Introduction

This is the story of Harvey's natural philosophy, how he acquired it, what it was and how while practising it he discovered that the blood circulates around the body. It is also the story of how that discovery and its natural philosophy were met and understood by people with different philosophies and how as a result they accepted or dismissed Harvey's doctrines.

Before Harvey's doctrine changed natural philosophy and medicine as a whole – that is, before it was 'accepted' – some sort of consensus had to exist. Unless there was widespread agreement that the blood circulated, it would have remained a minority view, and to most people a false one. Without some kind of consensus the natural philosophy of the time would not have changed (and historians are agreed that it changed so rapidly that it amounted to a revolution in what used to be called 'science'). This story accordingly includes considerations about mechanisms which contributed to or discouraged the formation of a consensus. Such mechanisms include formal structures of argument and expression, developed and used in the universities and common to most educated men. Such structures had a role in Harvey's natural philosophy before he discovered the circulation, in his announcement of its discovery and in other people's reaction to that discovery.

Another factor that made a consensus possible was the structure and arrangement of groups of people, whether in medical faculties, professional colleges or wider national and religious groups. Some attention has been paid to these groups therefore, and an attempt has been made to show how membership of a group might incline a man to accept or reject a novelty. This book accordingly examines important authors in their setting, in an approximate chronological order, across Europe.

In such a story the reasons why and the materials with which some people resisted Harvey's doctrine are as important as the arguments of those who agreed with him. (In addition to his followers and opponents, there was also a large number of people who misunderstood Harvey.) Clearly, in seeking to understand mechanisms of change within natural philosophy we must know why some people resisted change, sought to refine the traditional picture or promoted different novelties. It is for these reasons that this book reports fairly

extensively on the natural philosophies of those of Harvey's contemporaries who left records of their views on the Harvey affair. No major figure who published for or against Harvey during his lifetime has, I think, been omitted. These figures have been known to historians who have worked on Harvey, but I do not know of any systematic or detailed account of what most of them had to say, and I have attempted to remedy that here. It is generally agreed that when Harvey died the battle for the circulation had been won, which makes for a convenient *terminus ad quem* for this account. By then too the 'revolution' in natural philosophy was in full swing, and the natural philosophy of the schools was under fierce attack. I have made some suggestions about the roles played by Harvey's natural philosophy, by the devices of the schools and by groupings of people in this 'revolution'.

I have also tried to understand the priorities in the minds of people who knew about Harvey's work. To most people who had the leisure to think about it in the seventeenth century, the unresolved problems about the motion of the heart and blood stemming from Harvey's publication were secondary – very secondary – to bigger problems about personal salvation, the correct interpretation of God's will, the coming millennium or the current wars. It is only with hindsight that we see Harvey's discovery as fundamental to a later 'biomedical science'. To the men of the mid-seventeenth century it was a question of whether they could, or felt they had a need to, fit Harvey's doctrines in with the more important things in their minds. I have therefore tried to suggest that what was in their minds, whether or not it may fit into categories of the religious, the rational or the philosophical, determined whether they could or wanted to accommodate what Harvey had said.

It will accordingly be clear that this account of change does not depend on the truth-value of Harvey's doctrines, on seeing him as a modern or on interesting intellectual configurations of the seventeenth century. These have been the features of much Harvey scholarship in the past, and I have been less concerned to show that the circulation was accepted because it was true than to show that it came to be seen as true because it was accepted. Harvey, his followers and his opponents could not see the motion of blood as one could see an eclipse or the height of mercury in a glass tube and a whole network of things lay between the uncommitted and his acceptance or rejection of the circulation: arguments, observation, rhetoric, social and intellectual groupings, his age, nationality, religion, training and occupation.

1 Natural philosophy and anatomy

When Harvey raised his scalpel to begin the Lumleian anatomy lectures at the College of Physicians, he was embarking on an exercise in which he was to discover the circulation of the blood. To understand that discovery we need to understand what Harvey was doing when he made it. What kind of enterprise was his anatomy teaching? Why was Harvey doing it?

