

# William Harvey's other book: *Exercitationes de generatione animalium*

In memoriam Gweneth Whitteridge, great scholar of William Harvey

William Harvey's *De motu cordis*,<sup>1</sup> in which he first described in print his discovery of the circulation of the blood, was published in 1628. From then until 1649 he published nothing further, disdaining to reply to criticisms. Finally, he reacted to the book by Jean Riolan the Younger, who accepted that blood circulated in some vessels but not in the portal system, by publishing his *Exercitationes duae anatomicae circulatione sanguinis*<sup>2</sup> in which he elegantly and courteously, but systematically, demolished his opponents' positions.

The times had not treated Harvey kindly. Physician to Charles I, he was a staunch royalist and lost his library and many of his notes when his house was attacked, probably not by chance, by parliamentary troops; and he had been fined and banished from London under interdict. But during these unhappy years he had not been idle; rather he had pursued one of his early interests,<sup>3</sup> begun before the Civil War when, in 1642, John Aubrey saw him in Oxford visiting George Bathurst 'who had a Hen to hatch eggs in his chamber, which they daily opened to discern the progress & way of Generation'.<sup>4,5</sup>

About Christmas 1648<sup>3</sup> Dr George Ent, his friend of many years, visited Harvey and persuaded him to hand over, apparently reluctantly, a longstanding manuscript upon the mechanisms of reproduction which Ent promised to see through the press himself.<sup>6</sup>

To speak more plainly, I made it my Province to oversee and correct the Press; and because the Author writes so obscure a Hand (A thing, as we say, common to learned men) as that scarce any man, but who hath bin accustomed thereto, can read it without difficulty, I used all diligence to provide against the Errors of the Compositor; that might be occasioned thereby; which I observed, not to have been duly prevented in the Impression of a small Treatise of the Doctors, not long since set forth.<sup>7</sup> ['The Epistle Dedicatory', verso before sig.a. For an example of Harvey's practically illegible hand see ref. 8.]

Harvey prevaricated and was unwilling to surrender his manuscript, especially since the section on insects had been lost when his house was ransacked, but, as Ent wrote:

In a word; at length I prevailed: and He said, Loe, I resign these my Writings freely into your hands, with



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*Exercitationes de generatione animalium*, London, 1651

absolute power, either suddenly to publish, or for a while to suppress them, as you shall think convenient. Having returned Him very many thanks for so high a favour; I took my leave, and departed as another Jason, enriched with the Golden Fleece.<sup>7</sup> [sig.A3 bis verso ff.]

Thus Harvey's longstanding attempts to understand the mechanisms of animal reproduction saw the light. I call it Harvey's 'other book' to distinguish it from his very much better-known work on the circulation. It was the last of his works to be published in his lifetime and caused much less stir than *De motu cordis*.

It is not difficult to understand Harvey's reluctance to hand over the manuscript – for undoubtedly he was conscious that he had not been able to provide a satisfactory explanation for the problems of reproductive mechanisms in the way he had for the circulation. To us it is clear that, unlike the secrets of the 'movements of the heart', the mysteries of reproduction could not be unraveled by unaided 'ocular demonstration', however much skill, ingenuity and persistence – and Harvey was a master of all these – the seventeenth-century experimenter expended on them.

The manuscript was published in 1651 as *Exercitationes de generatione animalium*<sup>6</sup> (frontispiece shown above) and translated by an anonymous hand into English in 1653.<sup>7</sup> Ent's dedication must be one of the most charming there is; it is also very illuminating since he quotes extensively Harvey's own comments on his methods of investigating nature. Here are two extracts in the lively prose of the 1653 translation:

No man doubtless, hath ever rightly determined of the Use, or Office of any Part; who hath not in many Animals, beheld, and with himself diligently considered the Fabrick, Situation, annexed Vessels, and other Accidents thereof. Those Ancient Oracles of Wisdom did terminate the knowledge, as of all Countries, so also of all Animals, Plants, and other things whatever, almost with the narrow limits of Greece alone...

