

The Pre-Harveian Era*

BY

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When Dr. Krikler asked me to address you on William Harvey I stepped back a little and protested. An invitation to speak on so celebrated a figure in medicine, one who is almost deified in our profession, is generally linked with the Harveian oration given in England only by physicians of outstanding ability. Also to speak on Harvey demands some special knowledge gained by painstaking research. I could not possibly do justice to so great a man as Harvey. So after some argument we agreed to compromise and I consented to talk on the pre-Harveian period in our history.

Fortunately we have preserved historical records which give us a pretty good account of the prevailing ideas before 1628, when Harvey published his *De Motu Cordis*. We need to know this in order to realise that Harvey's discovery was not made completely out of the blue. He was helped by some important observations that had already been made. And although these seemed of little import to his contemporaries, he had the genius to realise their significance and to use them in arriving at his own discovery. This is a fact that you should always remember in your work. Any feature of disease that you may notice in the course of

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your daily labours, although trifling to you at the time, may subsequently turn out to be the key to a revelation of tremendous moment. What better example can we quote than that which led Harvey to his momentous series of experiments. As was customary for men of learning in his day, Harvey travelled to the famous medical school at Padua, where the anatomist Fabricius was working on the valves of the veins. There Harvey was impressed with the fact that these valves all faced the heart and came to the conclusion that they must prevent the blood from flowing backwards, and this gave him the clue to the working of the circulation.

At this stage, I think, we should review the main stepping stones in the progress of medicine before 1628 that led to the work of Harvey. The space between each may seem long to us and some of the ideas may appear ridiculous in the light of later knowledge. But we should remember that one or two hundred years is but a brief spell in the history of Man and that the interval between Galen's theories and Harvey's discovery was in proportion not long at all. We should also bear in mind that each step, no matter how out of keeping with those of modern medicine, was a big move forwards when compared to the little that was known then, and that some of the ideas, of which we are so proud to-day, may quite easily be considered abysmal ignorance in a few hundred years' time. What then are the main landmarks in our medical history prior to Harvey?

The first discovery came about 4,000 years ago when the Egyptians conceived the idea of using plants to treat disease, believing that these so-called herbals had curative properties. This is so well known to-day that it is taken for granted, but I should like to remind you that nowhere in the Bible is the use of herbals even mentioned.

The next important step forward came about the same time. We are not quite sure, but we believe it originated from Mesopotamia, where the idea of agriculture was born. Man began to turn his thoughts to the cosmos—the stars and planets—and to ask questions about the spiritual forces of Nature. And it was not long before he proclaimed that if these spirits were angered they could enter the body and cause disease, but if propitiated in the correct manner could be employed to cure. From this arose the belief that there were men and women who possessed evil spirits and could bring sickness

and tragedy upon their innocent victims. Thus sprang up in these lands the exorcist—the doctor who specialised in removing evil spirits from the afflicted. You must be wondering why I consider the evolution of this spiritual philosophy as a milestone in medicine. The answer is simple. For the first time in human history man is seeking an etiology for the disease and is realising that once the cause of an illness is removed the patient will be cured.

Then for about nearly 2,000 years the practice of medicine involved finding the spiritual causation of the illness and treatment with herbs. After that came the great race of Greeks, whose culture produced new methods of thought and reasoning in so many different disciplines. Medicine, too, received its impetus through Hippocrates (about 300 B.C.). We are not certain that all the teachings and writings ascribed to Hippocrates were really his, as we believe they were augmented by other medical writers of his time, but we know that he formulated the great truth that outside spirits were not the cause of disease and that it was due to some process in the body itself. Out of this arose Aristotle's phenomenal concept based on the four basic elements in life—water, fire, earth and air. These elements were formed when these four primary and opposite fundamental qualities *hot* and *cold*, *wet* and *dry*, met in any combination and this, may I remind you, was the *birth of chemistry*.

