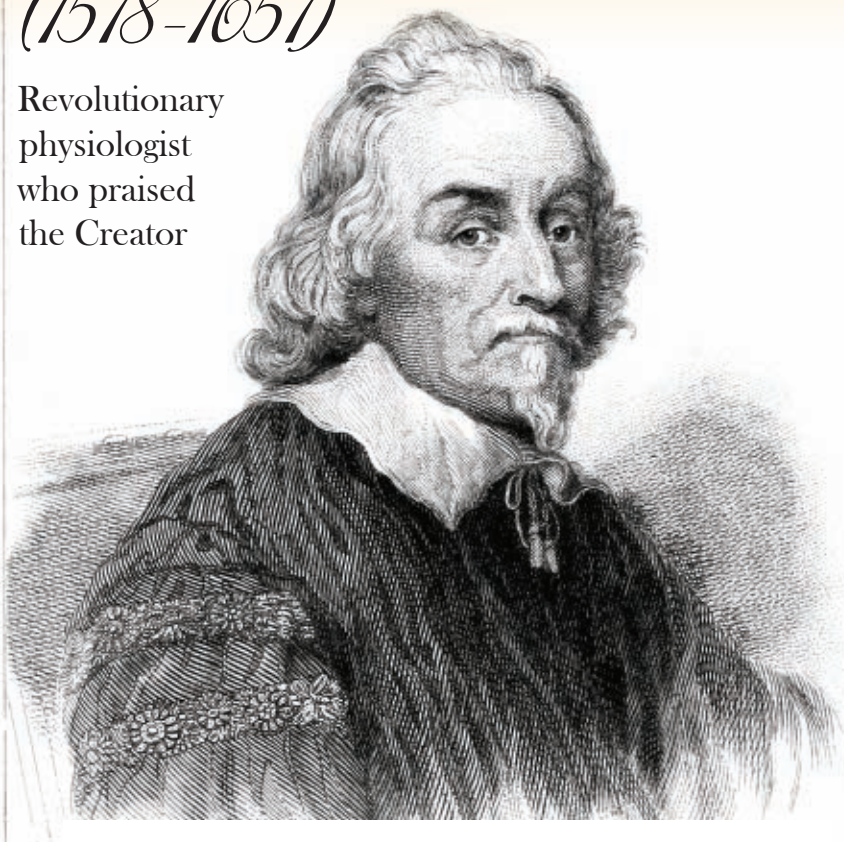
William Harvey

(1578–1657)

Revolutionary physiologist who praised the Creator



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"We acknowledge God, the supreme and omnipotent creator, to be present in the production of all animals, and to point … to his existence in his works."[1]

Ann Lamont

PRIOR TO William Harvey's time, doctors believed that venous "blood is formed in the liver and is then carried by the veins to all parts of the body, where it is used up."[2]

Such incorrect ideas about the source and flow of blood were proposed by the Greek doctor Galen. He had been the accepted medical authority for 1,400 years. However, Greek thinkers like Galen sought to deduce knowledge of how nature works by using human reasoning rather than by observing nature.

Unfortunately, applying such false ideas led to many medical procedures that were useless, and some were actually harmful to patients.

When the Reformation movement in Europe resulted in a more literal and objective interpretation of the Bible, this was a boon to science. Christians applied God's command to "subdue the earth" (Gen 1:28) to mean that they should make careful observations of nature in order to harness its resources. From their careful observations, they made deductions about how nature works in order to make practical use of that knowledge. This change in thinking gave rise to the scientific method.

One of the earliest scientists to champion the scientific method was William Harvey, who said:

> "… I profess both to learn and to teach anatomy, not from books but from dissections; not from the positions of philosophers but from the fabric of nature … ."[3]

