

THE LIFE AND WORK OF WILLIAM HARVEY*

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During 1957, my year of office, the death of William Harvey was commemorated throughout the civilized world. It is therefore appropriate that I should tonight recall the life and work of this outstanding colleague.

William Harvey was born in 1578 to young and happily mated parents in the 20th year of Elizabeth's reign, with Drake in the 'Pelican', 3½ months at sea on the first English voyage round the world; Hawkins at work, not wholly to his own disadvantage, upon the Navy that was to discomfit Spain; Gilbert at Limehouse brooding over his plan for future overseas colonies; Frobisher on the verge of sailing from Harwich upon the third of his Arctic explorations; Sydney at Court, beloved of the Queen and already encouraging, perhaps by his friendship, Spenser's muse 'out of the floor to sing his sweet delight in lowly lays'; Bacon reading for the Bar, but for the moment in France; Shakespeare and Marlowe boys of 14—and something of what that stood for can hardly have failed to find its way across the Harveys' threshold.

Harvey received his early education at King's School, Canterbury, and then obtained a scholarship which took him to Caius College,

Cambridge, for 6 years. The scholarship was founded in 1571 by Matthew Parker, Archbishop of Canterbury, and one of the interesting conditions was that at the University the scholar should be educated first in subjects that pertained to medicine, and then in subjects which actually constituted medicine itself. Such a regulation for a medical scholarship was very remarkable, and unique at that time.

In Harvey's 'Prelectiones' there are references to the anatomy of no less than 80 animals, and his book on generation is a mine of information on natural history. Many references are made to Harvey's intense interest in natural history. This intense lifelong devotion to this science is an inborn quality, and it is by no means unlikely that in Harvey's schoolboy days it was this predilection that justified the authorities in nominating him to what was practically a medical scholarship.

Harvey's first term at Cambridge began in May 1593, when he was admitted to the scholars' table at Caius College. Although Caius College had a medical reputation there is rather meagre evidence of systematic instruction in medical subjects. Dr. Caius had obtained a licence for the dissection of two bodies annually in the winter, and for their decent burial. The church registers give evidence that bodies, chiefly of prisoners, were dissected, and demonstrations were given.

The Exit Book throws some interesting information on Harvey's time at Cambridge. During the first 3 years there were no absences beyond one month's annual holiday. During the next 3 years the Book shows repeated absences, and Harvey was away from college not less than 16 months. We know that Harvey, like Sydenham, suffered severely from gout at various times, but there is no certain explanation of his absences. He took his Arts degree in 1597. Following in the footsteps of Linacre and Caius and of other Fellows of his College, Harvey went in 1600 to Padua, where the standard of luxury was scarcely high. The food was bad, and the windows of the students' quarters consisted for the most part of sheets of linen. Artificial light was a rare amenity, and there was very little amusement for leisure hours.

* Valedictory Presidential Address.



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Before we follow Harvey's further career, let us consider for a moment the intellectual atmosphere of Europe when he began his course at Padua. There had been a great revival of classical learning, followed not only by the Reformation and the consolidation of the Protestant states, but by the counter-reformation of the old Catholic countries. And there was a great ferment of free enquiry on philosophy, on the principles of government, on the polity of nations, the rights of the humbler folk, and the conduct of life. The creation and dissemination also of the greatest English literature was then in progress. Tolerant and open-minded Britain welcomed to permanent posts many learned men from other lands. Continental travel attracted many Englishmen who sought illumination in those days far more in Italy than in Germany, or even in France.

Galileo had been lecturing 6 years at Padua before Harvey went there. Robert Boyle was not born till 1627, and the work of Torricelli and of Pascal was still to come. The Royal Society held a few informal meetings in 1645, but did not receive its charter till 1662. Thus, although at the end of Harvey's life physics had made great advances, in 1600 it was by no means a popular science. The chemistry of that time was dominated by unverifiable hypotheses which were too vague and nebulous to suit Harvey.

Of the biological sciences the subject which not only engaged the energies of some of the greatest men of that generation, but also attracted the interest of educated people, was human anatomy. Italy was the Mecca of anatomical students. At Padua itself there was a great tradition, for Vesalius, Falliopus and Fabricius formed a brilliant succession of teachers. Indeed it was in anatomy and surgery, rather than medicine, that the progress of the age was being principally reflected. Harvey found himself in the van of all that was progressive in his chosen career.

Charles I took the greatest interest in anatomy and in the numerous demonstrations, not only on the circulation of the blood, but on embryology, which Harvey gave him from time to time.

But it is important to note that although the great Italian anatomists had made enormous strides in the study of structure, their knowledge of function was lamentably small; physiology had not kept pace with anatomy. It has indeed been stated that physiology had not advanced since the time of Galen, and doubtless its inadequate progress was partly the consequence of the prevailing ignorance of physics and chemistry.

