

William Harvey and his legacy

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The first question was, why Padua? Harvey's decision was not made in ignorance, as Italy's superiority in medicine was well known throughout Europe in the Middle Ages. The medical schools there were at the centre of intellectual life. The College of Physicians in London had been modelled by Thomas Linacre on the organisations he had found in Italy, and John Caius, the re-founder and former Master of Harvey's College in Cambridge, was a graduate of Padua, much influenced by Italian ideas. Moreover, by choosing to study in Italy, Harvey was reviving a tradition among Cambridge students that had been suspended for around 50 years after the Reformation, of supplementing their studies at home with a period at Padua University.

A further consequence of the religious upheaval in England earlier in the sixteenth century was the reduction in the number of hospitals, as they had been associated with monastic foundations – there were none in Oxford or Cambridge, only St Bartholomew's and St Thomas's in London, whereas Padua, a city with a population at the time of 30–40,000, had four. Thus Padua was able to provide a practical as well as a theoretical medical education, with daily hospital rounds and autopsies of fatal cases. Clinical teaching had been part of the curriculum since it was begun by G.B. da Monte in 1543, the year in which the fruits of Vesalius's anatomy teaching at Padua appeared in print as *De humani corporis fabrica*¹. The Senate decreed in 1578 that the professors would visit the hospital regularly to lecture to the students on the diseases presented there. And the importance to the students of the practical tuition was made clear in a letter from some of them (evidently from north of the Alps) to the Rector in 1597:

We do not lack for lecturers in our own country or elsewhere, and we also have books at home ... It is the study of practice that has led us to cross so many mountains and at such great expense.

An additional attraction was that Protestants and Jews were able to take degrees at this nominally Catholic university. The economic advantages of this arrangement to the Republic of Venice were made clear by a comparison of the income generated by the students (around 100,000 ducats) with the cost of running the university (about 10,000 ducats). In view of Harvey's later willingness to disagree with

both his predecessors and his contemporaries in correspondence that was always conducted in the politest of terms, it is worth noting that Padua was a 'customer-oriented' university, governed by the students through their councillors (in contrast to a magistral university ruled by the professors, like Cambridge). Such an organisation was conducive to adversarial discussion and tolerance of conflicting views.

In the sixteenth century, the University of Padua had two faculties, law and arts. Harvey was enrolled in the Universitas Artistarum, where the curriculum covered medicine and science, theology, and philosophy. Philosophy provided the necessary concepts and the accurate logic required for the consideration of medical problems. Teaching was based on Galen, but by the 1590s, though the four humours remained the basis of proper medicine, it was a revised and more flexible Galenism that had moved away from the rigid style of the 1540s associated with Caius. At the time, several developments were taking place, including the introduction of new therapeutic methods, and some teachers and writers were even rejecting Galen in favour of Hippocrates. Learned medicine provided the physician with a method by which diseases and remedies could be understood and classified and which could be applied equally, for example, to local plants or to the novel ones being imported from the New World. In anatomy, following the re-publication of Galen's works in the 1520s, the principal influence was the work of Vesalius who, unlike the traditional anatomy teachers, performed his own dissections. Numerous anatomists took up the challenge and made a series of anatomical discoveries. Dissections became regular events and anatomical illustrations were frequently seen. At the end of the century, permanent anatomy theatres were constructed in Padua and Leiden. Although the fact that he was unable to dissect human bodies had seriously restricted Galen's view of human anatomy, the sixteenth century anatomists came to realise the limitations of their investigations on human corpses and returned to the use of live animals. In the second half of the sixteenth century, Coiter in Italy and Germany and Fabricius ab Aquapendente, Harvey's teacher in Padua, were notable exponents of the comparative approach, and it is clear from Harvey's writings and even the title of his work on the heart and circulation ('the motion of

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This half-day symposium formed part of the celebrations to mark the fourth centenary of William Harvey's graduation at the University of Padua on 25 April 1602. It was held on 21 June 2002 at the Harveian Society's London home at Lettsom House, 11 Chandos Street, and organised under the joint auspices of the University of Padua, the Royal College of Physicians and the Harveian Society of London

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Symposium programme

■ Medicine in the time of Harvey

Professor Vivian Nutton, The Wellcome Trust Centre for the History of Medicine at University College London

■ Prevention of heart disease

Dr Alan Maryon Davis, King's College London

■ Physiology of the circulation

Professor Mike Frenneaux, University of Wales College of Medicine, Cardiff

■ Harvey in Padua

Professor Gaetano Thiene, Institute of Pathological Anatomy, University of Padua

Dr Maurizio Rippa Bonati, Institute of History of Medicine, University of Padua

■ William Harvey – scientist and physician

Professor Erik Änggård, The William Harvey Research Institute, London

the heart and blood *in animals*') how much he benefited from the comparative method.

