William Harvey

The Circulation of the Blood

and other writings

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Translated by

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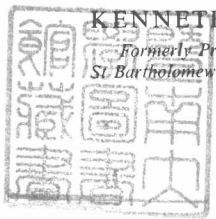

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EVERYMAN, I will go with thee,

and be thy guide,

In thy most need to go by thy side

WILLIAM HARVEY

Born at Folkestone in 1578. Educated at Canterbury, Cambridge and Padua. Fellow of the College of Physicians, 1607; became Physician at St Bartholomew's Hospital. Died in 1657.

INTRODUCTION

WILLIAM HARVEY was born on 1st April 1578 in Folkestone, a 'limb' of the Cinque Port of Dover, the first of the nine children of Thomas Harvey, Esquire, and his second wife, Joan Hawke or Haike. He was thus an Elizabethan, and we get some appreciation of what that meant if we read pages 9–10 of C. V. Wedgwood's *Seventeenth Century Literature* or recall the naturalness of the sculptures which are in Westerminster Abbey and were shown in a special exhibition in London after the Second World War. The spirited nature of Harvey as a young man was in keeping with Wedgwood's pen-picture. His father, Thomas Harvey, was elected mayor of Folkestone in 1586 and hence was importantly concerned with the preparations for invasion in 1587 and with the actual defeat of the Spanish Armada in the following year.

During that summer Harvey passed the examination in reading, writing, English and Latin for his admission into Canterbury Grammar School (or King's School, Canterbury) as a fee-paying scholar. His boyhood was influenced by persons rather than institutions, by nature's way rather than by abstract ideas. From his mother came his charitable disposition and his lifelong though unobtrusive loyalty to the Anglican faith and liturgy. From his father came his vigour, temper and capacity for hard work and for taking pains. It is interesting to note that he wrote in an album in 1641: 'Dii laboribus omnia vendunt' (Hard work is the price of every achievement). In the vale of Folkestone he found his kinship with the life of the countryside.

At ten years of age he was admitted to King's School,

Canterbury, where his schooldays seem to have been not too dissimilar to those which he was to have later as an undergraduate at Gonville and Caius College, Cambridge, and it is probable that by the time he went thither he could not only read, write and speak Latin, but had a working knowledge of Greek.

In his sixteenth year Harvey, described as the son of Thomas Harvey, Yeoman, of Folkestone in the County of Kent, was admitted at Gonville and Caius College, Cambridge, on the last day of May 1593, as a Scholar, and became the only one of the first ten holders of the Matthew Parker scholarship to take up medicine, though the conditions were most favourable, namely, three years of study in subjects useful to medicine, followed by three years' study of medicine itself. Further, the scholars had to be able, learned and worthy youths born in Kent, and educated in Canterbury.

The student's day began with chapel at five o'clock. From six to ten o'clock there were lectures, with an interval for a snack of bread and some beer, a meagre dinner at ten o'clock, and then, from 10 a.m. to 5 p.m., teaching and learning followed at five o'clock by supper, which was 'not much better than dinner' had been. From six to nine o'clock there was reasoning or other study, and finally for half an hour from 9.30 running to get the feet warm before bed. The standard of living at the university did not improve until after Queen Elizabeth's day.

Harvey kept his residence well at Caius up to summer 1596, but after that lost some time through periods of ill health. He finally left Cambridge on 30th October 1599, intending to return in January 1600, but the first part of that term found him instead at Padua.

In recalling in 1662 Harvey's life at Cambridge, Scarburgh (Payne, 1957) tells of 'the great goodwill, the esteem and the devotion he excited among those around

him; for such was his nature. He devoted himself assiduously to his studies and turned with the greatest zeal to philosophy. After the manner of the ancient philosophers he thought that he should travel as widely as possible in the hope of acquiring thereby some of their teaching and wisdom.

'It would seem that while he studied at Padua, and not before, he began to think of his career. He thought again and again and for a long time how he could raise himself effectively from the ground and place his head among the stars and at last there settled in his mind the wish to embrace medicine.' Accordingly, on St Luke's day in 1600, he enrolled among the students of Hieronymus Fabricius of Aquapendente, the professor of anatomy, and such was his popularity that he was elected as councillor of the English students in the Jurist University for the years 1600–1 and 1601–2, receiving thus the right to display his stemma in the university cloisters. The pen-picture Sir Thomas Barlow drew of him as he was in 1600 was 'rather on the small side, with raven hair, dark piercing eyes, somewhat sallow complexion and a keen restless demeanour and rapid speech'. He was also a keen and accurate observer and an enthusiastic naturalist, and he had a mind that lent itself to reflection on the causes and relations of things, was quick to recognize resemblances and, above all, was fertile in making working hypotheses and in devising experiments which would more or less verify them. It was in these latter qualities that Harvey's supremacy over his teachers and predecessors ultimately became so manifest. The addition of experiment to observation was vital and far reaching.

In Harvey's time there was an anatomical school at Padua on Vesalian lines, with comparative anatomy and embryology added from Aristotle, and experimental physiology reintroduced after its more or less complete

abeyance throughout the world since Galen's time, and given (Cawadias, 1957) an English prudence, thoroughness and patience.

