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LETTER TO THE EDITOR

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William Harvey, discovery and life

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Dear Editor,

William Harvey was an English biologist and physician living at the turn of the 16th and 17th centuries (born April 1, 1578, died June 3, 1657). He was born in Folkestone (a city on the south-east coast of Great Britain), the son of a farmer, Thomas Harvey. He had numerous siblings, including seven brothers and two sisters.[1] William Harvey began his education at the age of 10 at King's School in Canterbury, and the next stages of his medical education were Gonville and Cauis Collage. In 1599, he graduated from Cambridge University, moving to the University of Padua, which at that time was a leading center when it comes to medical science. His mentor was Hieronymus Fabricius ab Aquapendente, who gave a detailed description of the crescent-shaped valves (in his work "On the Valves of the Veins"), which was the basis for Harvey's later discoveries. On April 25, 1602, he obtained his doctorate and then returned to England to practice his profession. Two years later he married Elizabeth Browne, the daughter of the London physician Launcelot Browne, who served as King James I's physician. his daughter) and raising his social status opened the way for him to salons.[1] In 1607 he joined the Royal College of Physicians, which was an organization treating patients from the highest society (he made an unsuccessful attempt to join in 1604 shortly after the wedding). Harvey was active in it until the end of his days. In 1609, he began working at St. Bartholomew's Hospital, London. In 1616, he received the Lambley Lecturer status in the Royal Collage of Physicans (which he kept until 1656), which meant that he was to teach anatomy to both doctors and surgeons (an interesting fact is that at that time both professions were separated from each other). However, he did not do it in the way it has been done so far. He presented anatomy on bodies during non-book dissections, which became the standard until the end of the 17th century, and the model of the practical study of anatomy has remained unchanged to this day.[1] From that moment he started climbing the career ladder to obtain the status of the Extraordinary Physician of the King at the court of James I on February 3, 1618, and then of his son, Charles I (here he had already taken the position of the Ordinary Physician, i.e. the king's chief physician). The relationship with the second of the aforementioned monarchs was reportedly very friendly, which resulted in permission to experiment on deer that were owned by the royal family. Harvey was also asked by the king to present him with medically interesting cases, which indicates his strong interest in medicine. We do not know much about his private medical practice (due to the later events related to the loss of his works and documents), and quite interesting information is that his patient was Francis Bacon – one of the greatest authors of empiricism.[1-3] The most important and groundbreaking for all medicine is the description of the movement of blood and the functioning of the heart, in the work "Anatomical Exercise on the Motion of the Heart and Blood in Animals" (today known as "De Motu Cordis"), which is his peculiar magnum opus. [Z] The field of his interest was also the biology of animals and their reproduction, which resulted in the publication of "Exercises on the Generation of Animals" dealing with the physiology of animals, in particular about reproduction.[4]

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Unfortunately, however, his wide field of interest and numerous discoveries have not been presented or have been published by other people due to the looting of his collections. It happened in 1642 in Whitehall, where Harvey had his home. He lost, among other things, a book containing numerous species of insects, notes with reported cases of his patients, descriptions of reports from post-mortem sections of people and animals, and many other significant notes. Harvey himself used to call the loss of so much of the collection "the greatest crucifixion". It is possible that this was a very strong component of his suicide attempt. [4] The Great Fire of London of 1666 also contributed to the loss of his legacy, which consumed the literature he had helped to gather for the Royal College of Physicians.[4]

It is also worth mentioning here that Harvey had his role in the famous witch hunt. However, it was not a negative role, because he approached women tried for witchcraft objectively and found them innocent. He also made expeditions alongside the king during the English Civil Wars, and participated in diplomatic missions. [4] William Harvey died in London of a stroke. Before his death, he suffered from insomnia caused by his work, gout and kidney stones. While still alive, he was recognized by the environment for his groundbreaking discoveries. It is one of the few cases where a groundbreaking explorer can enjoy fame while still in existence. [1] As mentioned above, his life's work is "Anatomical Exercise on the Motion of the Heart and Blood in Animals". It is a 70-page book published in Latin in 1628 and in English in 1653 dealing with the movement of blood and the role of the heart in that movement. She presented the groundbreaking statement that the heart acts as a suction pump, and blood circulates in the body. To better present how groundbreaking this discovery was for those times, we should briefly mention the beliefs about blood, heart and liver at the turn of the 16th and 17th centuries. The theories of the doctors of that time were still based on the works of Galen, a Roman physician who lived around 100 AD. He assumed that clear blood was flowing in the arteries, transmitting substances that it bound in the lungs (no molecules, especially oxygen, were known at that time) and transferred it to organs such as the brain, muscles or pancreas with the help of the heart, which was supposed to pump only "lung blood". Dark blood was supposed to flow in the veins, carrying nutrients bound in the liver. As we know today, Galen was not mistaken much in his assumptions when it comes to the generalized properties of blood. However, he additionally postulated that blood is consumed by the organs to which it goes and then reconstituted (by the liver), which was the basis for such blood circulation. It was also the basis for the use of phlebotomy, which was to restore the balance of the body's fluids, because disease was then associated with this imbalance.[5] Harvey during the lessons he gave (Lambley Lecturer) was able to closely observe and examine the human body, which allowed him to question Galen's postulates about blood and heart. Probably around 1618 he came up with the concept of the heart as a pump. He began his deliberations by asking himself questions that Galen and his theory of anatomy and physiology could not answer, eg. Why do valves, despite the same structure, fulfill different functions? Why is the pulmonary artery so large compared to the other "nourishing vessels" if (according to Galen) it was intended only to nourish the lungs? And why would blood flow into one ventricle and drain out of the other if they both contract at the same time?.[1] With these questions, Harvey questioned the whole philosophy of the Roman genius's understanding of the heart and started a period of theory based on experience and facts without authority. I profess to learn and to teach anatomy not from books but from dissections, not from the tenets of Philosophers but from the fabric of Nature - William Harvey.[2]