The answers to these two questions are not as straightforward as they might seem. Certainly anatomy was a medical business, Harvey was a physician and the college a place where medical education might properly proceed. But Harvey's own account of the nature of anatomy makes us aware of the care with which we must use modern categories of such kinds. Harvey opened his anatomy lectures with a general statement on the nature of anatomy, that is, a kind of introduction, or more strictly, an *accessus*, to anatomy.[1] Here he gave five headings to which 'anatomy' could be reduced: the description, *historia*, of the major organs; 'action, function and purpose of the parts'; observation of rarities and morbid conditions; solving problems in the authors; and skill in dissection. This description largely agrees with his subsequent account of the kinds of anatomy, the different ways in which it can be practised.[2] The first was public, teaching anatomy, concerned with *historia* of the major organs in the 'three venters' (abdomen, thorax, head) of the body. The second was philosophical anatomy, concerned with the purposes of the organs (the 'action, function and purpose' of his anatomical *accessus*) and the relationship of the body, the microcosm, with the world at large, the macrocosm. In third place

[1] An *accessus* was the device used by a teacher to introduce his class to a new text or topic. It located the matter at hand within the rest of 'philosophy' and asked a rote of questions of the text which helped to explain it to the pupils, such as, what was the intention of the author? How is the text divided up? Originally a device of early Aristotelian scholarship (it asked, why did Aristotle make his work so difficult?) it came to be applied to the other subjects like medicine. See R. K. French, 'A note on the anatomical accessus of the middle ages', *Medical History*, 23 (1979), 461–8.

[2] G. Whitteridge, ed., *The Anatomical Lectures of William Harvey. Prelectiones Anatomie Universalis De Musculis*, Edinburgh and London, 1964, p. 5.

was medical anatomy, which dealt with the organ systems and morbid states ('rarities and morbid conditions'). Last was 'mechanical' anatomy, the physical process of cutting.

Two things are notable about these ways of characterising anatomy. The first is that among his contemporaries and predecessors Harvey was unusual in not giving a religious purpose to anatomy. It was common for anatomists to place at the top of their lists of the parts or the functions of anatomy the purpose of knowing oneself in order to revere the Creator. The second is that medical anatomy is low – third – on Harvey's list. Here Harvey agrees with other anatomists, for whom the medical use of anatomy was always subsidiary to the philosophical, descriptive and religious.[3]

So Harvey's view of anatomy was by no means the same as our own. We like to see anatomy as having primarily a medical use. We would even like to identify with the early seventeenth-century physician and with Galen in the second century AD in maintaining that anatomy should be the basis of *rational* medicine (see below for the 'rationality' of Galen's medicine). But even here there is something that has to be explained. It was Harvey the physician who was teaching anatomy, as physicians had taught anatomy for 300 years. Surgeons, to whose *practice* anatomy was much more essential, do not have anything like the same share in the history of anatomy as physicians.[4] The reason for the dominance of the physicians over the surgeons has to do with the institutional history of the two trades, and we shall see below that this, too, contributed to what it was that Harvey was doing when lecturing on anatomy.

Although Harvey announced that the lectures were to be *anatomia popularis*, public or teaching anatomy, yet his interest throughout is philosophical. Of the philosophy taught in the schools, Harvey is using a form of *natural* philosophy. We hear nothing of the other two philosophies, moral and rational. In what follows in this book we shall be looking at Harvey as a natural philosopher, and at his natural philosophy, his medicine and his anatomy.

[3] See for example C. Bauhin, *Theatrum anatomicum*, Frankfurt, 1605, in which these sentiments are made clear in the address to the Landgrave of Hesse. Bauhin seems to depend heavily on the earlier textbook of du Laurens: A. Laurentius, *Historia anatomica humani corporis et singularum eius partium multis controversijs et observationibus novis illustrata*, Frankfurt, n.d., but the *Ad lectorem* dated 1599. Harvey made extensive use of both authors. See also C. Varolius, *Anatomiae, sive de resolutione corporis humani*, Frankfurt, 1591: dedication, p. 2.