For a brief account of Fabricius, who stimulated Harvey's interest in embryology and the existence of valves in veins, and of his wonderful permanent anatomical theatre at Padua, see Franklin, 1933.

On 25th April 1602 Harvey was given a diploma as Doctor of Medicine of the University of Padua which was signed by Count Sigismund and witnessed by Simeon Fox (later president of the College of Physicians) and Sir Matthew Lister (later Physician-in-Ordinary to King Charles I). But most interesting was the signature of Fabricius, who in 1600 must have been preparing for the press his book on the valves or little flood-gates in veins (*De venarum ostiolis*, 1603). This book was wrong in some important respects, but at least it had the striking observation about valves: 'Insuper est adnotandum quod summa cum tenuitate summa etiam densitas adjuncta sit' (Above all should it be noted how with extreme delicacy is joined extreme firmness). Fabricius intended his book on the valves to be one of a series of standard size anatomy textbooks, but while he was allowing Salomon Alberti to publish *his* account and figures first and while his own was still evolving, William Harvey had returned to England with *his* plans.

It is very relevant to ask how the latter saw so clear a line of research ahead of him, for his research principles would appear to have remained constant throughout his life, so that two sections from *De generatione animalium* can still be read with profit. Also, his embryological work was begun in Padua with Fabricius, even if the account of it as a whole was not sent by Dr Ent to the press until half a century later. 'Careful observation', Harvey wrote, 'is needed in every discipline, and sensation itself is often to

be consulted. One's own experience is to be relied upon, not that of someone else.' Just after that he advised that we should base our judgment on our observation rather than accept anything which he wrote about the generation of animals. 'For all true knowledge depends on beginnings derived from sensory investigation, and special care must be taken that you know these things well and have investigated them through frequent dissections of animals. . . . In this rank age there are many who write and argue speciously, but few who are truly wise and philosophers. I have thought fit to offer you this foretaste of what is to come so that you may know the assistance on which I have relied, and the advice which I have followed, in making these experiments and observations of mine public knowledge . . . so that you yourselves, treading in the same tracks, may not only judge impartially but, deserting clevernesses and probable guesses and, keeping to what you can see for yourselves, may discover very many things as yet unknown to others, and certainly rather outstanding.'

'All men', says Aristotle, 'the leading dictator of philosophy', 'naturally wish to know. The sign of this is the pleasure which they get from using their senses, among which I choose as the outstanding one that of vision, because this is the one most conducive to our knowledge of anything and makes plain many differences. . . . The research method in use today is very unsuitable and misleading, since very many inquire not what things are, but what is said about them by others. . . . I therefore whisper in your ear, friend Reader, that you weigh in the exact balance of experience whatever I treat of in these essays . . . that indeed you use them only in so far as you find them most firmly corroborated by the direct evidence of your own senses.'

Dealing with Harvey's recollection of the reasons that

induced him to think of a circulation of the blood, the Hon. Robert Boyle wrote: 'He answer'd me that when he took notice that the Valves in the Veins of so many several Parts of the Body, were so plac'd that they gave free passage to the Blood Towards the Heart, but oppos'd the passage of the Venal blood the Contrary way: He was invited to imagine, that so Provident a Cause as Nature had not so Plac'd so many Valves without Design: and no Design seem'd more probable, than that, since the Blood could not well, because of the interposing Valves, be sent by the Veins to the limbs, it should be sent through the Arteries, and return through the Veins, whose Valves did not oppose its course that way.' Drs Hunter and Macalpine have found over a score of passages in which Harvey is mentioned in Boyle's Works, including No. 5 from page 119 of their 1958 paper, which also refers to the valves and the circulation.

After his incorporation as M.D. at Cambridge in 1602, Harvey lost no time in applying for admission to the College of Physicians, and after further appearances was admitted a candidate on 5th October 1604.

On 24th November 1604, in St Sepulchre's Church, Holborn, he married Elizabeth Browne, daughter of Dr Lancelot Browne, who had been first Physician to Queen Elizabeth. Elizabeth Harvey's portrait used to hang at Burley-on-the-Hill, but it was destroyed by a fire in 1908, in which the damage was extensive owing to the failure to catch the Oakham Fire Brigade horses. According to Norman Moore it showed her to have been tall, of a dark complexion and somewhat severe aspect.

Harvey was elected Fellow of the college on 16th May 1607, and began an active association with it that ended only with his death.

In 1608 the governors of St Bartholomew's Hospital, on the recommendation of King James I, appointed him

physician in reversion, and on Dr Wilkinson's death in the summer of 1609, Harvey became physician. In November 1613, the year in which Fabricius retired from his chair at Padua, Harvey was elected Censor of the college, an office which he also held in 1625 and 1629.

