

Harvey and his claims as a discoverer : a lecture, delivered at Folkestone on the three-hundredth anniversary of his birth (April 1st, 1578) / by Robert C. Jenkins.

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HARVEY:

AND

HIS CLAIMS AS A DISCOVERER.

A Lecture,

DELIVERED AT FOLKESTONE ON THE THREE-HUNDREDTH ANNIVERSARY
OF HIS BIRTH (APRIL 1ST, 1578).

BY

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RECTOR OF LYMINGE,
AND HON. CANON OF CANTERBURY.



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HARVEY, AND HIS CLAIMS AS A DISCOVERER.

IN a well-known passage of the *Areopagitica* of Milton, the great poet describes the virgin form of Truth, perfect in the day of her first entrance into the world, as "hewn into a thousand pieces and scattered to the four winds". "From that time", he continues, "ever since, the sad friends of Truth, such as durst appear, imitating the careful search that Isis made for the mangled body of Osiris, went up and down gathering up limb by limb still as they could find them"; and he ends with the suggestive words "We have not found them all". These words, applicable as they are to all truth, are singularly applicable to the history of that great science from which the metaphor is itself derived. In the study of the human frame and its organic laws we have had from the earliest times many sad and anxious searchers after truth,—men who, contending against many prejudices and under great disadvantages, have ever kept in view the ultimate triumph of truth,—men, who, when they durst appear, feared not to stake their name and reputation, and even their life itself, on the fortunes of some great and rejected truth, the acquisition of years of ill-requited labour and of deep and lonely thought. One of the earliest of the precursors of Harvey in the great school of Padua, and in the study of the functions of the heart, Petrus Aponensis, after pursuing his anxious search till his eightieth year—the very age at which the life of Harvey ended so peaceably—was cited before the Tribunal of the Inquisition on a charge of practising magic, and died while the process was yet pending: his sentence being pronounced after death, and the burning of his effigy indicating sufficiently the terrible punishment which would have overtaken him had he lived to become, in its most painful sense, a martyr to medical truth. But great as are the claims upon our admiration of those early seekers who recovered the least fragment of truth out of the gripe of custom, or saved it from the suppression of prejudice, we must not place them on a level with those higher minds, which have from first principles, and independently of the assistance of any earlier explorer, solved the deepest and

most intricate problems of human life, and have left us such a record of their labours as to establish for ever to every rational mind the originality and independence of their work. All great discoveries may be said to have had a kind of prophetic anticipation, but, like most prophecies, these early presages of truth are neither noted nor understood until some perfect and final discovery throws back upon them its really underived light, and enables ingenious and, perhaps, captious minds to discern the glimmer of a great revealed truth in the dimness of the most ambiguous oracle. While truth is in conflict and controversy, no one thinks it worth while to claim it for any other author than the man who awakened the controversy and incurred the reproach of breaking through old traditions and the slavery of an established error. But no sooner is a truth freed from controversy and raised beyond the stormy region of doubt, than the very minds which before were most eagerly engaged in disputing it, devote themselves to the most ingenious and invidious inquiries into the history of the discovery—attributing to those who never claimed such a distinction for themselves, the priority of the invention, or at least the indication of the clue to it, and having in view the single object of depriving the conqueror in the finished warfare of the crown he had so justly won. This is eminently true in the case of Harvey and his grand discovery. While the truth was militant and “the vengeance”, not only of “antiquity” but of modern science, was invoked against it by its opponents,—while the innumerable devotees of Galen, marshalled by Parisinus, Plempius, Primerosius, Piso, and others, were almost hunting down the discoverer and denouncing his discovery, in the words of the last-named of these polemists, as “a novelty not only unknown to the ancients, but even falsely excogitated by modern writers”,—no one ventured even to hint that Harvey was not its first propounder. But when the truth was firmly established in the close of the seventeenth and the beginning of the eighteenth century, claimants were sought out from every age and place. The Book of Job itself, the writings of Aristotle, the *Timæus* of Plato, and countless other ancient sources, were explored by the envious critics, who, having failed to discover the truth, found their only revenge in endeavouring to deprive the real discoverers of it of the reward of their labours. Undoubtedly there were distant hints thrown out in the remotest periods of antiquity which, read in the light of the new discovery, seemed almost prophetic of the coming day; but until that daybreak came they were, like a yet greater dawn, the “light shining in darkness” and by the darkness “comprehended not”. Those who remember that the first principle of Harvey

was this—that the so-called “vital spirits” were inseparable from, and even identical with, the blood itself, and were no more to be distinguished from it than the flame from its heat, or the wine from the spirit it contains, will recognise yet an earlier light even than that of Plato and Aristotle, in the inspired words of Leviticus xvii, 2, “for the life of the flesh is in the blood”—and will rather wonder that so great a truth was not pursued and followed “as a light shining in a dark place” than be surprised at its even late recovery. But this wonder will be greatly lessened when they reflect on the almost insuperable obstacles which the study of surgery, or more strictly speaking, of pure anatomy, met with from its earliest days until the opening of the sixteenth century.

I. The first great obstacle was the universal and superstitious ignorance in which every class was plunged in regard to the nature and use of every organ of the human frame. Let me take as an instance, the comparison which we find in a paper written by King Edward VI, and doubtless inspired by his learned preceptor Sir John Cheke, between the frame of society in a commonwealth and the organisation of the human body. “As the arm”, he writes, “doth decoct no meat itself and engendereth no blood, therefore even *as the stomach, liver, and lights*, which parts engender the blood, *send nourishment to the arms and legs* sufficient to strengthen the parts, even so must the artificers, husbandmen, etc., so work that the hands and legs, that is to say, the states of gentlemen and serving men, may well do the commonwealth that service they ought to do”; and he argues further that the gentry ought not to draw too much from the peasantry, “for the arms and legs”, he adds, “do never draw the whole blood from the liver but leave it sufficient to work on, neither do they meddle with the engendering of the blood.” In this strange comparison the heart and the lungs are treated as ornamental superfluities. The frame of man is regarded simply as growing up like a plant from that very ancient and esteemed root of all human life, the liver, though, as Maimonides observed some four hundred years earlier, “the only internal organ of the human body which the Scriptures apply figuratively to God, is the Heart—because”, he adds, “it contains the principle of life.” (*Moreh Nevochim*, p. I, c. 46.) Now we must remember that this royal comparison was written little more than twenty-five years before the birth of Harvey, in order to appreciate fully the almost suddenness of the light which burst forth in his teaching.