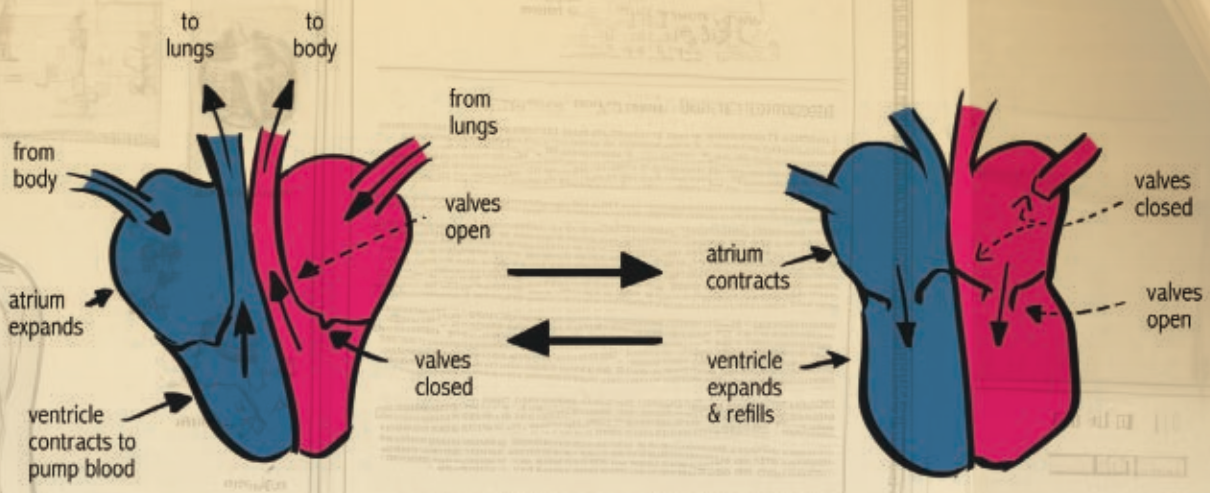

Fig. 1. Structure of the heart and a simplified representation of its action as a pump

Early life

William Harvey was born in April 1578 in Folkestone, Kent, in England. While all six of his brothers became merchants like their father, William became a doctor. After his schooling in Folkestone and at King's School in Canterbury, William studied medicine at Cambridge University in England and Padua University in Italy.

Medical career

Returning to England, Harvey quickly rose to prominence as a doctor. His fortuitous marriage in 1604 to Elizabeth Browne, whose father was physician to King James I, gave Harvey the opportunity to demonstrate his giftedness.

Harvey became a Fellow of the Royal College of Physicians in 1607, and he was the college's lecturer in surgery from 1615 until 1656. He also served as physician at St Bartholomew's Hospital, London, from 1609 until 1643. In 1618, Harvey became physician to King James I and then to his successor, Charles I.

While working as a doctor, Harvey could also pursue his research.[4] William Harvey was a pioneer of anatomy, physiology, and embryology. He was the key figure who discovered the truth about the movement of blood, and he is widely considered the 'Father of Cardiovascular Medicine'.[5]

Function of the heart

Several other scientists had previously noted that blood circulates between the heart and the lungs.[6] Harvey sought to determine what caused this circulation. He dissected the hearts of many animals and found that these hearts contained valves which allowed blood to flow in only one direction. He also saw that the heart contained two separate sides. One side pumped blood to the lungs while the other side received blood back from the lungs and then sent it out to the body.

The fibres and muscle tissue that Harvey found in the heart convinced him that the heart was a pump to control blood movement. He also discovered that the two sides contract together, not separately as had been previously thought.[7]

Source of blood

Harvey disproved Galen's idea that the liver manufactured blood which the body used up. He estimated how much blood was expelled during each beat of the heart and observed how often the heart beats. From these measurements, Harvey calculated that the liver would have to produce more blood in a day than the weight of the whole body, which was implausible.

Circulation of blood

In another experiment, Harvey used a ligature to cut off blood flow in a human arm. He observed that the artery drained of blood, while the vein became swollen.