What Harvey's exact attainment was at this time in anatomy and the technique of dissection we have no means of knowing, but we have reason to believe that even then he was by no means ill-equipped with ancient learning. We know that he was a keen and accurate observer and an enthusiastic naturalist, and that he had a mind reflective on the causes and relations of things, fertile in recognizing resemblances and, above all, ready in making working hypotheses and devising experiments which would verify those hypotheses.

From the time when Vesalius described the valves of the heart, the Italian anatomists had been keenly exercised on the valves in various parts of the vascular system; Fabricius' discovery of the valves of the veins was made as far back as 1574. But the scientific use of the imagination seems to have been dormant with these clever observers, and they were inept in explaining the mechanism of the valves.

Sir William Osler suggests that it was reflection on the mechanism of the valves of the veins which at this early stage led his mind in the direction of his own great discovery, and there is a remark of Harvey's friend Robert Boyle which is not inconsistent with that suggestion. Boyle says that Harvey's observations on 'contrivances similar to the valves used in hydraulic engines for preventing counter-currents led to his discovery of the circulation of the blood'. It is certain from the terms of his diploma that Harvey enormously impressed his teachers and examiners with his knowledge and ability.

Harvey returned home in 1602 and, after his incorporation as Doctor of Medicine at Cambridge, he presented himself to the College of Physicians as a candidate, which is equivalent to the present designation of Member. He was elected to the Fellowship in 1607, being then 29. Harvey then became a physician at St. Bartholomew's Hospital. The relations between the Governors and Harvey were creditable to both sides. In 1633 Harvey submitted revised hospital regulations, and these were adopted; they show that Harvey was a strong conservative and that he stoutly maintained the then existing supremacy of physi-

cians over surgeons. The surgeon was not only obliged to consult the physician in all difficult cases and whenever inward physic was required, but he was not to be allowed to perform any major operation without the approbation and the direction of the physician. The surgeon was forbidden to give inward physic and had to attend the physician in his weekly consultations in the Great Hall, to which the patients were brought and where both matron and apothecary attended. In those days the surgeons had to visit their patients in the wards, and the physician as a rule only went to the wards when his patients could not be brought to the Hall, where most of the medical work was done.

Harvey was connected with St. Bartholomew's for 36 years. His post of Court physician, first to James I and subsequently to Charles I, led to his having a considerable clientèle amongst the well-to-do. We know that some of the most eminent men of time were his patients. It is said that his practice declined sharply after the publication of his 'De Motu Cordis'.

Harvey's Court duties were by no means strictly limited to medicine. As physician to the Court he was instructed to take two long and important continental journeys. In 1630 he accompanied the young Duke of Lennox on a rather prolonged tour, during which he several times dodged the plague and was greatly impressed with the impoverishment of the countries through which they travelled. In 1636, he accompanied the Earl of Arundel, the Lord High Marshall, on an embassy to Vienna and Ratisbon, which was mainly concerned with efforts to secure the restoration of the King's nephew, the young Prince Palatine, to his proper status.

It was during a visit to his friend Lord Feilding that he was detained at the border for fear that he might be carrying the plague. Harvey refused to go to the lazaretto and elected to stay in the open fields. Detained, Harvey writes to Lord Feilding: 'I am fallen into the hands of a base and evil people and while they delight to exercise their tyranny I am to lie in the open fields for God knows how long, and I fear it will do hurt to my health'. As a result of this letter Harvey was offered a roof and a bed, but this he declined because, as he said, 'such offers were unseasonable, like physic when a man was dead'.

A few days later he writes: 'Their manners and cruelty have been shameful, and I now have a sciatica that maketh me lame. I have never longed for anything so much as to be gone from this base place'. He was detained here almost a month.

As court physician, Harvey accompanied the King for his Scottish coronation. It was characteristic of the man that his chief interest was not the ceremony, nor the theological disputes, but his own visit to the Bass Rock in order to find out some points with regard to the solan goose or gannet, which then, as now, congregated on that island in great numbers.

The clouds were gathering for the Civil War, and Harvey's official association with the King rendered him *non persona grata*, not only with the Parliamentarians in the House of Commons, who tried to oust him from St. Bartholomew's Hospital, but also to a mob who sacked and plundered his official lodgings in Whitehall. Harvey, referring to this outrage, says the cause of his sorrow is that certain rapacious hands 'stripped not only my house of its furniture but, what is subject to far greater regret with me, my enemies abstracted from my museum the fruits of many years of toil . . . whence it has come to pass that many observations, particularly on the generation of insects, have perished with detriment, I venture to say, to the republic of letters'. It has been assumed that Harvey's medical observations, as well as some other papers, were destroyed by this mob.