II. The second great difficulty with which our discoverer had to contend was the prejudice against dissection, having its root

in a mistaken religious sentiment, which attached an almost criminal guilt to every attempt at anatomical demonstration. If I mistake not, one of the earliest of those who ventured upon any kind of dissection of a human body in modern times, was Marcus Antonius Turrianus (or della Torre), who lectured at Padua in 1500, and was permitted to dissect the bodies of criminals who had been executed by order of the Senate of Venice.* The ancient anatomists had here a great advantage, which however they failed to turn to the best account. Erasistratus and Hierophilus were not only animal, but human vivisectionists, the latter on so terrific a scale that he is said to have vivisected as many as seven hundred men. But from the time of Galen, who does not appear to have taken such extreme measures, a rude kind of comparative anatomy supplied the place of an actual study of the human body, and reduced the science from an experimental and inductive one, to a mere following of the great masters, Hippocrates and Galen, on whose writings, especially on the *Aphorisms* of the one, and the *Ars parva* of the other, the entire literature of centuries of medical works was based. I am not sure whether a study of these lesser works would not be a better introduction to medical learning than the more elaborate treatise of Celsus—but they were used not as a mere introduction, but as an end. At last the great science which Harvey did so much to place on a better foundation became so degraded as to be wedded even to the occupation of a barber—and the ancient Company of the “Barber-Surgeons” of London, whose Hall survived till the end of the last century, indicated the humiliation of a science which was held by the ancients, even in the days of its infancy, to have a divine origin. Even the name of surgery (*Χειρουργία*) represents to us its simplest and most external function, that of the dressing of wounds, and we may venture to affirm that the more ancient surgeons were little more than dressers. Even at Padua, almost the oldest† and altogether the most illustrious School of Medicine in Europe, the Chair of Anatomy was not founded until the days of the famous Hieronymus ab Acquapendente, the friend and tutor of Harvey, and as late as the year 1565.

III. The third great obstacle to the study of anatomy was that abject devotion to every statement and even word of Galen, whose absolute authority in the schools rendered all originality

* He is said to have illustrated the anatomical works of Galen by actual demonstration, and to have disclosed in this manner many of the grave errors into which his predecessors had fallen.

† That of Salerno is affirmed by Dr. Bartolomeo Corte, of Milan, to have been the oldest, being founded in the tenth century.

a heresy, and every contradiction to the great lawgiver a crime. "For fourteen centuries," writes the great Boerhaave, "the reign of Galen in the schools was absolute and undisputed. They never thought of increasing an art which they seriously believed to have been long ago perfected." This traditional school culminated in Jacobus Sylvius, the adversary of the immortal Vesalius, whose boast it was never to have departed from the doctrines of Galen even to a letter. Fortunately, this excess of superstition provoked the hostility which led on to its defeat, and which Vesalius, the Father of Modern Anatomy, did so much to bring about. We cannot wonder that our Harvey terms him the "*divinus Vesalius, vir anatomes peritissimus*." The theory of Galen that the beat of the heart was derived from respiration, and that the only distinction between the two was that the one represented an animal faculty, and the other a vital one—*i.e.*, derived from those "vital spirits" of which we shall have to speak presently, stood in the way of Harvey and all who were aiming at a clearer understanding of the processes of human life. Conformably with this strange view, Galen and his school affirmed that as the beat of the heart and of the arteries was insufficient to keep up respiration, the lungs were placed near the heart as a kind of bellows, "*ad eventandum et refrigerandum*" (to ventilate and cool) the system. Now we cannot really estimate the originality of Harvey's work unless we remember that this absurd theory prevailed as late as the year 1670, and was reproduced in that year by a Dr. Willis (not the learned Dr. Willis, who has since, by a kind of poetical justice, edited and adorned the writings of Harvey, but a much earlier namesake), who enjoyed in his day a reputation greatly exceeding that of Harvey—and in his treatise on the "Heating of the Blood", writes, "we cannot attribute the incalescence of the blood to any other cause than that it is set on fire"—(a passage of singular tautology, reminding one of Dr. Blomfield's definition of an Archdeacon, as one who has to perform Archidiaconal duties). He ends an elaborate argument, hidden in very bombastic Latin, with the sublime conclusion—"and therefore it seems very reasonable to affirm that life itself is a kind of flame." And this leads us to consider briefly another of the obstacles with which Harvey had to contend. This was the idea of a "vital spirit", having its seat in the heart.

iv. Many of my hearers may here recall the admirable letter of the lamented Dr. Bence Jones, who regarded the destruction of this ancient and venerated idol as the grandest result of the discovery of Harvey. "I should have liked", he wrote, (while joyfully embracing the opportunity of contributing

his name and his influence to the Harvey Memorial), "to dwell on the greatness of that truth which Harvey gave us in his discovery of the motion of the blood, by which he cast out of our bodies those mysterious animal spirits and vital spirits which still rise up continually in our language, and are even still said to make us happy or sad, and to determine our health or our death." These "vital spirits" are declared by Harvey to be "the common subterfuge of ignorance." "For mere sciolists," he adds, "when they are unable to assign a reason, immediately affirm that the phenomenon results from the spirits, and introduce them as the efficient cause in every case, just as bad poets, to explain their fable and to bring about its catastrophe, introduce a divine operation." Every one of those for whom the anticipation, in any degree, of Harvey's discovery is claimed, believed firmly in these "vital spirits", and the fact that they did so, is conclusive as against their claim to anticipate the work of our great discoverer. The learned Dr. De Back, a convert to Harvey's views, in a work which he dedicated to him in his old age, describes the opinion as a "*decantata et ab omni ævo recepta de spiritibus opinio*."