With only a magnifying glass to work with, he was unable to see the

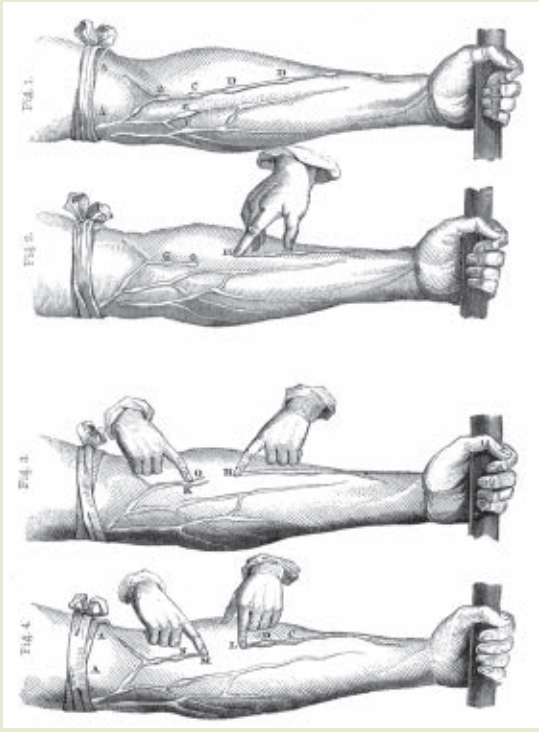

Fig. 2. A ligature experiment diagram in Harvey's classic work on circulation (fig. 4)

capillaries joining the smallest arteries to the smallest veins. He mistakenly believed that the blood must permeate through the tissues. In 1661, Marcello Malpighi was able to resolve this issue using the newly invented microscope. His observations provided "definitive proof of the existence of a continuity between arteries and veins and confirmed what had previously only been postulated by Harvey".[8]

Dissection of blood vessels also revealed that veins contained valves, but arteries did not. From this, Harvey concluded that the blood in the veins flowed back to the heart, and the valves "maintained the one-way flow."[9] Harvey published his findings (in Latin) in *Anatomical Exercise on the Motion of the Heart and Blood in Animals*, in 1628 (fig. 4).

Unfortunately, Harvey suffered derision and abuse because of the awe in which Galen was held. It took over 20 years for his findings on blood circulation to be generally accepted.[10]

Fig. 3. Harvey showed that blood circulates from the heart through arteries to tissues and organs, and then back to the heart through veins.

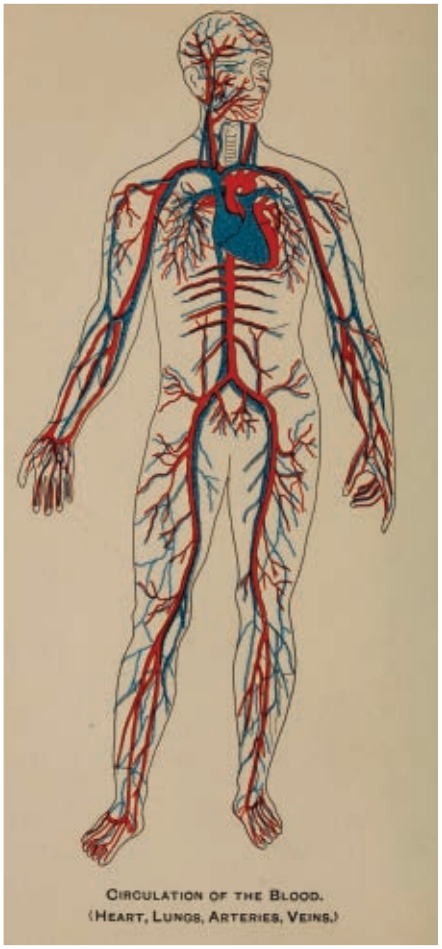

Fig. 3. PD | Brands, Orestes M., Van Gieson, *et al.* | commons.wikimedia.org


EXERCITATIO
ANATOMICA DE
MOTV CORDIS ET SAN-
GVINIS IN ANIMALI-
BVS,
GVILIELMI HARVEI ANGLI,
Medici Regii, & Professoris Anatomia in Col-
legio Medicorum Londinensi.

FRANCOFVRTI,
Sumptibus GVILIELMI FITZERI.
ANNO M. DC. XXVIII.

Fig. 4. Harvey's 1628 masterpiece on circulation, often shortened to *De Motu Cordis* (on the motion of the heart).

