Calvin for corrections and suggestions. Calvin denounced it promptly to Cardinal Tournon as heretical, whereupon the cardinal laughed heartily at one heretic accusing another. It has been said, and it is to be feared with too much truth, that John Calvin was stirred not so much with holy zeal or fanaticism as by hate, as he had received a letter from this medico-legal theologian, now tied to the stake, awaiting the horrid tortures, and death, by slow fires about to be kindled at his feet, which letter animadverted, perhaps not very sweetly, upon the errors and absurdities of Calvin's "Institutes." This letter, be it understood, was in reply to a violent one which Calvin had written to this poor victim concerning his opinions. Time will not allow me to tell the whole story of how Calvin vindictively threatened him, and drew up thirty-eight articles of accusation against him, and how the poor, unfortunate man fled and disguised himself, and was subsequently arrested and tried by a grave council of sixty, who, after deliberating three full

days on his heresy and the degree of punishment to be inflicted, fixed upon a heavy fine, and death by slow, torturing fires; and that all his manuscripts and copies of his works were to be burned with him and to furnish a part of the fuel with which to execute this fiendish sentence. Yet so it came to pass that this unfortunate scholar expiated his crime of heterodoxy in this tragical manner, and so effectually was the order for the burning of his works carried out, that only a single copy of one of his books is now believed to be in existence, and that is not a little scorched by fire.

You may wonder who this poor victim was, and why he is introduced here in a sketch of the history of the discovery of the circulation of the blood.

It was MICHAEL SERVETUS, whose Spanish name was Miguel Servete, born in the year 1509, at Villanueva, in Aragon near Saragossa, in Spain. He was educated, as before hinted, in three professions, in jurisprudence and theology in the University of Toulouse, in medicine at Paris. He practised as a physician, and wrote at least one medical treatise. He also wrote, most unfortunately, two theological books, one an abstruse metaphysical work, already alluded to, "The Restitution of Christianity," which, though it ended in his ruin, contained words and ideas which have immortalized his name. Of this wonderful book a copy exists in the Bibliothèque Impériale at Paris, of which M. Flourens, Perpetual Secretary of the Academy of Sciences, proudly says, "I have seen, I have touched, the book of Servetus!" He then goes on to state that it is perhaps the only copy now in existence; that it belonged to Colladon, one of the accusers raised up by the pitiless Calvin against the unfortunate Servetus; that this copy formerly belonged to the celebrated English physician Dr. Richard Mead, and was afterward purchased by the Royal Library of France at a very high price. In it, says Flourens, Colladon has underscored the passages upon which he accused Servetus; and that, finally, as a last mark of undeniable authority, several pages of this unlucky volume are scorched and blackened by fire. It was not saved from the pile where author and work were burned together until after the conflagration had commenced.

In this rare book is contained the first account ever written of the pulmonary circulation. I will not stop to quote the exact words as I have them in translation, but will briefly state that, in plain and unmistakable language, he declares that all the blood is sent by the contraction of the heart from the right ventricle through the pulmonary artery into the lungs, where it is changed from dark to red in color by the atmospheric air, and thence returned to the left side of the heart through the pulmonary veins—which is strictly true. Servetus denied the old doctrine of Galen, that the liver was the seat of sanguification, and declared it to be the lungs.

Thus it is seen that, long before the day of Harvey, there was a

man of genius occupied with this great subject of the circulation of the blood, and that man was Michael Servetus.

I will add but a word to this sketch, already too long, in explanation of the occurrence of these physiological considerations in a metaphysical treatise of this kind. Servetus was discussing the Scriptural assertion that the soul is in the blood, that the soul is the blood itself; and hence, as Flourens states the case, "‘Since the soul is in the blood,’ says Servetus, ‘to know how the soul is formed it is necessary to know how the blood is formed; and, to learn this, we must see how it moves.’”

But Servetus was not equally clear in his views of the general or systemic circulation. "He speaks confidently of the nerves being continuations of the arteries, and describes, with grave precision, how the air passes from the nose into the ventricles of the brain, and how the devil takes the same route to lay siege to the soul."¹

REALDO COLUMBUS (1544-1577).—This celebrated anatomist, one of the best of that illustrious line which gave glory to the medical school of Padua in the sixteenth century, was a native of the city of Cremona, which is about fifty miles from Milan, in Italy. He flourished about the year 1544, and was a pupil of the renowned Vesalius. Columbus made several important discoveries and improvements in the knowledge of anatomy. He rediscovered the *pulmonary circulation* six years after Servetus's ill-fated book was printed, and unquestionably without any knowledge of what was in it; for it does not appear that the discovery by Servetus was known to the world, or produced any influence whatever upon any individual, owing to the character of the work in which it appeared, and to its thorough destruction by fire.

