

Andreas Vesalius: Leader of the Anatomical Renaissance

Alexandra A. Majerski, HBSc¹

¹Faculty of Medicine, University of Toronto

Ad fontes “(back) to the source” is a phrase often used to characterize the renewed vigor with which Renaissance humanists sought and studied the texts of Roman and Greek antiquity. In the field of anatomy, the texts of ancient Greek physician, Claudius Galen (129-c.216 CE), constituted the fund of all Western knowledge on human anatomy for over 1500 years. For centuries, any incongruences between the human cadaver and the authoritative text were attributed to a fault in the eyes of the observer, a malformation of the body, or an error that had been introduced during translation¹ – never was the word of Galen disputed. Unbeknownst to students of anatomy for centuries was the fact that Galen’s observations were based on dissections not of human cadavers, but of the carcasses of animals, such as pigs, dogs, and apes. Nevertheless, the work of Galen formed the basis of university curricula well into the sixteenth century. One who embraced the spirit of the Renaissance was Belgian physician, Andreas Vesalius (1514-64), who fervidly returned to the texts of the ancients. However, unlike generations of anatomists before him, Vesalius studied these texts in an effort to engage his contemporaries in the processes of inquiry and discovery and to add to the wealth of knowledge in the field of anatomy. Part I of this article will explore the published works of Vesalius and include a discussion of his teaching activities. In Part II, the role of Vesalius as a forerunner in the restoration of anatomical investigation will be evaluated in the context of the Renaissance.

Born into a wealthy family in Pergamon (present-day Turkey), Galen received a comprehensive education in the fields of medicine and philosophy and eventually settled in Rome. Roman law strongly prohibited the dissection of human cadavers, thus necessitating his use of animal carcasses for anatomical studies. Despite errors that arose from the nature of the anatomical material available to him, Galen was a devoted and highly skilled investigator, publishing hundreds of treatises. His death is said to have marked the end of anatomical investigation in the West.¹ At least part of the reason for the long hindrance to the return to the study of anatomy lay in Galen’s doctrine of final cause. This teleological doctrine required that something be philosophical and sometimes religious, before it be considered scientific.² A secondly contributing factor, and perhaps a more important one, is the fact that Galen’s works were not translated into Latin in the

ancient period. Thus, alongside the collapse of the Roman Empire was the decline of the Greek medical tradition.

From approximately the eighth to thirteenth century, intellectual leadership of the West passed to the Byzantine and Muslim civilizations as trustees of the classical heritage. It was during this period that many of the most important Greek medical writings were translated into Arabic to become, in turn, the guide for Eastern medicine.

Between the fourteenth and sixteenth centuries, a growing number of universities, beginning with those of Bologna and Padua, became well known for their demonstrations of human dissections. Two points must be made about this trend. The first of these is a consideration of the utility of the dissections to students. They were performed on an annual or biennial basis, with only a privileged handful of students permitted to attend each.² Additionally, each dissection was completed within a matter of days with very few, if any, interruptions. Students were given little opportunity to digest and comprehend what was taking place before them. Secondly, human dissection during this period was performed not as a means of investigation but merely for illustration of the authority, a somewhat diluted Galenism. Toward the end of the fifteenth century, a paucity of Galen’s writings became available directly from the original Greek texts, while the majority were recovered as Latin translations from Arabic.² A pervasive belief developed that the true answers to all medical questions were to be found in these recovered texts.

Part I: Vesalius the Anatomist

Andreas Vesalius was born in Brussels, Belgium, into a family of eminent medical men who served as apothecaries and physicians to successive emperors of the Holy Roman Empire. Vesalius studied medicine from 1529-1533 at Louvain in Belgium, a university about which he claimed, “doctors had not even dreamed of anatomy.”³ According to his own account, Vesalius inspired its members to “spend great and very serious study in acquiring a knowledge of the parts of man.”³ Vesalius continued his training in Paris from 1533 to 1536 in a medical faculty that also adhered to the Galenic framework of medicine. In fact, Vesalius worked under the supervision of two pre-eminent Galenists, Johann Günther and Jacobus Sylvius, to translate and compile the work of Galen into compendia.⁴ These years were vital to the work that Vesalius would later accomplish, as they made him cognizant of the status of anatomy during his time. He became acquainted with the facts of anatomy that had been and continued to be widely circulated and taught.