[4] There are of course exceptions, such as Berengario da Carpi and others in Italy. But here the surgeons were educated alongside the physicians and most of those who wrote anatomies did so in a philosophising way, not topographically and surgically. See R. K. French, 'Berengario da Carpi and the use of commentary in anatomical teaching', in A. Wear, R. K. French and I. Lonie, *The Medical Renaissance of the Sixteenth Century*, Cambridge University Press, 1985, pp. 42–74.

Physicians and rational medicine

To understand why the Lumleian lectures were given by a rationalist physician, philosophising to the extent that he discovered the circulation, and not by a surgeon teaching the structure and disposition of bones, blood vessels and nerves, we have to jump briefly back to the origins of Western medicine. Hippocratic medicine, dating from the fourth and fifth centuries BC and regarded since the Western Middle Ages as the foundation of medicine, was not based on anatomy. Nor was that of China or India. But Galen, revered in the later West as the 'Prince of physicians second only to Hippocrates', thought of himself as a Hippocratic yet spent much of his medical education seeking out anatomy teachers. Combining this anatomical knowledge with an early and extensive philosophical education, Galen rationalised Hippocratic medical practice on an anatomical basis.

He had good reason to do so. As a provincial Greek doctor in Rome, Galen was in a dangerously competitive situation. He arrived, moreover, with two considerable disadvantages. His medical system contained two techniques which he had derived from the Hippocratic writings. One of them, letting blood from a vein, was painful and unsightly. The other, prognosis, came close to augury and could be politically dangerous. Yet by means of his anatomy and philosophy, Galen turned these two disadvantages so much in his favour that he became physician to the emperor. His success lay in being able to tell his patient a convincing story about the treatment he was getting. Galen could relate therapeutic techniques like the letting of blood to the structure of the body, to its functioning, and from here by a microcosmic–macrocosmic parallel to the fundamentals of the world picture. His early successes were among Aristotelians, and it was largely with Aristotle's philosophy that Galen had put Hippocratic precepts and practice into a rationalised understanding of the natural world. From Galen the worried patient not only got reassurance that his doctor knew by experience about the kind of disease he was suffering from, but that he understood the *causes*; and hence also, by rational prognosis, the outcome. This was not available from doctors of other sects in Rome.[5]

Part of Galen's scheme of microcosm and macrocosm was 'nature', partly the deified nature of Pliny and the Stoics (among whom was Marcus Aurelius, Galen's emperor), partly the Platonic demiurge (the creative principle in the *Timaeus*) and partly Aristotle's nature-of-a-thing. The theme of Galen's great natural-philosophical work *On the Use of the Parts of the Body* is how nature, working with materials of limited scope, has put together the body in the best

[5] For Galen's career in Rome see for example P. Brain, *Galen on Bloodletting*, Cambridge University Press, 1986; also V. Nutton, *Galen on Prognosis. Edition, Translation and Commentary*, Berlin (Corpus Medicorum Graecorum), 1979.

possible way.[6] Each part, each kind of material, has its own natural actions, which nature has selected as appropriate for the overall function of the complex parts and the body as a whole. That the body was created by a higher agency, which created with wisdom and foresight, made Galen's doctrines acceptable in the Christian West.