The description which Columbus gives of the circulation of the blood through the lungs is very complete, clear, and concise. "Between the two ventricles is the septum through which it is believed the blood passes from the right to the left; but this is a great mistake, for the blood is carried by the *arterial vein* into the lungs; thence it passes, with the air, by the *venous artery*, into the left ventricle of the heart, which no one has yet seen."

His work, "De Re Anatomica," was published in 1559. Columbus died in 1577.

ANDREAS CÆSALPINUS (1519-1603).—This third aspirant for the glory of discovering the pulmonary circulation was born at Arezzo, thirty-eight miles from Florence, Italy, about the year 1519. He was an eminent philosopher, a celebrated botanist, and a distinguished physiologist. He was for many years a professor at Pisa, and subsequently called to Rome, where he also professed, and received the appointment of first physician to Pope Clement VIII. He spent the last years of his life in Rome, where he died February 23, 1603.

¹ "Blackwood's Edinburgh Magazine, August, 1858, p. 151.

Error?
see dict.
encycl.

The great naturalist Linnæus styled Cæsalpinus the first systematic writer on botany, and followed his classification in many particulars, making it the basis of his own. The history of the physical sciences gives more than one example of the discovery of an important fact by two or more persons, in different places and at different dates, each without previous knowledge of what the other had observed. So do we find it in this instance. Cæsalpinus rediscovered the pulmonary circulation without knowing that both Servetus and Columbus had each previously and independently discovered the same, for he nowhere alludes to them; and he was too noble and honorable a man to bedeck himself with glories not his own.

Moreover, this man was the first who ever employed the felicitous and expressive words, "the circulation of the blood."

"This *circulation*," said he, "which carries the blood from the right heart through the lung into the left, corresponds perfectly with the disposition of the parts. For each ventricle has two vessels: one by which the blood arrives, and the other by which it departs. The vessel by which the blood arrives at the right ventricle is the *vena cava*; that by which it leaves is the *pulmonary artery*. The vessels which pour the blood into the left ventricle are the *pulmonary veins*; the vessel which affords it exit is the *aorta*."

No man can describe it more accurately. But Cæsalpinus did not stop here. He was the first and only one before Harvey who gave the world any idea of the circulation of the blood through the entire body. He pointed out the familiar fact that the veins swell below and not above the bandage tied around a limb, which demonstrated that veins return the blood to the heart and not toward the external parts of the body. He also says, "The blood conducted to the heart by the veins receives there its perfection, and, this perfection acquired, it is carried by the arteries to all parts of the body."

Certainly no man can describe the general circulation more concisely or better than this.

Thus it appears in evidence that, over half a century before Harvey's discovery, Andreas Cæsalpinus lifted the veil which concealed the mysteries of Nature, sufficiently to obtain quite a clear understanding of both the lesser and the greater circulation of the blood.

His countrymen are determined to proclaim his priority, and contest the claims of Harvey for the right to wear the laurels, as will appear from the following extract taken from a recent medical journal:¹

"A monument in honor of Andrea Cesalpino was unveiled in the University of Rome, October 30, 1876, with imposing ceremonies. The Italians claim for Cesalpino the merit of having discovered the circulation of the blood more than fifty years prior to Harvey's discovery. Dr. Giulio Ceradini, Professor of Physiology in the University of Genoa, seems to have been the orator of the

¹ NEW YORK MEDICAL JOURNAL, December, 1876, p. 667.

day, and he recommends that over the entrance of the Pisa school, where Cesalpino first taught his discovery, there be placed the following inscription: 'Andrea Cesalpino, of Arezzo, Lecturer on Medicine in the University of Pisa, after the correction of Galen's errors as to the function of the liver and the veins, discovered the circulation of the blood through the whole body, which circulation he made manifest by vivisections after ligatures had been applied to the veins, and which in his "Quistioni Peripatetiche" and "Quistioni Mediche," published in 1569 or 1593, using the word "circulation" itself, he fully described. Ill-advised was the English Harvey, who, in 1628, dared to arrogate to himself the discovery of this mighty truth.'

HIERONYMUS FABRICIUS AB AQUAPENDENTE (1537-1603).—Jerome Fabricius was very celebrated in his day. The republic of Venice settled upon him a yearly stipend of a thousand crowns in gold, and honored him with a statue and a golden chain; but his immortal honor consists in having discovered the valves of the veins, the anatomical proof of the circulation, and in having been the teacher of Harvey.

