The Fabrica

De humani corporis fabrica libri septem

of

Andreas Vesalius

Published in 1543, the “Seven Books Concerning the Structure of the Human Body” was not only the foundation of modern medicine, but a datum milestone in the history of science.

John Pearn

An invited lecture on the occasion of the acquisition of the English translation of Versalius’ epic work.

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Introduction

The publication of the work, *De Humani Corporis Fabrica*, heralded the beginning of modern medicine. Literally titled “On the Fabric of the Human Body”, but always known simply as the “Fabrica”, this book is not only the datum for medical science, but joins with two others as the catalyst of all modern science.¹ These three books, published as sixteenth-century incunabula, are:

1543  *De Humani Corporis Fabrica*  Andreas Vesalius
1543  *De revolutionibus*  Nicolaus Copernicus
1545  *Ars Magna*  Gerolamo Cardano ²

Perspective

The *Fabrica*, published in 1543 by Andreas Vesalius (1514-1564), pre-dated the five seventeenth-century books which were to change the world – its religions and philosophy, the physics which governed its natural laws, and the function of the human bodies who populated it. These books were:

1600  *De Magnete.*  William Gilbert (1540-1603)  The earth is a magnet, explaining the orientation of lodestones; with hints of its internal structure.
1610  *Sidereus Nuncius*  (“The Starry Messenger”).  Galileo (1564-1642).  The extension of the boundaries of the visible universe; a work which changed religion and philosophy forever.
1628  *De Motu Cordis*  William Harvey (1578-1657).  The circulation of the blood.
1665  *Micrographia.*  Robert Hooke (1635-1703).  Living things are composed of microscopic cells.

The *Fabrica* was, and remains much more than the most significant work in the chronology of modern medical science. Medical historians have described it also
“as an exquisite piece of creative art with its perfect blend of format, typography and illustration”.

Vesalius in fact published two works. The first, the Fabrica in seven “books” – “Libri Septem” – is an extensive account of human anatomy, some pathological states, descriptions of normal variation in parts of the body, and accounts of surgical operations. A second companion volume, the Epitome, was published within several weeks of the main volume. The famous portrayal of Vesalius, looking out to the reader with a confident and mildly challenging pose, is in Folio 6v, opposite the beginning of the text of the Epitome.

Vesalius included seven new, larger, full-page woodcut engravings in the Epitome. It is believed that he produced these in large format as separate sheets, with the potential to be hung as wall charts. Cheaper and more focused on anatomy than its forebear, the Fabrica, the Epitome included novel devices as flap-anatomies. The Epitome cost 10 batzen, coins minted in Berne in Switzerland throughout the 15th to the 19th centuries. In Vesalius’ time, the batzen was a silver coin. It is difficult to estimate the equivalent buying power of 10 batzen, but a series of estimates indicates that the Epitome cost more than the contemporary price of food for a large family for a week.

In the twenty-first century world of virtual reality, to have and to hold a facsimile copy of the Fabrica engenders, for many, an emotional experience – in one’s hand is an enduring reference point in the chronology of knowledge.

What the origins of this remarkable book, what is its history, and what is its significance?

Andreas Vesalius (1514-1564)

It has been said that Vesalius’ life “was one of the most romantic in the history of medicine”. His forebears were German. Their family name was originally “Witing”, later
changed to “Wesel”, the name of the town where their forebears lived. The family coat of arms was charged with three weasels. This depiction was taken from the badge of the town of Wesel, the three weasels on the central shield being an heraldic toponymic pun. The supporters of the shield at the *centrum* of the coat-of-arms are muscular cherubs. The arms are surmounted by an olive sprig and acanthus leaves. The citadel town of Wesel was an important trade and shipping port at the junction of the Rhine and Lippe rivers of north-west Germany.

Prior to Vesalius’ birth, the family had moved to Brussels, 180 kilometres to the south-west of Wesel. Vesalius’ father was an apothecary in Brussels. Belgium of course claims Vesalius as its own; but in the sixteenth century, the Low Countries of today (The Netherlands, Belgium and Luxembourg) comprised the County of Flanders, the Duchy of Brabant, the County of Holland and the Bishopric of Liège. The region was overruled by the Spanish Habsburgs, but also by France, with influences which persist in the two regions of modern Belgium. The southern provinces later revolted against the north and formed the independent Kingdom of Belgium in 1831.