Fig. 4. CC BY-SA 4.0 | Wellcome collection | commons.wikimedia.org

Fig. 5. Examples of postage stamps honouring Harvey

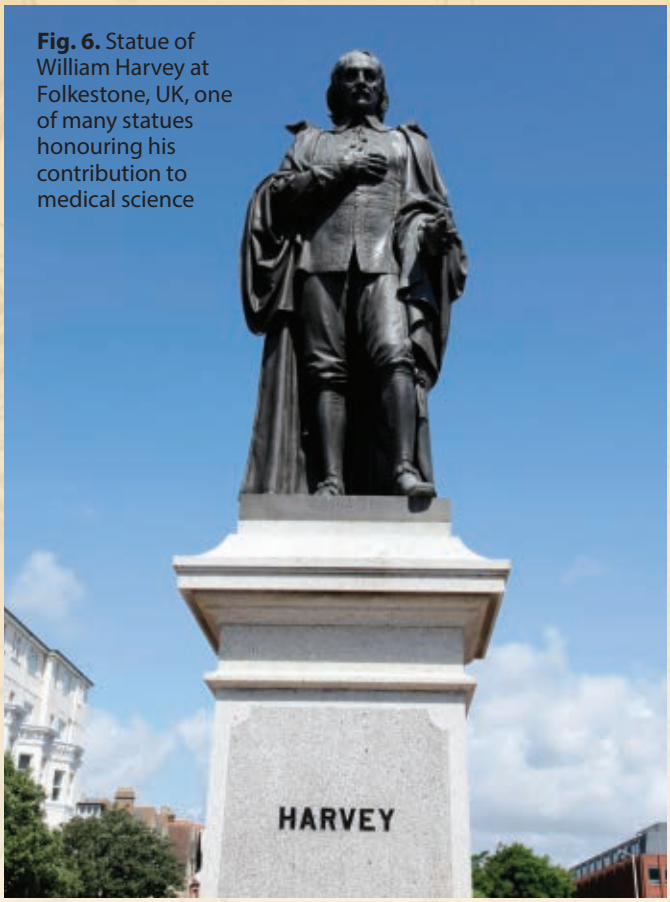

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Fig. 6. Statue of William Harvey at Folkestone, UK, one of many statues honouring his contribution to medical science

Reproduction in animals

In 1651, aged 73, Harvey published *Anatomical Exercises on the Generation of Animals,* sometimes shortened to *On Animal Generation*. In this work, he "made significant contributions to embryology".[11] Harvey investigated reproduction in many animals. In some such as chickens, "embryonic development occurs within eggs hatched outside the mother's body". In others such as the deer, "embryonic development occurs within the mother's body, resulting in the birth of live young".[12]

Despite differences of where embryonic development occurred, life developed from eggs in all the animals Harvey examined, including worms and insects. He found this to be inconsistent with the then popular idea of spontaneous generation—that some life forms arise from non-life. Harvey pointed out that even insects "spring from seeds" too small to be seen by the naked eye.[13] Later, in 1861, spontaneous generation was more thoroughly disproved by another Christian researcher, Louis Pasteur.[14]

Christian beliefs

Though not many details about Harvey's personal faith have survived, it is clear that "Harvey believed in the divine authorship and authority of the Bible and the deity of Christ".[15] Moreover, "a strong motivation behind" Harvey's work was "the search for purpose in nature resulting from God's creative wisdom".[15]

Harvey recognized God's "skillful and careful craftsmanship of the valves and fibres and the rest of the fabric of the heart".[15] Harvey stated to a friend, "The examination of the bodies of animals has always been my delight; and I have thought that we might thence not only obtain an insight into the … mysteries of nature, but there perceive a kind of image or reflex of the omnipotent Creator himself."[16]

After demonstrating that blood circulates throughout the body, Harvey saw a connection with Leviticus 17, concluding, "life therefore resides in the blood".[17] He also thought it appropriate that the Bible speaks of the heart as the core of a person, given the vital role it plays in the body. The physical heart, Harvey said, "nourishes, cherishes, quickens the whole body, and is indeed the foundation of life, the source of all action."[18] Proverbs 4:23 speaks of the spiritual heart: "Above all else, guard your heart for everything you do flows from it."

Important insights

Harvey's discovery of blood circulation is one of the greatest medical discoveries of all time. His scientific work was not only compatible with, but inspired by, his belief in a loving Creator. Harvey's greatest discovery, though, was Jesus Christ as his God and Saviour.

References and notes

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