Corresponding Author:
Alexandra A Majerski
a.majerski@mail.utoronto.ca

On his way to the University of Padua, at which anatomy had been an integral component of medical studies for years, Vesalius befriended artists in the nearby city-states of Venice and Florence. Scholars have suggested that the contact was fostered by apothecary shops, where physicians went for their medicines and artists bought their pigments. It is believed that Vesalius' artistic skills, particularly those in anatomical illustration, were nurtured by these interactions.⁵

Shortly after his arrival in Padua, Vesalius was awarded a doctorate in medicine. According to an oft-repeated legend, the following day, he was appointed Professor of Surgery at the age of twenty three. Vesalius then embarked upon anatomical teaching.⁵

The standard and truly singular practice for conducting anatomical dissections made use of an ignorant barber-surgeon to carry out the physical work of the dissection. Propped atop a chair and far removed from the dissection table was the instructor who looked at the body through the book. In this scenario, the physical aspect of the dissection was viewed as a mere supplement to the reading of the sacred work of Galen. Vesalius believed this practice to be laughable.¹ Not only did he refuse to blindly re-iterate the words of the authoritative text as an instructor, but he took to the knife himself with the intention of stating the facts of the body as they appeared to him in the human cadaver.



Figure 1. Frontispiece of Andreas Vesalius's 1543 *De Humani Corporis Fabrica*.

Vesalius consolidated his findings in two texts. In 1538, Vesalius published his first book, *Tabulae Anatomicae Sex* (Six Anatomical Plates). It was a short book but very popular thanks to its extremely high-quality images. In accordance with long-held tradition, *Tabulae* contained a mere six images and was written in three ancient languages: Latin, Greek, and Hebrew.⁵ Historians are particularly interested in this text because of the inconsistencies between the portrayal of certain morphological features and the level of knowledge Vesalius is thought to have acquired by this point in his training. Despite the evident care taken in artistic preparation, the body proportions of some figures are incorrect. The ribs are drawn shortened and the spine too straight.⁵ Interestingly, vestiges of Galenic anatomy are also included in this text, such as the five-lobed liver. Some historians believe Vesalius deliberately placed these features in the illustrations of his first text in an attempt to abate the reaction he anticipated to his future work.⁵ Copies of *Tabulae* are actually more scarce than original editions of Galen's second and much more famous text.

The culmination of Vesalius' medical career came in 1543 with his publication of the first illustrated and observation-based anatomical textbook: *De Humani Corporis Fabrica* (On The Fabric of the Human Body). The frontispiece (Figure 1) of this seven-volume text is rife with symbolism. In the center, Vesalius is seen surrounded by a large crowd at the medical faculty in Padua. His head is turned towards the reader, at whom he is looking boldly. His hands are in direct contact with the corpse of a woman he is dissecting. Below the table are the squabbling barber-surgeons displaced from their traditional position. Found cast off to the side are the dogs and monkeys of Galen's studies. Finally, in the customary location reserved for the recitation of Galen's text is found nothing more than a skeleton.

Vesalius used the preface of *Fabrica* to draw attention to his medical achievements. He differentiates himself from and elevates himself above his peers by claiming to have "trained [him]self without guidance in the dissection of brute creatures"³ and protesting, rather than accepting dubious information reluctantly. He indicates his detestation of the practice of the day in which a lecturer "perched up aloft a pulpit and with an air of notable disdain, dron[ed] out information about facts they never approached at first hand, but which they merely commit to memory from the books of others."⁶ The incongruity between theory and practice exemplified by this scene is what Vesalius sought to eliminate. With complete awareness that he was the first anatomist to physically take to the cadaver for investigation, Vesalius took advantage of each opportunity to educate others. Accompanied by a skeleton and equipped with diagrammatic illustrations and charts for his students,⁷ Vesalius' didactic efforts were unique amongst previous anatomists. They were clearly intended to provide his audience members (sometimes made up of over 500 students, physicians, government officials, and distinguished citizens)⁶ with an opportunity for further visual analysis.

Fabrica was a "completely fresh arrangement in seven books,"³ which were presented in the order that Galen himself had written, covering the bones and cartilages, ligaments and muscles, veins and arteries, nerves, the organs involved in

nutrition, the heart, and the brain. Vesalius claimed to have corrected over two-hundred of Galen's mistakes in *Fabrica*.⁸ Amongst those errors included the discovery that the mandible is a single bone, not two (an error derived from dog anatomy) and that the sternum has three parts, not seven (an error derived from monkey anatomy). He also gave detailed descriptions of complex abdominal parts, such as the omentum, and suggested that the kidneys filter blood to produce urine (rather than filtering urine as had been previously believed).¹