Vesalius was initially educated in the humanities at the University of Louvain (1529-1533). Subsequently, he went to Paris as a medical student (1533-1536). In 1536 when war broke out between France and Spain, Vesalius returned north to his first university at Louvain (1536) and thence to the University of Padua. He completed his Doctorate of Medicine thesis as a critique of the ninth book of the Arabic physician, Rhazes (860-932); and graduated in medicine at Padua in 1537. Veslaius’ revision of Rhazes’ great medical encyclopaedia, *El Hawi*, “was the source of therapeutic knowledge until long after the Renaissance”.6

Vesalius undertook extensive personal dissections, primarily at the University of Bologna, and made detailed notes and illustrations of his work. In 1542, aged 27 years, he took his illustrations to Venice to the studio of the Renaissance painter, Titian. It was
probably in that Venetian studio that woodcuts were prepared by the artist, Jan Stephan van Calcar, or another pupil of Titian.7

Vesalius carried his manuscript and the woodcuts over the St. Gotthard Pass to Basel in Switzerland; and gave them to his printer and publisher friend, Johannes Oporinus, himself experienced in medical matters. The first (1543) edition of the Fabrica, and its corrected successor (the second Basel edition of 1552-3), were to change the history of medicine.8, 9

The Fabrica

The Fabrica is known principally for two features. The first was the corrections (heretical at the time) of Galen’s anatomy. Galen (c. 130- c. 199) had studied living human anatomy, perhaps initially when he served as surgeon to the gladiators who fought at Pergamon. Galen had an extensive knowledge of animal dissections, including dogs, monkeys and pigs. His teaching, the most influential and enduring in the entire chronology of medicine, was promoted by every teacher of medicine until the Enlightenment; and remained unchallenged for 1500 years.

The Fabrica was published in seven books:

- Book I The Bones and Cartilages
- Book II The Ligaments and Muscles
- Book III The Veins and Arteries
- Book IV The Nerves
- Book V The Organs of Nutrition and Generation
- Book VI The Heart and Associated Organs
- Book VII The Brain

At the time of its publication (1543), Vesalius was serving as a household physician to Charles V to whom he dedicated the Fabrica. The Fabrica is noted not only for the
woodcut illustrations of exquisite form and artistic skill, but also for the historiated initials which introduce each section; and also for the inclusion of an index.

Vesalius published this anatomical text and its illustrations, as a witness of his extensive first-hand experience of human cadavers. Throughout the *Fabrica*, he criticised Galen, although in a respectful way, and corrected many of the former’s mistakes. The significance of the *Fabrica* rests especially on this theme. Vesalius’ corrections included revisions to Galen’s errors in ascribing certain features of animal anatomy to that of humans:

- The horned uterus
- The rete mirabiloas of quadrupeds
- The four-and five-lobed liver
- The double bile duct
- The seven segmented sternum
- The scalenus muscle of dogs
- The rectus abdominis muscle of monkeys
- The relations of the Azygos vein

The significance of the *Fabrica* is not just the technical correction of what had been regarded as “holy writ” for 1500 years; but Vesalius’ promotion of the broader principle of defining personal observation as contemporary truth, the new post-Renaissance philosophy of “thinking for oneself”. Vesalius’ heretical challenge to received dogma saw its further expression a century later, when the newly-founded Royal Society chose as its motto, “Nullius in Verba”, freely translated as “Take Nothing for Granted” with the implication that personal observation (rather than received dogma) held primacy in the acquisition of knowledge.

The *Fabrica* also contains reports of Vesalius’ pioneering experiments and observations on genetic variation and the changes which occur in the human body as part of
aging. He also showed that an animal could be kept alive by artificial ventilation with bellows, even after the chest had been opened; and that such artificial ventilation would restore the normal heartbeat after a period of short-term failure. He demonstrated the ageing changes in osteoarthritic joints, the anatomy of a prolapsed hernia, and aneurysms of both the abdominal and thoracic aorta.