While observing the capacity of the vessels, counting the amount of blood that was in the body and estimating the amount of blood pumped by the heart per minute (today we know this value as cardiac output, it is 5-6 liters), Harvey concluded that such a large amount was impossible to achieve. resynthesized by the liver in such a short time and thus has to constantly circulate. However, he did not know how it happened, but his subsequent experiences were to shed light on it.[4] Harvey based his further experiments on studying the veins and valves in them. They consisted in ligating the subject's hand above the forearm or other examined parts of the body and forcing the person to exercise in order to fill the veins with blood. On the subject's hand, there were clearly visible superficial veins with valves. The researcher then pressed a finger against the vein to block the flow of blood in it. t turned out then that the blood "blocked" on the valves as if it were reflecting on them. If the blood in the veins was flowing around the perimeter as Galen assumed, the veins should collapse below the finger position, not above which meant that blood was flowing inside the cage. Harvey repeated this experiment on other parts of the body and determined that the valves were arranged around a centrally located heart.[4]

To answer the question about the role of contraction and relaxation of the heart, Harvey chose cold-blooded animals (then referred to as cold-blooded), whose hearts beat much slower than human ones, which facilitated the observation of changes occurring during the heartbeat. An English physician noticed that during contraction, the aorta fills with blood similar to the pulmonary artery, which was already the basis for refuting Galen's assumptions. Further observations allowed Harvey to distinguish systolic and diastolic pulses, which he

himself did not know, and the term was used by medicine years later. Harvey, on the basis of the above-mentioned (and other not mentioned in his book) theories and observations, presented a comprehensive model of blood circulation in the body and the role of the heart in this movement. The heart was supposed to pump blood with a vital particle taken from the lungs (today we know it as oxygen) around the periphery to all organs. From them, blood was to be collected by less flexible venous vessels and pushed by the muscles towards the heart into the right atrium (from today's perspective, we know that the main force driving venous return is the pressure difference between the left and right atrium, but the mechanism presented by Harvey also plays big role in this movement). Then the blood was sent to the lungs by the pulmonary artery, where it was supplied with the above-mentioned substance and returned to the left atrium and then to the ventricle, which was a condition for the closure of the entire cycle.[1] It is absolutely necessary to conclude that the blood is in a state of ceaseless motion; that this is the function which the heart performs by means of its pulse; and that this is the sole and only end of the motion and contraction of the heart. - William Harvey Harvey's groundbreaking theory caused the expected uproar among his colleagues, but it was mostly negative despite the positive reception of King Charles I. use of laxatives.[5] Despite general rejection from the community, Harvey continued teaching as Lambley Lecturer, which helped train a new generation of physicians to base their therapies and research on facts and experiences. Additionally, to counter criticism by Jean Riolan, the English anatomist published "Two Anatomical Exercises on the Circulation of the Blood" in 1649.[2-4]

Despite such extensive knowledge and numerous attempts, Harvey did not prove the existence of a connection between the veins and arteries that would complement his theory, but Marcello Malpighi did it with a microscope, which during the English researcher's lifetime was not developed enough to be able to show images at a magnification sufficient for observation of capillaries.[5] His impact on medicine, as well as on the history of the world, is placed on the 55th place of the hundred most important people in the history of the world according to Michael H. Hart. [3] Another significant event showing William Harvey's influence on medical science is the exhibition dedicated to him at the opening of the 500th anniversary of the Royal College of Physicians, a member of which he was a member practically throughout his professional life. [6] Many centers named after him were named in honor of the genius explorer, e.g. the residential wing of the Royal College of Physicians, the hospital in Ashford in Great Britain named after him (it is a town 34 km away from Folkestone), The Harvey School which is an institution for children from 6th-12th grade located in New York, William Harvey Research Institute / Heart Center under the jurisdiction of Quinn Mary University of London dealing with biomechanics and biochemistry of the heart.[5-6]

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