v. A fifth disadvantage under which anatomical science laboured until the time of Harvey, was the absence of all the means of minute observation. Even Harvey himself possessed only the rude appliance of the magnifying glass, the microscope being then unknown. With this imperfect instrument he began his examination of insects and of embryo life; making use of the magnifying glass (as he writes) for the discernment of minute objects—"Ope perspicilli ad res minimas discernendas." Leuwenhoek, by the introduction of the microscope, was enabled at the close of the 17th century to solve many problems which Harvey had but partially investigated, and the advantage which more modern physiologists have derived from the perfection of the new instrument can hardly be estimated. We might almost assert that every stage of perfection which the microscope has reached, has marked a like stage of perfection in anatomical research. Such were the difficulties which stood in the way of Harvey when he entered upon his lifelong work—and we cannot truly appreciate either the courage with which he met them, or the wisdom and power by which he overcame them, without seeing them as far as possible in their full proportions. We appreciate an Athanasius when he stood alone against the world, for the figure is a more conspicuous one, and the vast array of the hostile forces is more clearly seen; but the unanimity of the medical world, and of the world it governed, was not less complete or less energetic against

Harvey, while the personal means of resistance were so much less. This consideration we must take into account in our estimation of the originality of his work and the irrefragability of his claims.

It might seem almost a work of supererogation, in the face of the testimony we are able to produce from the treatise of Harvey himself, to trace the long succession of great men, who, not in their own person, but by their posthumous advocates, have put in a claim to the anticipation at least of the *idea* of the circulation of the blood. From Plato to St. Gregory of Nyssa in the fourth century, from the natural Theology of Theodorit* in the fifth century to the scholastic divinity of Aquinas in the thirteenth, one writer after another repeats in weary monotony a more or less distinct prophecy of a kind of blood-circulation, not in the modern and true sense, but in that of a kind of flux and reflux of the blood—an ebb and flow resembling rather a contrary than a circular motion. As we pass on through the darkness of the middle ages to the period of the establishment of inductive reasoning in the sixteenth century we continually seem to be approaching the light, and again to be lost in darkness. Every one who is summoned as a witness or rival in this great controversy will be found (and I venture to say, has been proved) merely to have suggested a pathway out of the gloom which the processes of inductive reasoning and experimental investigation alone could lay down with clearness on the map of (what I may term) physical geography. Before the introduction of this method the problem might indeed have been hinted at, or stated, with more or less accuracy, but the solution of it was simply impossible.

The tract of Aquinas *On the Motion of the Heart*, written in 1270, presents what we might call a "guessing at the truth", which though very obscure is very curious. From the dilatation and contraction of the heart he derives a kind of circular motion, only interrupted by a short interval which corresponds with what Harvey calls the period of rest; "*Habet quendam motum circularem*" are his words—a motion which he attributes to the heating of the blood around the heart. He does not deal in "vital spirits" or admit the favourite comparison to the growth of a plant, but he fails to connect his "circular motion" with its true cause, or to take up the second of the subjects which Harvey has wedded together in his immortal treatise. The great Italian Reformer Zanchius, seems to make a still nearer approach to the truth, deriving his anatomical knowledge as he tells us from Vesalius and Melanc-

* *Sermones de Providentiâ.*

thon. He speaks of "the heart communicating life to the members, and the other members in their turn giving it back to the heart"; but he clings still to the "vital spirits", and the light we seem to have gained sinks into darkness. The claim of the learned and unfortunate Michael Servetus (b. 1509), founded on a remarkable passage in his *Restitutio Christianismi*, is refuted by Dr. Willis, the Editor of the works of Harvey, who in his learned and exhaustive retrospect of these earlier pretensions, shews that Servetus had in view "not the pulmonic circulation, properly so called, but the generation of the vital spirit." His idea of the course of the blood through the lungs and of its transmission from the right to the left side of the heart, does not satisfy the grand idea of Harvey, of a "circle of blood beginning and ending in the heart": on the contrary, he regarded the liver as a fountain-head of the blood, as all his predecessors had done. Yet Servetus made one grand step in the direction of the circulation, which none, as far as I can discern, had made before him; before his time the true idea of the circulation was lost, from the belief that the septum or wall dividing the ventricles of the heart was porous, and so that the blood was conveyed from one ventricle to another, instead of passing through the lungs from one ventricle to the other. "*Fit autem communicatio hæc*", he writes, "*non per parietem cordis medium ut vulgo creditur sed longo per pulmones ductu*", etc. Realdus, Columbus, and Cæsalpinus (whose claim has lately been urged with so much importunity and even passion by Dr. Ceradini, of Pisa), saw but little farther than Servetus. Dr. Willis, after shewing that Cesalpini's claim depends rather upon the inferences and deductions of his advocates than upon his own direct testimony, justly observes, "The world saw nothing of the circulation of the blood in Servetus, Columbus, or Cæsalpinus, until after William Harvey had taught and written."* The claim of Cesalpini has been entered into at so great a length and so admirably refuted in the pages of one of the principal medical journals,† that I refrain from entering upon it more fully here. I would only ask whether it is likely that Harvey, with his deep religious convictions, could have attached much weight to the judgment of a man, who, as Dr. Tennemann tells us in his *History of Philosophy*, "dared to represent the Deity not only as the cause, but the subject matter and substance of the worlds, and identified with the universal intelligence, the minds of individual men and even of animals, asserting even the existence of dæmons."