Vesalius did not correct all of Galen’s errors – he clung to the Galenic doctrine that a different blood flowed through veins, compared to that of arteries. Importantly, it was not until the second (1553) Edition of the *Fabrica* that he began to question whether there really were pores in the interventricular septum of the heart. His account of the nerves in Book IV is a complex mixture of insight and error because in some cases he called tendons nerves. Although he developed to new heights the science of human anatomy, Vesalius still accepted the Galenic systems of physiology.

The Engravings

There can be no doubt that the *Fabrica* woodcuts rank among the finest achievements of the art of the engraver in the sixteenth century. His use of historiated initials continued the beautiful artistic tradition of pre-Renaissance calligraphy. An historiated initial is an enlarged letter at the begging on a page or section of a text (especially those of incunabular) which contains a picture.

Vesalius Himself

Vesalius married Anne van Hamme in 1544, the year after the publication of his *magnum opus*. The couple lived in Brussels where Vesalius built an imposing house “in keeping with his growing influence and [from which] he attended to his flourishing medical practice”.

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The effect of the publication of the *Fabrica* was dramatic. It was said that the influence of:

“a publication, so radical on a superstitious and forelock-pulling age, was immediate and self-evident. Sylvius, Vesalius’ old teacher, turned against his brilliant pupil with acrimony and coarse abuse; while Vesalius’ own pupil, Colombus, sought to cast discredit and derision on his master, by sharp practice”.

At worst, there was widespread condemnation of his questioning of Galenic dogma; and at best, faint praise. It was said that in a fit of indignation Vesalius burned his manuscripts and turned to a life of clinical practice as a surgeon and moved to Madrid to be the court physician of the Emperor Charles V. In 1556, Charles V, on his abdication of the Spanish throne, made Vesalius a Count and provided him with a life-long pension.

In the year 1563, Vesalius embarked on a pilgrimage to Jerusalem in 1563, carrying 500 gold ducats as a gift to the warden of the Holy Sepulchre, as an embassy from Philip II of Spain. On his return, he became ill onboard ship and was put ashore at the island of Zakynthos (Zante) in Greece, and died there in June 1564.

**The English Translation**

A third complete translation of the entire *Fabrica*, into English, was undertaken by William Richardson and the New Zealander, Professor John Carman. The entire work was published in five books, between 1998 and 2009, after William Richardson’s death.

**Conclusion**

The pre-Renaissance quantum of knowledge was largely based on assertion, argument and authority. The paradigm shift, to emphasise personal, “hands-on” observation with recording of reality as the author saw it, was the great contribution of Vesalius. It was said that the priceless ingredient of the *Fabrica*:
“is that of a working anatomist and surgeon reshaping his views and his world as he goes about his business of dissecting, teaching students, and uncovering and correcting errors of fact, all the while coming to realise that he must challenge a received wisdom”.

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References


2. [NOTE: Gerolamo Cardano (1501-1576), physician and mathematician of Padua, gave the first clinical escription of typhus, and wrote Book on Games of Chance, the first work on the science of probability theory and practice. His Ars Magna (“The Great Skill”) founded the modern mathematical domain of algebra].


4. [NOTE: Estimating the historical buying power of local currencies is notoriously difficult due to differential inflation rates in local currencies, the debasement of specie, and the lack of archives of conversion rates which are always changing, decade by decade. The crude “estimate” quoted here is a compilation of estimates from several sources including (a) H. Robinson[Editor]. Original Letters Relative to the English Reformation. Volume One. Eugene (Oregon, USA), The Parker Society, Wipf and Stock Publishers, 2007: 62; (b) Letter XXXI. John Hooper to Henry Bullinger. Dated at Antwerp, May 3, 1549; (c) Patrick Kelly’s The Universal of Cambist and Commercial Institute, published by Lackington in 1821 (page 27). [10 Batzon ≥100 rappen; or ≥10/27 of a Rixdollar. 15 Rixdollars would buy 160 gallons of wine]; and (d) The University of Exeter’s website “Current Value of Old Money”, accessed at projects.exeter.ac.uk. Accessed 13/01/2016.


6. Ibid.: 129.

8. Vesalius, Andreas. De Humani Corporis Fabrica Libri Septem. Basileae (Basel), [Ioannem Oporinum], 1543.