Fabrica was copiously illustrated because Vesalius believed that the description of a body structure was inseparable from its corresponding image. In the same way that Vesalius brought diagrams to dissections, he promoted the accessibility of anatomy and "place(d) before the eyes of the student... nature's works, as it were, a dissected corpse."³ The second book of *Fabrica* features the most famed of Vesalius' illustrations, the muscle men (Figure 2). Commentary accompanied each illustration and explained which muscle origins had been cut and which insertions were left hanging to create each of the successive diagrams. Ironic humor is interwoven throughout the text and its illustrations. As muscle is removed layer by layer, the body of the poor cadaver transitions from one of athletic exuberance to a pitiful sight needing ropes and walls for support. Moreover, the landscape background becomes increasingly barren as summer turns to winter as layer by layer of muscle is removed.⁵ In 1996, the late Terence Cavanagh, Professor of Medical Literature at Duke University, placed the reversed muscle figures in a horizontal series to demonstrate that they create a continuous landscape.⁹ Some scholars have identified the scenery in the Eugean Hills near Padua, where physicians have travelled in search of the exact site. Considered the "first great positive achievement of Science itself in modern times"¹⁰ *Fabrica* made nature's handiwork available to a growing literate public and encouraged the widespread practice of dissection.

Part II: Vesalius, Leader of the Anatomical Renaissance

Vesalius' methods, with their apparent disregard for long-held beliefs and his claims, in conflict with those of Galen's, were met with widespread antagonism. Some critics were outraged at the immoral sacrilege of organized dissections which desecrated "God's handiwork."¹ Court physicians and academic professors taunted Vesalius, referring to him as a "mere barber." Some went so far as to call him an "anti-Galen-

ist."⁵ Conversely, certain present-day historians have referred to him as "Galen restored to life."⁴ How can these two views be reconciled?

In reference to his work at Padua, Vesalius rebutted that one "could not find in [his] procedure anything that fell short of the tradition of the ancients."³ It is essential that the work of Vesalius be evaluated within the Renaissance context. Anatomical dissections that took place prior to the sixteenth century not aimed not to reveal a hidden truth but rather to confirm and recite facts as Galen had espoused them. The intense study of ancient texts was not undertaken during the Renaissance with an aim to re-install the specific rejections or beliefs of the ancients. Instead, it aspired to appraise ancient texts through a combination of reasoning and empirical evidence, the same methods by which the ancients came to understand their world and explore nature. Vesalius was convinced that "one could with confidence assert that our modern science of anatomy was equal to that of old, and that in this age anatomy was unique both in the level to which it had sunk and in the completeness of its subsequent restoration."³ Much like the humanists, Vesalius was looking to the past, not to give new life to the presuppositions of the ancients but to emulate their approach to scientific reasoning, an approach that was based entirely on observation and experience.

Almost immediately upon publication, Vesalius faced intense ridicule and derision from his contemporaries. He later wrote in his *China Root* epistle of burning all of his unpublished papers in December 1543: "...as to my notes, which had grown into a huge volume, they were all destroyed by me..."¹¹ Expressions of sentiment other than awe towards the work and discoveries of Galen were preposterous and considered unacceptable at this time. The examples of John Geynes of Oxford and Thomas Fludd of Cambridge illustrate this. The former was forced to recant his criticisms of Galen, in 1559, before he could be made a fellow of the college. The latter, after having performed poorly on his examinations, was awarded his license to practice after merely reading sections from the work of Galen.¹² Within a short period, Vesalius relinquished his chair at the University of Padua. For reasons unknown, he undertook a pilgrimage in 1564 to Jerusalem. On his return, he was shipwrecked on the island of Zante where he died in October of that year.²

William Harvey wrote in the eighth chapter of his book, *Exercitatio Anatomica de Motu Cordis et Sanguinis in Animalibus* (An Anatomical Exercise on the Motion of the Heart and