* *Life of Harvey*, Works, p. lxiii.

† *Lancet*, November 1876, January and February 1877.

He is asserted to have taught, though this does not appear in his works, that men were generated like vermin, from putrefied matter (*Zedler, Universal Lexicon*). Now we must bear in mind that the *Peripatetic Questions* of Cesalpini were first published in 1571; his work *De Plantis* in 1583. The world, however, did not find out during the fifty years which intervened between these dates and Harvey's publications, that the discovery of the circulation had been made in any sense. In strange contrast to this profound ignorance was the burst of indignation which proceeded from the medical world directly the work of Harvey was published, accusing him of disloyalty to Galen, and all antiquity, in which Cesalpini would be included. Yet Dr. Ceradini ventures to affirm that Harvey (the least likely of any of his cotemporaries to read a merely philosophical work of great complexity), had only the merit of disentombing the doctrine from Cesalpini's voluminous pages. The great Italian physician continued lecturing at Pisa and Rome till his death, in 1603, only thirteen years before Harvey taught it in his public lectures. Was it possible that he could suppress all mention of it from his two chairs, or fail to communicate it to some of his many hearers? or that they again would not have vindicated for the schools of Pisa and Rome an honour which, in the then divided state of Italy, would have been almost as deeply grudged to Padua, as it would have been to a heretical Englishman? Dr. Ceradini's work and his injurious inscription would have been much earlier anticipated had his theory indeed been true.

Dr. Willis forcibly remarks that "the foremost grounds of Harvey's claims to rank as a discoverer are very commonly overlooked—we always associate his name and fame with the development of the ultimate fact of the circulation of the blood. But Harvey, as a step to this conclusion, first demonstrated the heart as the means by which the circulation was effected, and he further shewed that there was but *one* kind of blood common to both the arteries and the veins. . . . The *motion of the heart* has even precedence in the title of his immortal work." This combination is most important and significant. We are too apt to fancy that we detect a plagiarism when there is the mere casual resemblance of a single feature. What Mendelssohn once observed to me in regard to musical plagiarism is equally true in regard to those coincidences of scientific thought which have been so often observed in the history of great discoveries. Such casual resemblances, however close they might seem, he regarded as nothing, the true plagiarism being that which imitates the plan and structure of a work or argu-

ment—and here the grand fabric of Harvey's treatise stands alone and unique in its originality and perfection. The observation of Dr. Willis on its twofold object and title cannot therefore be too strongly insisted upon.

One writer, whose claim has escaped attention during the course of the recent controversy, deserves a passing notice, that of the Jewish physician, Amatus Lusitanus, born in 1511. He is alleged by Steinschneider, in his *Hebrew Literature*, to have been the first to observe the valve of the unformed vein, and to have been very near discovering the circulation of the blood. Even the former claim, however, can hardly be sustained, for Galen himself, as Harvey shews, had arrived at as clear a view of the valvular character of the veins, while his commentator, Sylvius, had so improved upon it as to lead Riolanus, the friend of Harvey, to attribute to him the actual discovery. My learned friend Dr. Hermann Adler, son of the Chief Rabbi, while communicating to me this notice of the claim of his co-religionist Amatus, adds, "I hope you will see that we do not set him up as a rival claimant: Harvey's claim is indisputable."

But it may well be doubted whether any of the advocates of the rival claimants to Harvey's great discovery have ever read the brief but exquisite treatise upon which that discovery rests. Its very opening words tell us that he had derived all his conclusions from his own personal knowledge, and not from the books and writings of others—"non per libros aliorumque scripta". Even if he sometimes appears to qualify this view, he always reasserts his position—that all his discoveries were experimental, all his knowledge personal, all his reasoning not theoretical but inductive. As his contemporary Zacharias Sylvius forcibly puts it, "Harvey, ever refusing *jurare per verba magistri*, did not put his faith in the writings of others, but trusted to his own eyes, the faithful internuncios of medical truth. For anatomy is better acquired by autopsy than by long reading and profound meditation." The learned Dr. De Back, of Rotterdam, in a work dedicated to Harvey, himself gives a like testimony: "Some fifteen years ago", he writes, "I became acquainted with the exercitation of William Harvey *On the Motion of the Heart and of the Blood*, which had already been published some five or six years before. . . . In this, relinquishing most of the rules of the ancient doctrine which I had laid as a foundation, I read that the blood . . . was impelled from the heart through the arteries for the nourishment of the body and flowed back again through the veins . . . by a circular motion constantly recurring, and that in a small space of time it was brought back through the same path. I examined this

new thing" (mark these words), "which at first I thought might be easily refuted. But having duly weighed it and illustrated it by means of dissection, I found it to be invincible, and compelled by the force of truth, I embraced it wholly. What then was to be done? Must we leave Hippocrates? Must we dismiss Galen? Not at all. If we are true followers of the truth, fortified by reason and observation, we are properly disciples of Hippocrates and Galen." (Præf., p. 11.) Harvey himself, in his exercitation addressed to the younger Riolanus, *On the Circulation of the Blood*, which forms the third of the great triplet of his treatises on this subject, asserts his claim in words of characteristic dignity and modesty. "Whatever", he writes, "has been delivered in that book 'on the circulation of the blood' discovered by myself (*a me invento*) seems exclusively to belong to me, and first and foremost to devolve to me as a matter to be weighed and determined." So hopeless was the mind of the medical world in the days immediately preceding, that Fracastori, one of the most famous anatomists of the 16th century gave up the inquiry into the heart's motion as "a mystery known only to God"; and the same conviction forced itself upon Harvey as he entered the gloom guided only by the then faint light of his earliest investigations. "I found it", he says, "so arduous a matter and beset with so many difficulties, that I was ready to conclude with Fracastori that it was a mystery known only to God." But he had had the advantage of an education in the great school of Padua, and among a body of teachers who were as fearless as they were indefatigable in their search after physiological truth.