On 16th, 17th and 18th April 1616 he gave the Lumleian Lectures at the college, and in the second one he made publicly known for the first time the gist of his revolutionary new ideas on the movement of the heart and blood in animals. He also had ideas about the local movement of animals, though these lay dormant in manuscript until very recently. Here it can be said that there was no serious opposition at the college to his ideas on circulation except on the part of Dr James Primrose (died 1659), who accepted Galen as authoritative and said that in the olden times patients were healed without a knowledge of the circulation and that this doctrine, even if true, would be of no practical value. In November 1627 Harvey became an Elect of the college; in the following year he was elected treasurer, and also published his first book, a short one of seventy-two pages giving the literature and also the discoveries resulting from his own experiments on animals. The book closed with a resounding declaration that 'All these phenomena to be seen during dissection, and very many others, appear if rightly assessed to elucidate well and to confirm fully the truth which I stated earlier in it, and at the same time to oppose the commonly accepted views. For it is very difficult for anyone to explain in any other way than I have done the reasons why all these things have been arranged and carried into effect in the manner I have described.'

It must have been a supreme act of courage on the part of the fifty-one-year-old Harvey to oppose tradition single-handed in asserting that the blood travelled along a previously unrecognized circular pathway of its own,

and it is not difficult to guess what a help and encouragement it was for him to win from his colleagues at the college acceptance of the ocular proof of his assertions.

In 1629 Harvey became physician to the king and to the royal household, and the king encouraged his physician's researches and with his nobles used to get Harvey to demonstrate his great discovery.

Early in 1633 he commanded Harvey to attend him on a journey to Scotland, where his Scottish coronation was even then being planned. On the way north Harvey was entertained by the Earl of Arundel, and Charles was duly crowned in the abbey church at Holyrood, but in various tactless ways upset his northern subjects. The city of Edinburgh, however, gave a banquet for him, and on the same occasion Harvey was admitted a freeman and guild-holder of the city. On 5th October he was back at St Bartholomew's Hospital as a physician without duties.

While in Edinburgh he had shown no interest in court life or sectarian disputes, but had visited the Bass Rock, a landmark which later he described very graphically in his 1651 book.

In 1634 his enlightened views and prompt and energetic action resulted in a pardon being obtained for four out of the seven convicted so-called Lancashire witches. On Queen Henrietta Maria's birthday (16th November) in the following year he and the other royal physicians carried out an autopsy on one of the king's subjects, a certain Thomas Parr, who had been a small holder in the Shropshire village of Winnington up to the unbelievable age of 152 years 9 months, when the second Lord Arundel brought him from Shropshire to London and showed him to the king. Harvey's notes on the autopsy are quite interesting, and its subject was thereafter buried in Westminster Abbey.

Early in 1639 Harvey went with the king and Lord

Arundel to Scotland, but the troops sided with the Scottish and the king, on 18th June, signed the so-called 'Pacification of Berwick'.

The king's proclamation, dated 9th August 1642, denouncing the Earl of Essex as a traitor, was read, so far as Oxford is concerned, on 13th August, and nine days thereafter the king set up his standard at Nottingham. Harvey had left London with him, and was present not far from the fighting when the indecisive battle of Edgehill, the first major conflict of the Civil War, took place on 23rd October 1642. The traditional story is that the Prince of Wales and his brother, the Duke of York, were entrusted to his care. With the outcome of Edgehill indecisive, the king moved on to Banbury and Oxford at a leisurely pace, and made a state entry into the latter with his two sons and his two nephews (Princes Rupert and Maurice) on 29th October. After that date Harvey more or less settled down to scientific academic pursuits for nearly four years, incorporating as Doctor of Medicine of Oxford on 7th December 1642, the year in which Nathaniel Highmore proceeded to the degree in the normal way. The latter's textbook of anatomy, dedicated to Harvey in 1651, was the first produced in England in which the circulation was fully recognized.

Charles Scarburgh (1615–93), who with the Civil War was ejected from his Fellowship at Harvey's old college at Cambridge, withdrew to Oxford and entered himself at Merton, where he became a friend of Harvey and helped him considerably in his studies of the generation of animals.

Harvey gave Scarburgh letters testimonial for incorporating as Doctor of Medicine at Oxford on 23rd June 1646, and the two men remained firm friends up to Harvey's death. In 1643 the House of Commons resolved that Harvey, as a follower of the king, should be

dismissed from his position at St Bartholomew's Hospital, and as a result his connection with the hospital ended after thirty-six years of service, the last entry to a most distinguished doctor reading laconically: 'Item to Doctor Harvey Phisicon XXXIII^{l} VI^{s} VIII^{d}.'

Sir Nathaniel Brent was deposed from the wardenship of Merton College for adherence to the rebels, and the king at once nominated Harvey as warden, a post which he assumed on 9th April 1645, making a speech two days later to a fellows' meeting in Hall exhorting them to foster agreement and amity between themselves.

The surrender of Oxford in June 1646 marks the period of Harvey's severance from the court and also the year in which his wife died. Not long before this he had lost his twin brothers, Matthew and Michael, and his second brother, John. It is not therefore surprising that he elected, at the age of sixty-eight and a martyr to gout, to retire from public life and spend his closing years either in London or in the country at the house of one of his brothers, Eliab or Daniel.

Harvey died, apparently of a cerebral haemorrhage, on 3rd June 1657, in his eightieth year, and was buried at the village of Hempstead in Essex.

KENNETH J. FRANKLIN.

1962.

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CONTENTS