The essentially commercial reasons that made Galen's rationalism – his 'good story' – a success, were also present in the later history of Western medicine. The medieval doctor who diagnosed an unseen patient from a sample of his urine was demonstrating his grasp of natural processes. The astrological doctor who diagnosed the nature of unseen urine had a whole new theoretical field of which to show his mastery. In both cases too prognosis impressed the patient in a similar way.[7]

Rational medicine – the 'theory' of medicine – was also extremely useful when medical men wanted to demonstrate that their subject was a true *scientia* or part of philosophy and so justified as a university discipline. By the time Galen's *On the Use of the Parts of the Body* was available in the West, Mondino had – just – begun to teach anatomy by human dissection (his *Anathomia* is thought to have been completed in 1316). To consider anatomy as fundamental to medicine was essentially part of the rationalist position that argued from structure to function to malfunction to treatment. Only the rational, learned physician was in a position to make that argument. The public ceremony of human dissection was partly a teaching device, but it was also very much a public statement that a certain kind of doctor, the learned and rational, was doing something that characterised him and his special knowledge (see figs. 1–3).[8] In contrast, however much they needed anatomy, surgeons were outside this group and did not rely on a rationalist medicine. They did not dissect[9] because they were not able to call attention to the

[6] Galen, *On the Usefulness of the Parts of the Body*, trans. M. T. May, 2 vols., Cornell University Press, 1968, especially book 17, Galen's 'epode'.

[7] See my chapter in *Medicine from Salerno to the Black Death*, ed. L. Garcia Ballester, R. K. French, J. Arrizabalaga and A. R. Cunningham, Cambridge University Press, forthcoming 1993/4.

[8] From the first, Mondino conducted his anatomies in accordance with an anatomical *accessus* (of six routine observables: position, substance, size, number, figure and connections) that derived from Aristotelian scholarship by way of John of Alexandria's commentary on Galen's *De sectis*. See Mondino's text in Berengario's edn of 1521, p. 42v. Only later did Mondino or his pupil add a seventh, observation of morbidity, which corresponded to a 'medical' use of anatomy. See French, 'Accessus'. On anatomy as a rationalist display, see my chapter in the forthcoming (Routledge) encyclopaedia of medical history. It is evident from the words of the anatomists that anatomy was the kind of knowledge that could be used as a criterion to weed out the quacks and empirics. See the dedication of Andrés de Laguna, *Anatomica methodus, seu de sectione humani corporis contemplatio*, translated by J. R. Lind, in his *Pre-Vesalian Anatomy*, Philadelphia, 1975, p. 263.

[9] In Italy the more learned surgeons did dissect. The emphasis here is on the contrast between the physicians and surgeons in the north, where Harvey was lecturing.