He had already taken his degree at Cambridge, as a member of the College of Gonville, then recently refounded by Dr. Caius, who had also been a student at Padua, and is mentioned by his contemporary, Fuller, in his *History of the University of Cambridge*, as one of the earliest ornaments of the new foundation. From Cambridge, he passed over, like his predecessor, to Padua, and here an anecdote is related by Aubrey, his contemporary, which deserves a passing notice. He writes: "when Dr. Harvey, one of the Physician's College in London, being a young man, went to travel towards Padua, he went to Dover, with several others, and shewed his pass, as the rest did, to the Governor. The Governor told him he must not go, but must keep him prisoner. The Doctor desired to know for what reason? How he had transgressed? Well, it was his will to have it so. The Packet-boat hoisted sail in the evening, with the Doctor's companions in it. There ensued a terrible storm, and the Packet-boat and all the passengers were drowned. The next day the

sad news was brought to Dover. The Doctor was unknown to the Governor, both by name and face, but the night before the Governor had a perfect vision, in a dream, of Dr. Harvey, who came to pass over to Calais, and that he had a warning to stop him. This the Governor told the Doctor the next day. The Doctor was a pious, good man, and has several times related this story to some of my acquaintance.”* We may presume that he took advantage of the earliest subsequent opportunity to reach his destination, and was enrolled as a student in the University of Padua. Here he became the pupil and friend of the greatest anatomist of the age, Hieronimus ab Acquapendente, then assisting as Demonstrator to the equally celebrated Gabriel Fallopius, whose name has survived in surgery as the discoverer of a part of the structure of the body then very imperfectly known. He again was the pupil of John Baptist Montanus, who taught at Padua from 1530 to 1551, and was a rigid Galenist, so that the freedom of inquiry, even in the school of Padua, was not fifty years old when Harvey became a member of it. To Acquapendente, who lived till 1619, three years after Harvey’s first lectures on the Circulation, he himself attributes the first *delineation* of the valves of the veins. This word should be carefully noted, for the actual discovery of the fact was, as we have seen, as early as Galen, and at least as his commentator, Sylvius. But another remarkable friend and associate of Harvey at Padua, was the illustrious Fra. Paulo Sarpi, commonly called Father Paul, as great as an anatomist as he was a historian and a divine, the well-known author of the *History of the Council of Trent*. In 1575, this almost universal genius began, as his biographer Fra Fulgenzio tells us, “to experiment in anatomy on all kinds of animals, for the most part living ones,” a practice which in after years, we are told, affected him somewhat sadly, and gave him “*una certa displicentia compassionevole*”, a kind of compassionate displeasure. “Especially, the anatomy of the eye he had brought to such perfection, that Acquapendente alleged his authority in his lectures, and used to speak of him as the oracle of his age.” It was he who conveyed to Acquapendente his knowledge of the nature and uses of the valves of the veins, and Fulgenzio describes the process of reasoning by which Sarpi arrived at this most essential truth. “Having carefully considered”, he writes, “the weight of the blood, he came to the conclusion that it could not remain sus-

* *Miscellanies of John Aubrey, Esq., F.R.S.*, 2nd Edition, 1721, p. 58. I have since found that there is some doubt whether this story belongs to our Harvey or to Dr. Baldwin Hamley, junior, also an eminent benefactor of the College of Physicians. The mention of Padua rather connects it with the former, as Leyden was the University in which Dr. Hamley took his degree.

depended in the veins unless there had been kind of dykes to retain it, and enclosures which, receiving it and shutting it in, should give it the flow and equilibrium necessary for life. And with this natural judgment he applied himself to the work of dissection, with the most exquisite observations, and discovered the valves and their uses—how that they not only prevented the blood from dilating the veins by its weight in the matter of varicosity, but also preserved the heat of the parts which they were intended to nourish by not running with too great force, or in too large a volume.” This teaching he communicated to Acquapendente, who adopted it in his lectures and thus communicated it to his illustrious pupil—a truth which more than any other contributed to Harvey’s discovery, and in a manner cleared the way for it.—(*Vita*, pp. 42-5. *Ed. Ven.*, 1677.) On this ground it has been asserted, but most falsely, that Harvey was indebted to Sarpi for his still more important success. It has even been affirmed that Harvey availed himself of the MSS. of Sarpi; but Dr. Ent, a friend of our great discoverer, refuted this calumny, by shewing that if Sarpi had had any knowledge whatever of the later truth he had derived it from Harvey himself through the Venetian Ambassador. The statement of Harvey that Acquapendente, though writing upon every other point, had never made the heart a subject of his investigations, is absolutely irreconcilable with this charge, for we know from Fulgenzio that Sarpi communicated every fact he acquired in anatomy to Acquapendente, that *peritissimus anatomicus et venerabilis senex*, as Harvey calls him, who survived till 1619. Again, I must observe here, that the authors of such a calumny could never have read the very first sentence of Harvey’s work, or known the very first elements of Harvey’s character. But could such a claim have escaped Fulgenzio, the devoted and minute biographer of Sarpi, had it really any foundation? Could the physician Asselineo have been ignorant of the circulation of the blood, had Sarpi really known of it? that profound admirer of Sarpi who used to exclaim “O! how many things has Father Paul imported to me in anatomy, in mineral medicines, and in simples”—“*O! quante cose mi ha imparato il Padre Paolo nell’ anatomia, ne’ minerali, e ne’ semplici!*” And yet it is asserted by the advocates of Cesalpinus’ claim that Sarpi communicated to Acquapendente, and that Acquapendente was the medium of communicating to Harvey his alleged discovery of the circulation—Acquapendente, who, as Harvey affirms, had investigated the anatomy of every part of the human body, *except the heart*. I ask, was ever Cesalpinus, was ever Acquapendente, was ever Sarpi charged with this great heresy, for heresy indeed it was, until the time of Harvey? Did