Sitting under a hedge and reading a book, he was present at the battle of Edgehill—that strange encounter in which, the day before, an oblivious squire had gone hunting between the armies but had obligingly agreed, on having his position explained to him, to take a hand with his servants. Later, owing to a cannon ball and the fact that he was in charge of the future Charles II and his brother, Harvey, to his annoyance was obliged to move. But he seems to have played his part in succouring the wounded, of whom it is related that Adrian Scrope, having been left for dead, was afterwards 'recovered by the immortal Dr. Will Harvey'.

There must have been many of Harvey's friends on both sides of that great struggle, but there is no evidence that he took any part in political affairs whilst he was with the King at Oxford from 1642 to 1646. Here he was incorporated a Doctor of Medicine, and during the last year was appointed Warden of Merton College.

After the Civil War he retired, a saddened man of 68, to the quiet and rest provided him by his relatives in and about London; his rich and influential merchant brothers may well have secured him protection in his retirement.

It is probable that, from 1602 onwards, Harvey was working at his subject, and from 1609, when he was formally elected Physician to St. Bartholomew's, he must have gradually acquired a reputation as an anatomist as well as a physician. In 1615, at the age of 27, he was appointed Lumleian lecturer to the College of Physicians, a post which he held until 1656, the year before he died.

The 'Prelectiones' which bear the date of 1616 are really the lecture notes for the first anatomical course which Harvey delivered. The practical instructions which he laid down for his own guidance in method seem to be the last word on the proper objects and limits of oral teaching and demonstration, and are a model to be utilized by every medical teacher of our own time. The special value of this MS, which deals chiefly with the viscera, is that we have here Harvey's first account of the circulation of the blood, the full exposition of which he gave in his printed book in 1628.

I need not dwell on Harvey's masterpiece, so brief, so terse and so convincing, a model for all time of inductive reasoning. Let us never forget the two supreme doctrines which he established and which neither his predecessors nor his contemporaries had understood: Firstly, the circulation of the blood from the heart through the arteries and back through the veins to the heart again. The pulmonary circulation, it is true, had been more or less understood, but it was reserved to Harvey to establish the true nature of the systemic circulation, and to give the *coup de grace* to the ebb-and-flow movement of the blood current, which was the accepted explanation up to this time. And secondly, the muscular contraction of the ventricles, the real motive force of the circulation, which previously had been conspicuously ignored and misinterpreted.

Harvey's view of the respiratory function was inadequate, for he summed it up in cooling and ventilation, and never thoroughly faced the difference between arterial and venous blood. But the day of chemistry was not yet, and it was impossible for him, without the help of a microscope, to bridge over the space between the arteries and the veins.

His work on generation has been spoken of as Harvey's aftermath; it tells us incidentally about the worldly experiences of a

long and chequered career, and displays Harvey's speculative and contemplative side.

From 1646 to 1657, his Court duties ended, his private practice relinquished, Harvey lived henceforward in retirement, first with one of his merchant brothers, then with another in London or in the country near by. His brothers were substantial and influential people and looked after his money affairs, so that he had no anxieties.

We know little of his married life, but it must have been a happy one. His wife was the daughter of an eminent physician, Dr. Lancelot Brown, and she predeceased him by some years. He was childless, but his care for his nephews and nieces was very marked. The College of Physicians was the chief interest of his old age. Besides being Lumleian lecturer, he had been at different periods censor, treasurer elect, and finally, when he graciously declined the presidency, Councillor of the College.

An interesting autographical note by William Heberden has been discovered on the habits of Harvey, communicated to him by Harvey's great-niece, as follows: 'In 1761 Mrs. Harvey (great niece to Dr. Harvey) told me that the Doctor lived at his brother's at Roehampton, the later part of his life. That he used to walk out in a morning combing his head in the fields. That he was humorsome and would sit down exactly at the same time he had appointed for dinner, whether the company were come or not. That his salt cellar was always filled with sugar, which he used to eat instead of salt. That if the gout was very painful to him in the night, he would rise and put his feet into cold water.'

To read Harvey's work is to be conscious of companionship with a man of dynamic personality and a great lover of truth. Across three centuries of time William Harvey, the immortal founder of modern physiology and modern medicine, exhorts men to search and study out the secrets of Nature by way of experiment, and for the honour of the profession to continue in mutual love and affection. In the words of Hobbes, though he had lived to see 'his new doctrine everywhere established', he had been one of the few that had 'conquered envy'. And his last letter, perhaps, tells us why. It was to a young doctor who had sent him a specimen, and having thanked him for his kindness, since it was in just such deviations from the normal that Nature revealed her 'secret mysteries', he pointed out that as an explorer his own days were, alas, numbered. But 'it will always', he wrote, 'be a pleasant sight to see distinguished men like yourself engaged in this honourable arena' and, 'whatever you do', he added, 'not a very hard task, surely, still love yours most respectfully William Harvey'.