Even so, reverence for Galen constituted a considerable obstacle to any revision of the way the motion of the heart and blood were perceived. The heart was seen as being active in diastole, filling like a bellows; the auricles were not part of the heart but the terminal point of the vena cava; the liver was believed to be the origin of the venous system; blood was believed to pass from the right to the left ventricle through pores in the septum between them. Vesalius was the first to challenge the existence of such pores, but the way the blood is transferred from the right to the left side of the heart by passing through the lungs, though described earlier by Ibn an Nafis in the early thirteenth century and Miguel Servetus in the sixteenth (work Harvey knew nothing about), was delineated clearly in the *De re anatomica* of 1559 by Realdo Colombo², colleague and successor of Vesalius in Padua, whose work Harvey did know and confirmed with his own experiments. In the 1570s, Fabricius had focused attention on the valves in the veins and published his description in 1601, although he had described their purpose in Galenic terms as being 'to prevent tissue congestion'. Harvey's pioneering work, *Exercitatio anatomica de motu cordis et sanguinis in animalibus*³, is an Aristotelian consideration of the body in that, as in Aristotle, the heart is the centre of the body's activities. Observing the motion of the heart in living animals, especially cold-blooded animals with their slower beat, he was able to see that systole was the active phase of the heart's movement, pumping out the blood by its muscular contraction. Having perceived that the quantity of blood issuing from the heart in any given time was too much to be absorbed by the tissues, he was able to show by simple and logical experiment that the valves in the veins permit the blood to flow only in the direction of the heart and to prove to his own satisfaction, though not to all his contemporaries, that the blood circulated

around the body and returned to the heart^{4,5}. (Recent experiments have shown that suction is involved in the early phase of filling the heart with blood, so it seems that Galen did not get it completely wrong after all.)

Papers on recent developments in therapy and prevention reminded us how grateful we have to be to Harvey for beginning serious investigation into the workings of the cardiovascular system.

References

- 1 Vesalius, A. *De humani corporis fabrica libri septem*. Basle: J. Oporinus, 1543; facsimile edition Brussels: Culture et Civilisation, 1964. Three volumes of a projected five-volume set of an English translation have appeared so far: *On the fabric of the human body: a translation ...* by W.F. Richardson and J.B. Carman. San Francisco: Norman Publishing, 1998–2001.
- 2 Colombo R. *De re anatomica libri xv*. Venice: N. Bevilacqua, 1559; facsimile edition Brussels: Culture et Civilisation, 1969.
- 3 Harvey W. *Exercitatio anatomica de motu cordis et sanguinis in animalibus*. Frankfurt: W. Fitzer, 1628.
- 4 For an analysis of Harvey's ideas and his published work, including his correspondence with his contemporaries, see Whitteridge G, *William Harvey and the circulation of the blood*, London: Macdonald, 1971; also Pagel W, *William Harvey's biological ideas*, Basel: Karger, 1967; Pagel W, *New light on William Harvey*, Basel: Karger, 1976; Bylebyl J (ed.) *William Harvey and his age: the professional and social context of the discovery of the circulation*, Baltimore: Johns Hopkins University Press, 1979. For the details of his life, see Keynes JL, *The life of William Harvey*, Oxford: Clarendon Press, 1966, 1978, which supersedes earlier biographies.
- 5 It is not true, as was suggested at the symposium, that Harvey was unaware of the third circulation, that of the blood supply to the heart. His first letter to Jean Riolan, published in 1649, describes it clearly: Harvey W, *The circulation of the blood and other writings*, trans KJ Franklin. London: JM Dent (Everyman Library), 1993, p.106; Evan Bedford D, Harvey's third circulation: *De circulo sanguinis in corde* (the Harveian Oration for 1968), *BMJ*, 2 Nov, 1968;4:273–7.