ever anybody denounce the Cesalpini paradox, or the Sarpi paradox, or the paradox of Acquapendente? If any of our legal friends were to investigate this title, where, but with Harvey, could they find what lawyers call the "root of the title". At the root, however, of every claim and every pretension lies the decisive and irrefragable fact, that Harvey relied only on his own experimental anatomy, and on the inductive reasoning which he derived from it. He might have truly said with his friend Riolanus "I only believe what I see with my own eyes"; and he says as much as this in the opening sentence of his work. Of this treatise we will now proceed to speak, and first of the date of its composition. Though first actually published in 1628, it must I think have been drawn up substantially in its present form as early as 1619, or 1620, and formed the text of his lectures from 1616. He could hardly have spoken of Acquapendente as "that venerable old man", had he not been still living, or had he been aware of his death, which occurred as early as 1619. Let us now briefly sum up the argument of this now classical work, first reminding my non-professional hearers that the heart is, in popular language, a hollow muscular organ having two chambers called ventricles, laterally, though somewhat obliquely, disposed, and divided by an impervious wall called a "septum", a hedge or fence. At its base are two muscular cavities called, from their resemblance to an ear, "auricles". Each ventricle has two orifices—one from the auricle by which the blood enters, and another from the artery by which it passes out.

Our author then begins by shewing that he was led to investigate the subject from constant observations made during the dissection of animals, and not from any books or writings of others. But the suddenness of the dilatation and contraction of the heart, the *diastole* and the *systole*, had hitherto baffled his researches; at length, having extended his observations, and digested and collated them, he considered that he had arrived at the knowledge both of the motion and uses of the heart and the arteries, and made it the subject both of his public lectures and private discourses. The opposition it encountered, and the solicitations of his friends, led him at last to lay it before the public. Finding that the heart at times was moved and at others was at rest, and that a distinct period was marked in either case, he was led to the further conclusions:—

I. That it was elevated and raised on its apex during motion, and that then pulsation occurred.

II. That at the same period it was contracted at all points, but chiefly laterally: lengthening out and apparently decreasing in magnitude.

III. That during this period it became harder to the touch in consequence of its tension—as a muscle would become.

IV. That in cold-blooded animals it became livid and white during the period of motion, and recovered its sanguine colour when again at rest.

From all this it appeared that the motion of the heart is a kind of tension of all its parts, and a constriction according to the direction of the fibres, like that of the muscles, which are stretched and invigorated in tension, and relaxed in repose (whence Hippocrates not inaptly terms the heart itself a muscle). It seemed therefore to be reasonable to conclude that the heart in the period of motion is everywhere contracted, and its walls become thickened or hardened, while in regard to the ventricles or cavities in its right and left members, it is narrowed, and throws out the blood contained in it. This, he observes, is contrary to the received opinion, which supposes the pulsation to take place at the period of distension, instead of at that of contraction; and when the ventricles are filled with blood, instead of when they are emptied. He shews therefore that the terms of *dilatation* and *contraction* ought to be used of exactly the opposite periods to those to which they are popularly assigned—in other words the *diastole* is turned into the *systole* and the *systole* into the *diastole*.

He then proceeds to show that the action of the arteries in their *dilatation* and contraction, is exactly reversed in point of time to the corresponding action of the heart—that when the heart is dilated they are contracted, and *vice versâ*, when the ventricles of the heart are contracted and send forth the blood, the pulmonary artery (that which leads to the lungs), the aorta (that which leads to the system generally), and the other arteries, beat and are dilated. He then turns to the consideration of the *auricles* (or venous cavities, so called from their resemblance to an ear), and their motion. He shews that while the ancients asserted four motions of the heart, distinct both in time and place, viz., two of the auricles and two of the ventricles, there are properly four motions distinct in place, but not in time; for the motion of the auricles precedes, and that of the heart follows. From these preliminary conclusions the motion of the heart is thus defined.

First the auricle contracts itself, and in that contraction throws into the ventricle of the heart the blood contained in it. The heart thus filled, elevates itself, stretches forth its fibres, contracts the ventricles, and gives forth a pulsation, by which means it pours forth into the arteries the blood sent into it by the auricle; the right ventricle transmitting it into the lungs by

means of the pulmonary artery, while the left ventricle sends it into the aorta and, through the arteries, into the whole body.

These two motions, one of the auricles, the other of the ventricles, so follow one another as to appear coincident in time and to form only one motion—as in a machine, when one wheel moves another, the two seem to move together. Having traced the channels through which the blood is carried out of the *vena cava* into the arteries, and from the right ventricle into the left, he directs a more special observation to the passage of the blood through the cellular tissue of the lungs. Having traced the route of the blood through the lungs and back to the heart, he enters upon the important question of the quantity of blood thus passing through the system. He had constantly and seriously considered (these are his words) how it was possible that so large a mass of blood could, in so brief a space, be formed for the nutrition of the body, or be transmitted without disruption of the veins; and after long meditation he arrived at the conclusion that there must be a return of the blood, and a circuitous route by which the processes already described might be carried on without disturbing the course of life. This led him to inquire whether the blood had not a circular motion, "*which afterwards*", he adds, "*I found to be true.*"

Such are in few words the stages by which our discoverer, that "learned and wise Philosopher", who, like him in Milton's fable, "knew all the charters, laws, and tenures of the body", reached the goal of his great success, which he arrives at in his 8th Chapter; the remaining chapters of the treatise being devoted to the proof of his argument by means of illustrations and experiments, which shew by the very originality of their conception, the originality, and, so to speak, spontaneity of his first idea. The course of his argument not a little resembles that by which Sarpi, according to his cotemporary biographer, arrived at his doctrine of the valves of the veins, and shews how complete was the method of inductive reasoning which the great school of Padua had impressed upon all its disciples.