To this, another Evil hath adjoined it self; which is, that many, wanting the Experimental cognition of things, from the formerly conceived verisimilitude of some Opinion, afterwards boldly broach a positive Judgment



An enlargement of part of the frontispiece of 1651 showing creatures of many kinds coming out of an opened egg, which is inscribed: *Ex ovo omnia* (all arise from an egg).

thereupon, as if it were certainly known: whereupon it follows, that they are not only grossly deluded themselves, but seduce others also (who are not sufficiently circumspect) into Error.<sup>7</sup>

*De generatione* remains a monument to Harvey's philosophy of experiment, a monument which the late Gweneth Whitteridge greatly illuminated with her new English version<sup>9</sup> and especially its introduction and notes. There is not space here to describe the contents of the work; it cries out to be read when it will speak for itself.

Most clearly of all his writings, this book reveals a great deal about Harvey's philosophy and its preface contains, to my mind, his clearest statement of his unshakeable belief in experiment as the most reliable means of investigation. While Bacon is beloved of historians of the philosophy of science, his treatises are entirely theoretical; as far as we know he hardly ever made an experimental observation – unless we count his stuffing of a dead hen with ice to try to preserve it, which Aubrey says occasioned his death.<sup>5</sup>

In his preface, Harvey speaks of his own conviction about how nature should be investigated, and encapsulates the revolution to which he, more than any of his predecessors or contemporaries, gave birth:

## REFERENCES

The College Library holds copies of all the books cited.

- 1 Harvey W. *Exercitatio anatomica de motu cordis et sanguinis in animalibus*. Francofurti: sumptibus Guilielmi Fitzeri; 1628.
- 2 Harvey W. *Exercitationes duae anatomicae circulatione sanguinis*. Roterodami: ex officina Arnoldi Leers; 1649.
- 3 Webster C. Harvey's 'De Generatione': its origins and relevance to the theory of circulation. *Br J Hist Sci* 1967; 3:262–74. Webster suggests that Harvey's interest in embryology may have begun in his student days in Padua (pp. 268–9).
- 4 Keynes G. *The life of William Harvey*. Oxford: Clarendon Press; 1966.
- 5 Dick OL, editor. *Aubrey's brief lives*. London: Penguin Books; 1962.
- 6 Harvey W. *Exercitationes de generatione animalium*. London: Typis Du-Gardianis; 1651.

For although it be a more new and difficult way, to find out the nature of things, by the things themselves; then [sic] by reading of Books, to take our knowledge upon trust from the opinions of Philosophers: yet must it needs be confessed, that the former is much more open, and lesse fraudulent, especially in the Secrets relating to Natural Philosophy.<sup>7</sup> [Preface, third page, no sig. Whitteridge<sup>9</sup> gives the sense of this phrase more accurately as 'the former is a much more open way to the hidden secrets of natural philosophy and one which leads less into error', p. 9.]

In *De motu cordis* we see the mechanisms of the circulation more or less worked out in full from the results of 'ocular demonstration', effectively complete but for the direct evidence of a connection in the periphery between the arterial and venous systems which would only become available when the capillaries were seen. Harvey's observations and deductions truly explain the movement of the blood in animals; his end is achieved. The book's conclusions are unassailable.

In *De generatione* we see Harvey struggling with problems that he could not solve from his observations, but always persisting; always in the belief that, as he said to Ent, 'Nature, truly, is Her self the most faithful Interpreter of Her own secrets.' But in our understanding of these secrets, Harvey was very clear that all his conclusions are valid only until they are disproved:

And yet I do not wish the things I have to say about this business to be taken as though I believed them to be the pronouncements of the Oracle, or as if I desired to extort every man's vote in my favour. I only ask as my just deserts the liberty I freely allow to all other men, to put forward as true those things which in this whole dark business seem probable until such time only as their falsity may be openly proved before all men.<sup>9</sup> [p. 443]

His philosophy has served science well.

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- 7 Harvey W. *Anatomical exercitationes, concerning the generation of living creatures: to which are added particular discourses, of births, and of conceptions, &c.* London: printed by James Young, for Octavian Pulleyn; 1653.
- 8 Whitteridge G, editor and translator. *William Harvey, De motu locali animalium 1627*. Cambridge: Cambridge University Press for the Royal College of Physicians; 1959. For an example of Harvey's handwriting see the frontispiece: photo of folio 95 of Harvey's manuscript BL MS Sloan 486.
- 9 Whitteridge G, editor and translator. *Disputations touching the generation of animals by William Harvey*. Oxford: Blackwell Scientific Publications; 1981.