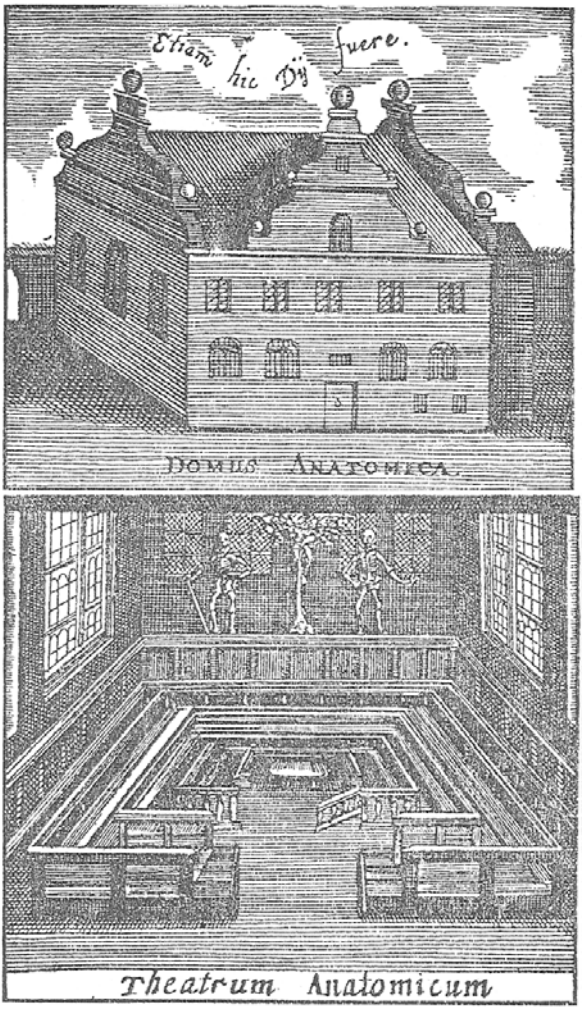

Fig. 1. The 'anatomy house' and its contained theatre, from Thomas Bartholin, *Vasa lymphatica*, a tercentenary edition by V. Maar (1916). The words floating above the anatomy house remind the reader that here too are gods: the anatomists normally gave priority to a religious purpose in explaining the nature of and reasons for anatomy. The phrase is probably designed to recall the story of Heraclitus at the stove, calling in fellow philosophers hesitating at the door: 'There are gods here too.'

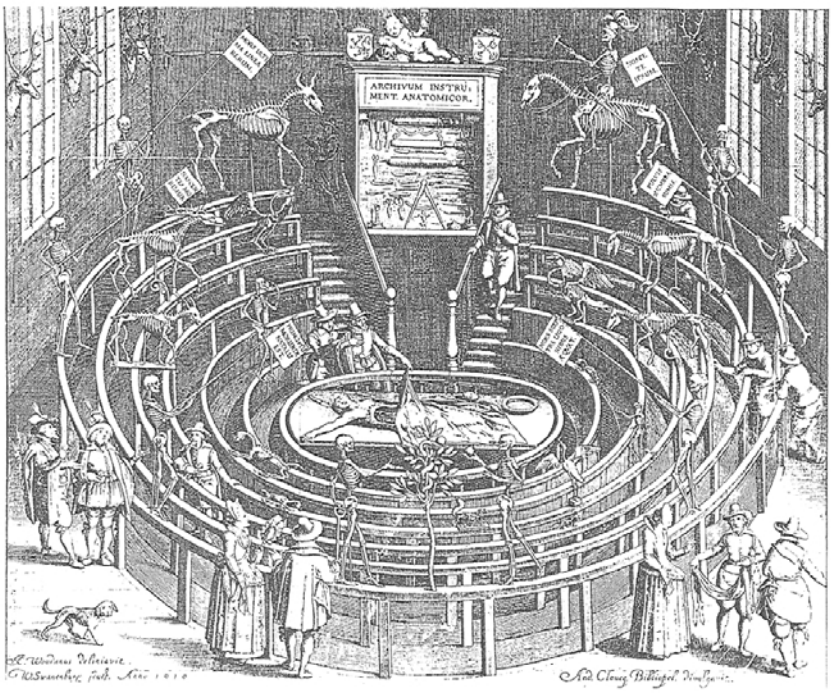

Fig. 2. Dissections as display: the anatomy theatre at Leiden in 1610. The human skeletons carry placards reminding the reader of his mortality and the need to know himself. The skeletons of the larger animals, the stuffed bodies of the smaller and the display of instruments of dissection add up to a powerful visual image of an important aspect of the medicine of the learned, rational and university-educated physician. The presence of fashionable visitors underlines the message.

anatomical component of a 'good story'. This went hand in hand with the different story of the surgeons' institutionalising and educating themselves, and it would be too simple to conclude that the surgeons did not dissect because they were less successful than the physicians in their incorporation and education. So it was not a surgeon giving the Lumleian anatomy lectures,[10]

[10] It is true that the barber-surgeons dissected in Harvey's time, but even there, in Surgeons Hall, the lectures were delivered by a physician and the College of Physicians took good care to maintain their control over the surgeons. The college could summon, fine and imprison surgeons, and in 1627 they defeated the surgeons' attempt to claim the right of giving internal medicine. See Sir Geoffrey Keynes, *The Life of William Harvey*, Oxford, 1966, pp. 49, 69, and P. Allen, 'Medical education in seventeenth century England', *Journal of the History of Medicine* 1 (1946), 115–43; 139.