It would be tedious, and at best could only provoke a languid smile, were I to enumerate the arguments by which the advocates of the older school endeavoured to refute a truth which made their most cherished convictions worthless and obsolete. Where argument failed them (and how soon it failed we can readily imagine) bitter invectives took its place. The title of a single one of the treatises of Harvey's opponents will give a fair idea of most of them, *The Vengeance of Antiquity against the Circulation of the Blood*, its author being Homobonus Piso, the Italian Galenist. Harvey, in his third treatise, includes their authors

(or as we might say in plainer English, shuts them up) in this single sentence, "The vituperators, scoffers, sordid writers of abuse,—as I have resolved never to read their writings, so have I deemed them to be still less worthy of a reply,—let them employ their evil genius, never, I think, to enjoy the advantage of gentle readers." In striking contrast with the contempt with which he regards these malevolent assailants, is the invitation he gives to a more friendly critic to inspect, with him, the wonders of nature in the smallest insect; "For the great and Almighty Father", he writes, "is even more conspicuous than ever in the very least and vilest of his creatures." Here the religious sentiment derived from the religious mother comes forth in all its beauty. Two adversaries only, did he condescend to meet in argument and to honour as worthy of his regard: one was his friend, the great French physician, *Riolanus*; the other the still greater philosopher, *Descartes*, who seems in some degree to have misunderstood the meaning of that portion of his theory which related to the periods of dilatation and contraction of the heart. His friend Dr. de Back explained and vindicated his teaching at this point, and throws no little light upon some passages which from the almost mathematical brevity of Harvey's style have a certain appearance of obscurity. The works of his more violent and unreasoning opponents have for us, however (and at the present time more than ever), a very peculiar value; for they are the faithful and consistent witnesses of the fact that Harvey was beyond controversy, and even beyond doubt, the only one whom his own age recognised, in every country of Europe, as the discoverer of the circulation of the blood. Here, at least, we may say, *Fas est et ab hoste doceri*. And surely if his bitterest enemies denied him not this recognition in his own day, it would seem an invidious task for those, whatever be their nationality, who have accepted his wonderful gift, and are standing on the vantage-ground of his grand discovery, to strain their eyes to discover some faint anticipation of it in the ages of darkness which preceded him, instead of crowning with immortal honour him, who by little less than a divine inspiration, has disclosed and imparted to us this amazing truth. Different indeed was the course of the learned Editors of the *Acta Eruditorum*, of Leipzig—the greatest of the scientific reviews of the seventeenth century—who speak of the work of Harvey, as "the golden discovery of the circulation of the blood made in the present century by William Harvey, contrary to the doctrine and opinion of all men."* These critics had examined every claim which had been

* *Acta Eruditorum*, Lips., an. 1686, p. 280.

advanced to an anticipation of this grand discovery, including even that of Cesalpinus, and had rejected them all in favour of the great English physician, as did their great countryman, Haller, in a somewhat later day. Let us then, accepting their unbiassed decision, turn our eyes from the past to the future, of which this great discovery is so sure a promise. Let us fall back upon the words of the poet, with which we opened these reflections, and remember that his description of the sad and anxious searchers after the scattered limbs of truth, closes with those pregnant words—"And we have not found them all." Much has been indeed discovered, but much, very much, remains. As Joshua said to the people when he had divided to them their promised inheritance—"There remaineth yet very much land to be possessed"—even now we seem to be on the threshold of very great discoveries; the nature and origin of diseases and their mysterious connection—the different constitution of the blood in health and disease—the phenomena and laws of dietetical science—the germ theory in zymotic diseases—these, and countless other subjects, culminating in the higher mystery of the very origin of our race itself, remain yet to be explored; and it were well indeed if the spirit of a Harvey, or of a Hunter, could revive in every student of that noble science for which they did so much with so few lights to guide them, and such almost insuperable obstacles to retard them. We cannot be too often reminded, in the words of the poet we have already cited, that "the light which we have gained was given us not to be for ever staring on, but by it to discover onward things more remote from our knowledge." As Sarpi's discovery, illustrated by Acquapendente, was a light to guide on Harvey to the great acquisition of his life, so the light of Harvey's discovery led on Asellius in his investigations in regard to the digestive organs; a path of study which has been so successfully pursued in the same light by our fellow-countryman Dr. Pavy; while the same light guided Hunter in his scrutiny into the very sources of life—led on in our own day my late friend Sir Charles Bell to his great discoveries in the nervous system; and the same light is still aiding the many anxious seekers for the scattered limbs, the *disjecta membra* of the mangled body of truth. Let us not be afraid of its light, let us not fear to lift the lamp of truth, however weak our arm, however diffident our hearts. In the beautiful words of my lamented friend Cardinal Wiseman, "the burning lamp will shine as brightly in the hands of a child as if uplifted by a giant's arm."* Well might Harvey have added

* *Lectures at Moorfields* (Last Lecture).