He discovered the valves of the veins in 1574. He saw that they open toward the heart, and that the blood could only move in that direction, the reverse of what takes place in the arteries, which have no valves. Fabricius saw the fact, but did not understand the proof it furnished that the blood moved in a continuous circuit.

The March and April numbers of the American reprint of the London *Lancet*, of 1877, contain two little articles, by Sampson Gamgee, entitled "Harvey and Cæsalpinus: an Historical Fragment," from which I learn that Prof. Ercolani, of Bologna, has brought forward another claim for the great honor of discovering the circulation, and has urged with so much erudition and persistence, on behalf of Carlo Ruini, that, *in memoriam*, a marble tablet adorns one of the halls of that ancient seat of learning. It would appear that Senator Ruini's work, "Anatomia del Cavallo," published at Bologna, in quarto, 1598, and at Venice, in folio, 1599, had but a limited circulation, and remained comparatively unknown. Dr. Gamgee says: "This marvelous passage, so far as I know, never attracted attention until my friend Prof. Ercolani set it forth, with justifiable national pride." I regret that Dr. Gamgee has not copied "this marvelous passage."

I will pass Fra Paolo Sarpi, theologian and anatomist, born at Venice in 1552; and La Vasseur, a disciple of James Sylvius, the very worthy master of Vesalius, and in turn his fiercest adversary—to both of whom has been attributed the honor of having discovered the circulation of the blood. Their claims rest on uncertain data, a critical examination of which would be out of place in an essay of so brief and popular a character as this; hence, having alluded to them, I will proceed to the so-called "immortal Harvey," on whom all English writers bestow the glory of having first discovered the circulation, and first published to the world the demonstrations of the great fact.

WILLIAM HARVEY (1578-1657).—I will be brief in my sketch of the crowning hero of the story of the circulation of the blood. William Harvey was born of a highly-respectable Kentish family, April 1, 1578—wanting one year of three centuries ago. Great men have chiefly come of superior and noble-minded mothers. I cannot pass the quaint and lovely moral portrait inscribed on the monumental tablet, in Folkestone Church, believed to have been written by Dr. Harvey himself:

“A. D. 1605, Nov. 8th, dyed in y^e 50th yeere of her age, JOAN, wife of THO. HARVEY. Mother of 7 Sones and 2 Daughters.

A Godly harmless Woman : A chaste loveing Wife :
 A charitable quiet Neighbour : A co'fortable friendly Matron :
 A p'ovident diligent Huswyfe : A careful te'der-hearted Mother.
 Deere to her Husband : Reverensd of her Children :
 Beloved of her Neighbours : Elected of God.
 Whose Soule Rest in Heaven : her Body in this Grave :
 To Her a Happy Advantage : to Hers an Unhappy Loss.”

This man, so noted in physiological science as to be generally spoken of as the immortal or the divine Harvey; occupied in his time many positions of trust and honor. He was physician to St. Bartholomew's Hospital, London; Professor of Anatomy to the College of Physicians; one of the physicians of King James I., and subsequently physician in ordinary to “the most illustrious and indomitable Prince Charles I., King of Great Britain, France, and Ireland, Defender of the Faith.” He was with this king at the battle of Edgehill. Much of his time was occupied in attendance at the royal court, and yet he found opportunity to follow the bent of his genius in anatomical and physiological researches.

Being wealthy, he remembered the necessities of his profession, and munificently bestowed money in the erection of a fine edifice for the College of Physicians, enriched it with a fine pathological museum and library, and endowed it with funds, wherewith, as a part of the bestowment, an annual oration is delivered for the advancement of medical science.

But to return to the subject under consideration: methinks I hear you ask, after the foregoing recital of what so many observers have discovered, “What remained for this great man Harvey to discover or explain?”

Dr. Rolleston¹ answers: “Nothing less than *the circulation itself*. His predecessors had but impinged, and that by guess-work, upon different segments of the circle, and then gone off at a tangent into outer darkness, while he worked, and proved, and demonstrated, round its entire periphery.”

True, as Flourens says, when Harvey appeared, everything relative to the circulation of the blood had been indicated or suspected; noth-

¹ “Harveian Oration” for 1873.

ing had been established. Servetus knew nothing of the general circulation; Columbus adhered to the Galenic error of the origin of the veins in the liver; Cæsalpinus, who perceived the two circulations, and came so near to comprehending them, still held belief in the error of perforations in the ventricular septum; and, lastly, Fabricius—who, by-the-way, was not the very first to discover valves in the blood-vessels, but who discovered more of them than any other observer, and wrote more and better than any of his predecessors—Fabricius, I say, did not understand the use of the valves, supposing them to be for the purpose of strengthening the veins and checking the too rapid flux of blood through them.