From this arose the Hippocratic theory that the body was composed of four humours or liquids—blood, phlegm, yellow bile and black bile. Excess of one humour or another resulted in a particular temperament, such as sanguine, phlegmatic, melancholic or choleric. Although it may seem far removed from the truth to us, we can look upon this theory as the first stepping stone to the realisation of the circulation of the blood, for without this hypothesis (130-200 A.D.) the next stage would not have been reached. And the next stage was not long in coming. In about 180 A.D. that genius of men, born in Permagon in Asia Minor, Claudius Galen, described his idea of what might be termed circulation. Galen spoke of an ebb and flow in the veins, and in this way the blood and, more important, the *Pneuma* (basic spirit of life) travelled round the body, its form depending on the part it reached. This spirit of life which he called the *Pneuma* was imbibed with air and moved down the trachea to reach the lungs, from where it continued its journey to the left ventricle through the venous artery

(really the pulmonary vein). There it mixed with the blood to become the *Vital Spirit* that moved along the arteries to the brain, where it was altered into the *Animal Spirit*, which was despatched along the course of the nerves and so initiated movement.

Galen still had to explain how the blood reached the left ventricle. Without any anatomical proof he postulated the theory that blood was manufactured in the liver, where also a new spirit called the *Natural Spirit* was made. The blood enriched with this spirit was transported to the right ventricle through the inferior vena cava and, he claimed, into the left ventricle through invisible pores in the wall between the two ventricles. There the blood from the liver with its *Natural Spirit* met the blood with its inhaled *Pneuma* and formed the *Vital Spirit*. Galen's hypothesis was accepted as fact, and as he linked the vital spirit with the design of the Divine Healer it received the blessing of the church. No one was permitted to doubt the veracity of his hypothesis, and for the next 1,300 years the Galenic thesis remained inviolate. However, there was a physician, an Arab, Ibn-an Nafis (A.D. 1210-1388), who denied that there was an invisible channel in the septum of the heart. And it is remarkable that without performing any dissection whatsoever this physician postulated that the blood flowed from the right side of the heart to the lungs and thus back to the left side of the heart. Unfortunately no notice was taken of his ideas.

Interest in anatomy was reborn during the Renaissance with the stimulus provided by the artists of Florence, who sought precise anatomical details, not only of the contours of the body, but even of the most minute parts of its various internal compartments. And so we come to Leonardo da Vinci (1452-1519), who even studied the heart and made casts of its hollow ventricles. Another Italian, Cariano (1515-1579), described the valves of the veins, and then in 1543 Andreas Vesalius (1514-64), the famous anatomist, published his famous masterpiece, *De Humani Corporis Fabrica*.

Why are we so concerned with the *Fabrica*? It was the first challenge to the teachings of Galen. Vesalius pointed out that what Galen recorded might apply to animals, but not to Man, as he had never dissected the human body. The writings of Vesalius were very unpopular and he was publicly criticised, but the seeds of doubt had been sown, and after this events moved a little more rapidly. He was followed by three men who earned medical fame for clearly indi-

cating that Galen must be wrong, although none of them established the concept of the circulation. Michael Servetus (1511-53), a Spanish theologian and famous anatomist and physician, and Realdus Columbus (1516-59), a pupil of Vesalius at Padua, both described the pulmonary circulation. Indeed, Servetus recorded it in a treatise "Restitutio Christianismi" in 1553, in which, like Galen, he showed how perfectly God made the human body, but opposed Galen's views by postulating that God's spirit, after being imbibed, passed through the lungs, where it was infused by blood which reached the lungs through the pulmonary artery and was thereafter taken to the left ventricle. For these views Servetus was burnt at the stake in Geneva in October, 1553. The third man, Andrea Cesalpino (1515-1603), a professor of medicine at Rome, went even further, for he described not only the pulmonary circulation, but also the circulation of the blood from the left ventricle into the systemic system.

Thus during the 1,800 years between Hippocrates and Harvey links were forged between the teachings of these two great men by Galen, Ibn-an Nafis, Leonardo da Vinci, Vesalius and Michael Servetus. The stage was now set for the famous series of experiments conducted by Harvey, who was fully aware of the postulation of the men who came before him. His genius was able not only to sift the relevant truths from these earlier teachings and to piece them together into a significant whole, but also to prove scientifically how the circulation of the blood really functioned.