with him, "I have endeavoured simply to hold before you the light of eternal truth—to Him that kindled it be all the glory!" Let every one remember that even the least and lightest contribution to the stock of discovered and recorded truth is a precious and indisputable addition to it—that the faithful record of a single fact, or in medicine, a single case—the intelligent observation of a single phenomenon—the mere registering of the plainest facts, or the most ordinary experience, is not to be lightly regarded or carelessly neglected. And let every searcher in the field of scientific truth, every patient explorer of the mysteries of life and death, learn, from the example of Harvey, that the reward of his services is in the service itself—he can look for no other in this world—he can seek for no higher in the world to come—for there it will cease to be what it is too often on earth, a daily cross, and will become a crown of rejoicing and a diadem of beauty. The closing years of the great discoverer were years of peace and rest, even when the bitter controversy was raging around him, and the world which now honours him was covering him with rebuke and dishonour; but, as a great writer has said, "There is a sweetness, there is wages to be found in the work itself, . . . for they who in their labours and travails take in the sweetness of the promise of their final rest, do even in their very labours make an entrance thereinto."* Harvey had reached his eightieth year when he died in the possession of every faculty, and in the midst of those relatives for whom he evinces his love and proves his confidence in that beautiful and simple testament in which, with his brother, he laid the foundation of the Grammar School in this town, which bears his name, and of which I am proud of being one of the oldest Trustees. Whether he died at the Manor of Barringtons, in Chigwell in Essex, the residence of his brother; or at Hempstead, in the same county; or (which is the most probable conjecture) at his own residence in London, I cannot certainly determine; but that his heart was in his native town, and that his last thoughts reverted to the scene of his earliest memories, I may affirm from the very words of his last will. His monument is here in his own foundation; but I trust that yet another monument may be his in the generosity with which you respond to the appeal which my friend Mr. Eastes has made to you, and that you will not suffer his memory to be left like Wren's, to his living work alone, and to be expressed in those terms of somewhat vague sublimity, "*Si monumentum quaeris, circumspice*". I own

* Owen.—*Sermon on the Death of the Lord Deputy Ireton.*

that I find it impossible to reconcile this natural view of his last days, the only one which is consistent with his long life, with that which our Kentish topographer, Hasted, has recorded, and which he professes to derive through several intermediate stages from the collateral descendant of Harvey, Mr. Eliab Harvey, of Chigwell in Essex. We are told that the Doctor "was ever afraid of becoming blind", that "early one morning, his house-keeper coming into his chamber to call him, opened his window shutters, and telling him the hour, asked him if he would not rise, upon which he asked if she had opened the shutters, and she replied 'Yes'. He then bade her shut them again; but still the effect was the same; for he had awakened stone-blind. Upon which he ordered her to fetch him a bottle" which she herself had observed on a shelf in the chamber for a long while, "out of which he drank a large draught, and it being a strong poison, which it is supposed he had long before prepared and set there for the purpose, he expired within three hours afterwards."*

Now the whole of this story is as perfectly inconsistent with all that we know of Harvey's life and character, as it is absurd and contradictory in itself. It is in the first place extremely improbable that, attached as he was to his brother, Sir Eliab Harvey and to his family, he should have thus wilfully cut them off from that indispensable privilege of love, a last interview and a peaceful parting. The profound religious sentiment which appears in all his writings, the peculiar devotion he ever exercised and expressed to the will of God, the keen susceptibility which so sensitive a mind would have to the very suspicion of the guilt and cowardice of suicide, all this gives a *primâ facie* improbability to the story, even if it rested on better evidence. But what do we know of the truthfulness of the first narrator? What right had she to suppose that her master had prepared this bottle of poison, or to assume that he left it about where it certainly would have endangered his friends, not to mention even herself? What large draught of a strong poison could enable the patient to survive for three hours? What actual proof had she of his blindness? that

"So thick a drop serene had quenched his orbs
Or dim suffusion veiled."

If she had suspected that poison was the cause of death, why had she not communicated her suspicion at once, in order that some inquiry might have been made at the time? Why leave this incredible story to ooze out to the curate of a parish in

* Hasted—*Parish of Folkestone*.

Essex, and by him to be commended to our industrious, but all too credulous topographer. I think that I shall carry with me your convictions while I express my own, that this story is little more than the "baseless fabric of a vision", though it has left a kind of "wrack behind". But this tangible relic may perhaps represent certain facts which the housekeeper put together, and brooded over, till they assumed the form of this romantic story. Let us briefly sketch what these may have been. It is very likely that the Doctor may have had a fear of blindness, though his sight to have been perfect till eighty was evidently not an ordinary one, for he had used the magnifying glass so much, and his observations were so very minute, that such a fear was not unnatural. Indeed, we know that it is very usual for doctors who know too much of our interior economy to be very timid in regard to their own state. Again, he might possess that very common medicine, a strong tonic, and perhaps feel some symptoms on waking of the weakness inevitable at so great an age; here then may be another element of fact. Finally, it is very possible that a feeling of impaired sight was the precursor of more serious symptoms, and that some spasm of the heart or sudden paralysis of the brain (I speak under correction from my learned friends around me), may have closed his life in the three fatal hours recorded by the housekeeper. But beyond this all is pure fiction, and we are left in undisturbed possession of a faith, which none of us I am convinced would relinquish without a very different kind of evidence from this, that our great discoverer died as he had lived; that however he might have had (as every aged Christian must have), *mortem in desiderio*, he had that grace which is invariably attached to it, *vitam in patientiâ*. Surely if any man upon earth could take up the fallen mantle of St. Ambrose, and claim his dying words, it was our great and good Harvey—"I have not so lived among you that I fear to live longer if it please God, and yet I am not afraid to die, for we have a good Lord"—"*Non ita vixi inter vos ut me pudeat vivere, nec mori timeo quia bonum Dominum habemus*". Nor can we put forth a better wish for ourselves or for our own age than this, that the admirable example which was opened to the world in this place and as on this day, three hundred years ago, may be renewed and perpetuated among us, and be reproduced in all its lines of truthfulness and beauty in every searcher after truth—until every limb of truth is found, and every mystery of life explored, and the great and Eternal intelligence "shall bring together every joint and member and shall mould them into an immortal feature of loveliness and perfection."