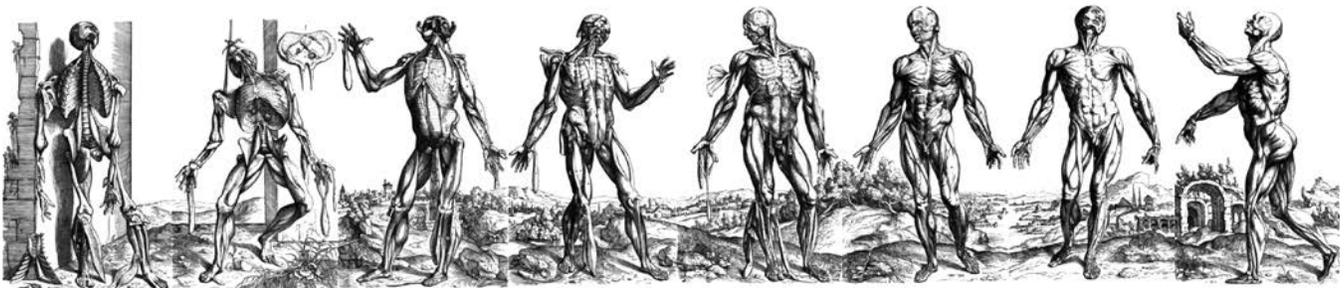


Figure 2. Eight-series landscape panorama of Vesalius' muscle men plates.⁹ Reversed muscle figures shown. Paintings are attributed to Jan Stephan Van Calcar.

Blood in Living Beings), that “the die has now been cast, and my hope lies in the lover of truth and the clear-sightedness of the trained mind.”¹³ The tone had undoubtedly been set for subsequent anatomical investigations in Western medicine. Vesalius’ immediate successors at Padua, Matteo Realdo Colombo and Gabriele Falloppio, elaborated and improved upon the work of their predecessor. Vesalius’ work was widely copied and plagiarized. One of the best-known plagiarists was Thomas Geminus (c.1510-1562), whose *Compendiosa totius anatomie delineatio, aere exarata* (A complete delineation of the entire anatomy engraved on copper), published in 1545, in London, featured Vesalius’ woodcuts finely engraved on copper – the second book in England with engraved plates. Juan Valverde de Hamusco (c.1525-1587), a Spanish anatomist who lived in Rome, was responsible for the introduction of Vesalius’ work in Spain. Of the forty-two engravings in his book, *Historia de la composición del cuerpo humano* (Account of the composition of the human body), only four new plates were made – the others were copied from Vesalius’ work. His text featured not only observations from his own studies but also a critique of Vesalius’ errors.¹² Such was the trend in studies and publications on human anatomy that continued well into the eighteenth century.

Having acquired a firm theoretical foundation as well as skill in dissection early in his medical education, Vesalius was poised to impact the field, most vividly through his debates and demonstrations. He was unique in his inability to accept discrepancies between the authoritative text and the physical embodiment of those texts: the cadaver. As in other areas of Renaissance science, literature, and art, Vesalius’ approach

and discoveries hastened a break with ancient traditions and long-established but unverified information. Through *Fabrica*, Vesalius pioneered the approach of relying on personal observations and investigations. Returning to the ancients was undertaken in such a way that a new anatomical tradition was created. Going back to the sources (*ad fontes*) resulted in Vesalius’ publication of a *new* source to which subsequent anatomists would return for the next several hundred years.

References

1. Parker S. Kill or Cure: An Illustrated History of Medicine. New York: Dorling Kindersley Publishing; 2013.
2. O’Malley, C. Andreas Vesalius of Brussels 1514-1564. Los Angeles and Berkeley: University of California Press; 1964.
3. Vesalius A. De Humani Corporis Fabrica. In: Ross J, McLaughlin M, editors. Farrington B, translator. The Portable Renaissance Reader. New York: Viking Penguin Inc.; 1953.
4. Cunningham A. The Anatomical Renaissance: The Resurrection of the Anatomical Projects of the Ancients. Aldershot: Scolar Press; 1997.
5. Duffin J. History of Medicine: A Scandalously Short Introduction. Toronto: University of Toronto Press Inc.; 1999.
6. Gordon B. Medieval and Renaissance Medicine. London: Philosophical Library; 1959.
7. Saunders J and O’Malley C. The Illustrations from the works of Andreas Vesalius of Brussels. Cleveland: The World Publishing Company; 1950.
8. Persaud T. Early History of Human Anatomy. Springfield: Charles C. Thomas Publisher Ltd.; 1984.
9. Cavanagh GST. A new view of the Vesalian landscape. *Med Hist* 1983;27:77-9.
10. Singer C. The Evolution of Anatomy. New York: Knopf; 1926.
11. Vesalius A. The China Root Epistle. In: Garrison, D, editor and translator. Vesalius: The China Root Epistle: A New Translation and Critical Edition. Cambridge: Cambridge University Press; 2014.
12. Persaud T. A History of Anatomy: The Post-Vesalian Era. Springfield: Charles C Thomas Publisher Ltd.; 1997.
13. Franklin K. William Harvey. Englishman. 1578-1657. London: MacGibbon and Kee; 1961.