Fig. 3. John Banister lectures on anatomy to the London barbers and surgeons in 1581. The text however is that of a learned and rational physician, Realdo Colombo, and is philosophical and vivisectional rather than topographical and surgical. Above the text, the words commemorating the importance of the occasion praise anatomy as an approach to God.

despite the fact that they had been intended as surgical lectures.[11] And it was no accident, bearing in mind the physicians' corporate need to hold anatomies, that natural philosophy came high on their list of reasons for doing so. Natural philosophy had been taken into the theory of medicine as part of the 'good story', and its use in anatomy helped to mark off its boundary with empirical surgery. The same may be said about the practice of anatomists in very generally giving a religious reason at the top of their lists. The natural world that formed the subject-matter of natural philosophy and of rationalist medicine was a created world. Part of the very rationality of the natural world was that it had been put together in a reasoned way by God; and that rational man could, albeit incompletely, understand God's reasons. It was not piety or expedience

[11] Keynes, *William Harvey*, p. 85. Of course, the manual dexterity of the surgeons made them ideal operators in dissections, while the learned physician lectured. The Tomkins lecture was served by a dissecting surgeon who was paid £3 for his trouble. See Allen, 'Medical education', p. 120.

that prompted the anatomists' first reason for doing anatomy. Rather, because their readers shared their world picture, the anatomists were adding to the rationality of their anatomy, indeed, they were adding the ultimate or necessary rationality.

Natural philosophy, anatomy and medicine

Having seen why it was Harvey the physician giving the lectures, and having seen some reasons why the anatomy should have been philosophical, we must look in more detail at what natural philosophy was.

'Natural philosophy' in this book means something quite specific. It is that subject which was put together almost exactly 400 years before Harvey's anatomy lectures and subsequently taught and modified within the universities on the basis of statutory texts, masters' commentaries and disputed questions.[12] It was constructed from Aristotle's 'nature books', the *libri naturales*. The basic text was the *Physics*, which laid down the principles of natural motion which were then demonstrated in action in a range of examples in texts that deal with the motions involved in generation and corruption, in the heavens and earth, in meteorology and in living things. Above all, medieval natural philosophy came to be embodied in a *textbook*.[13] By the middle of the thirteenth century, first the English Nation of the University of Paris and then the Parisian Arts Faculty as a whole drew up statutes that specified which of the nature books of Aristotle were to be read in order to proceed to the degrees of bachelor and master of arts.[14] The statutes gave rise to an industry of copying the texts to provide students with the statutory books with plenty of room for notes.[15] Many European universities adopted the Parisian statutes,[16]

[12] It is hoped that a full discussion of natural philosophy in this sense will be published in a book by the author and A. R. Cunningham.

[13] We may take as characteristic of the collection the contents of the British Library MSS. Royal 12 G II (which belonged to Rochester Abbey and was postilled by Henry of Rainham), 12 G III and 12 G V: the *Physics*, *De celo et mundo*, *De generatione et corruptione*, *De memoria et reminiscentia*, *De anima*, *De morte et vita*, *De differentiis spiritus et anime*, *De somno et vigilia* and the *De sensu et sensato*. The textbook of natural philosophy has been recognised in a sense, that is, as part of another process, the diffusion of Aristotelianism: see G. Lacombe, A. Birkenmajer, M. Dulong and A. Franceschini, *Aristoteles Latinus*, Rome, 1939. It will be evident that in the tradition of scholarship from Lacombe to Schmitt the principal interest has been the *fortuna* of the works of Aristotle and their 'diffusion', and in this tradition the texts we are presently considering are called the *corpus vetustius* (and the latter texts, the *corpus recentius*).

[14] For example *In isto libro habentur omnes libri parvorum naturalium ad gradum magisterii* (in a fourteenth-century hand in a 'recent collection' in the ducal library at Gotha, q.v. in Lacombe, Birkenmajer, Dulong and Franceschini, *Aristoteles Latinus*.

[15] The Royal 12 G series of MSS. contains about four times as much space for notes as for the text.

[16] Most universities followed Paris closely in their arts education. See J. Hale and J. Highfield, *Europe in the Late Middle Ages*, London, 1965, p. 28.