The medical historian Sprengel has cunningly remarked that nothing explains Harvey better than “his education at Padua,” under the teachings of Fabricius.

If it was a piece of good fortune for Harvey to enjoy the teachings of Fabricius, it was a happy thing, and a thrice fortunate thing, for the world, that the study of the circulation should have fallen into the hands of a man so well fitted to investigate it and to elaborate the true theory of the motion of the heart and blood.

Before Harvey, it was not known that the heart is the motive power—it was presumed to be the lungs; he it was who demonstrated every step in the progress of the blood in its double circuit, stilled all clamor of disputants, and convinced the world that he was right.

Let every man who has in any manner contributed to the final discovery have his just proportion of credit for what he has done, but let no man try to rob Harvey of the glory, which is rightfully his, of having perfected our knowledge of this wonderful function, modestly, lucidly, and with great forbearance and dignity, in view of the unkind opposition and even vindictive hatred which his teachings engendered.

John Aubrey,¹ who was at Harvey’s funeral, and “helpt to carry him into the vault,” tells us he had heard him (Harvey) say “that after his booke of the circulation of the blood came out, he fell mightily in his practice; ’twas believed by the vulgar that he was crack-brained, and all the physitians were against his opinion and envied him.”

I cannot follow the history of the opponents to Harvey’s new doctrines. I will mention a few of the most potent, beginning with Primrose, of Scotland; Parisanus, of Venice; Caspar Hoffmann, the learned and laborious professor of Nuremberg; Joannes Veslingius, professor at Padua; and end with Riolanus and Guy Patin, of Paris. Neither will time permit me to more than mention a few of the powerful defenders and promulgators of this new doctrine, as it was always called, among whom were Roger Drake, his own countryman; Werner Rolfink, professor at Jena; Renatus Descartes; Sir George

¹ Aubrey, “Lives of Eminent Persons,” 8vo, London, 1813.

Ent, his biographer; and Peter Dionis, who taught it in the *Jardin du Roi* by order of Louis XIV.—all praise be to this King of France.

Dionis says, "I was chosen to demonstrate in your royal garden the circulation of the blood and the new discoveries, and I acquitted myself of this duty with all the ardor and the exactitude which the orders of your majestie deserve."

All this looks as if the predecessors of Harvey had failed to discover or to teach the true motion of the heart and blood. It was twenty-three years after Harvey's publication that Italy, which now claims the entire credit of the discovery, admitted the truth of the new doctrine; and about the same time John Pecquet, of Dieppe, and Thomas Bartholin, the Dane, gave in their adhesion to the new doctrine, and spread it far and near in their writings. The victory was complete when Plempius, of Louvain, who had fought Descartes so valiantly, made the following retraction:

"This discovery did not please me at all at first, as I publicly testified both by word of mouth and in my writings; but, by-and-by, when I gave myself up with firmer purpose to refute and expose it, lo! I refute and expose myself, so convincing, not to say merely persuasive, are the arguments of the author; I examine the whole thing anew and with greater care, and, having at length made the dissection of a few live dogs, I find that all his statements are most true."

Harvey knew nothing of the capillary vessels; these were demonstrated by Marcellus Malpighius, who was born the very year that Harvey's work was published, 1628.

I will conclude my long story by merely mentioning the discoveries of the lacteals, the receptacle of the chyle, and the lymphatics.

Harvey discovered the circulation in 1619, and published it in 1628. Aselli discovered the lacteals in 1622; Pecquet the receptacle of the chyle in 1648; Rudbeck and Thomas Bartholin the lymphatics between 1650 and 1652. This was a glorious period indeed!

Thus it came to pass that the united labors of all these worthy men—and labors they were, and worthy men were they—resulted in giving the world a simple, clear, and satisfactory solution of the manner of the circulation of the nutrient fluids of the body.

Next all-fools-day will be the tercentenary of Harvey, when all Christendom ought to be interested in the justice of his claims to the glory of consummating a discovery of so much consequence to mankind. No mere national pride should bias the minds of men whereby memorials may be placed at Rome, Pisa, and Bologna, in rivalry with that which is to be erected at Folkestone, in England, to commemorate the time and place of Harvey's birth.

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