William Harvey and the Undercurrents of Science

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Cardiovascular medicine is prominent in the public eye owing to both the high prevalence of cardiovascular disorders and the string of spectacular scientific discoveries that have marked this discipline’s development. The heart transplants, the relief of symptoms experienced after coronary stenting or coronary artery bypass grafts, and, in recent decades, the progress in cardiovascular disease prevention make cardiovascular medicine a model of the benefits of medical science. The realm of the heart has also been explored by poets and writers, albeit in quite a different dimension.

One could argue that cardiovascular science, in the modern sense, started with William Harvey (1578–1657) (1). Harvey’s work is a convenient marker of the paradigm shift from speculation toward observation and experiment-based knowledge. Harvey developed a coherent theory of blood circulation and provided experimental—if partial—proof. He contradicted widely held views propounded by the Roman physician Galen (c.129–216 AD), who held that the blood was produced in the liver and was used up as it reached the tissues.

Harvey was born in Folkestone, a small English coastal town. At the age of 15, he received a scholarship to Gonville and Caius College in Cambridge to study medicine. In 1599, he traveled to Padua in Italy and stayed there until 1602. The University of Padua was then a leading intellectual center in Europe. Galileo taught there. Vesalius, whose work De Humani Corporis Fabrica was epochal for anatomy, also held a chair in Padua. Vesalius’s successor, Girolamo Fabricius of Aquapendente, became Harvey’s teacher (1).

Several factors prepared Harvey for his future discovery. Fabricius’s dissections fascinated him and remained the main tool of his work. Comparative anatomy became Harvey’s passion. Fabricius was also the discoverer of the venous valves, which later proved crucial to the theory of blood circulation (1, 2).

On his return to England, Harvey became assistant at St. Bartholomew’s Hospital in London and then was a physician there from 1609. In 1615, he started lectures “On the Whole of Anatomy” at the College of Physicians and continued doing so for 40 years. In 1618, he achieved prominence by becoming a physician to King James I. When James I died in 1625, Harvey continued to provide the service for Charles I, who became interested in his research (3).

Harvey’s theory of blood circulation was based on beautifully simple, logical considerations. His calculation of the large volume of blood pumped out by the heart daily led him to reject the hypothesis that the liver continuously produces blood. Furthermore, he proved that venous blood flowed toward the heart and not away from it, contradicting Galen’s theory. The elegance and simplicity of his experiments are striking (4). Harvey included the concept of circulation in his lectures after 1616 and published his views in 1628 in a 70-page treatise called De Motu Cordis (Concerning the Motion of the Heart), which he dedicated to Charles I. He concluded as follows:

It is absolutely necessary to conclude that the blood in the animal body is impelled in a circle, and is in a state of ceaseless motion; that this is the act or function which the heart performs by means of its pulse; and that it is the sole and only end of the motion and contraction of the heart. (2)

There were pieces of earlier studies that suggested blood circulation. Ibn al-Nafis, born near Damascus around 1200, described blood circulation through the lungs. In 1553, the Spaniard Michael Secretus described, in a treatise combining theology and medicine, the pulmonary transit of blood. Unfortunately, Secretus’s theories brought the wrath of both the Protestants and the Catholic Church: He ended up being burned at the stake for heresy (1).

Thus, the risk that was associated in these days with straying from the dogma was considerable. Harvey must have been aware of such risk and was very cautious. Perhaps it was out of caution that he published his book outside England. Still, by contradicting Galen he did antagonize the medical profession, and that harmed his clinical practice. Harvey also paid another—political—price. In 1642, civil war broke out in England, and Charles I was executed. Because Harvey had been loyal to the king, he was removed from prominence.

The painting shown (Fig. 1) is by Robert Hannah (1812–1909). Painted in 1848 in the early Victorian period, it is a historical anecdote showing Harvey demonstrating his theory of circulation to Charles I (3, 5).
The lofty historical painting practiced in France at the time and regarded there as a pinnacle of artistic sophistication, tended in England to be toned down to lighter anecdotes and narratives. A classical revival came later, in the 1870s (6).

Apart from his science, the lasting legacy of William Harvey is the annual lecture known as the Harveian Oration (7). In 1656, he provided funds to institute “an annual feast” to be held by the Royal College of Physicians each October 18th (St. Luke’s Day). The feast was to include an oration devoted to “searching the secrets of nature by way of experiment.” The first Harveian Oration was delivered in 1656 by the London physician Edward Emily (1617–1657), and the tradition continues today.

It is appropriate to write about Harvey in this issue devoted to cardiovascular disease, not only because of his scientific insight. The story of his life also illustrates how new science emerges from previous fragments of knowledge and how important are teachers and peers. It also reminds us—somewhat ominously—of external influences that shape both science and recognition of individual achievement. In all, the story of William Harvey is a microcosm of science and its context.

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References


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