

Artistic Anatomist

■ In a flea-infested hostel on the bleak Ionian island of Zante, a pilgrim returning from the Holy Land in 1564 lay dying, alone and unknown. A Venetian goldsmith, wandering on the island where his ship had chanced to put in, recognized the sufferer as the anatomist and the Emperor Charles V's own physician, Andreas Vesalius.

Vesalius at the age of 50 was on his way back to Padua, to resume the anatomic work he had laid down as a young man for the glittering but sterile life of a court physician. On the 400th anniversary of his death, the question of whether the author of the *Fabrica* would have gone on to further historic achievements in medical science remains a fascinating speculation.

Brussels. Andreas was born on December 31, 1514, the second son of the Emperor Maximilian's apothecary and valet-de-chambre: originally named Witing, of the Hanseatic town of Wesel on the Rhine, the family had a long line of physicians associated with the aristocracy. One of his ancestors had gathered a large and costly collection of medical manuscripts, written a commentary on Avicenna; a greatgrandfather was a doctor of medicine who taught at the university of Louvain, became city physician of Brussels and served the Duke of Burgundy. His grandfather Everard became physician to Mary of Burgundy, wife of the Hapsburg archduke, later Emperor Maximilian.

Andreas' father, Andries Van Wesele, was Everard's natural son, later legitimatized by his imperial patron. Andreas' mother Isabel Crabbe, daughter of the Brussels tax collector, valued the family's learned heritage and kept the manuscript library in her charge; young Andreas was familiar with his grandfather's commentaries on Rhazes and Hippocrates. Within sight of the family home in a new quarter of Brussels was the Galgenberg,



the gallows hill where the condemned were left dangling for the crows, an easy source of anatomic material for the inquisitive boy. Of the three other children, younger brother François followed Andreas into medicine.

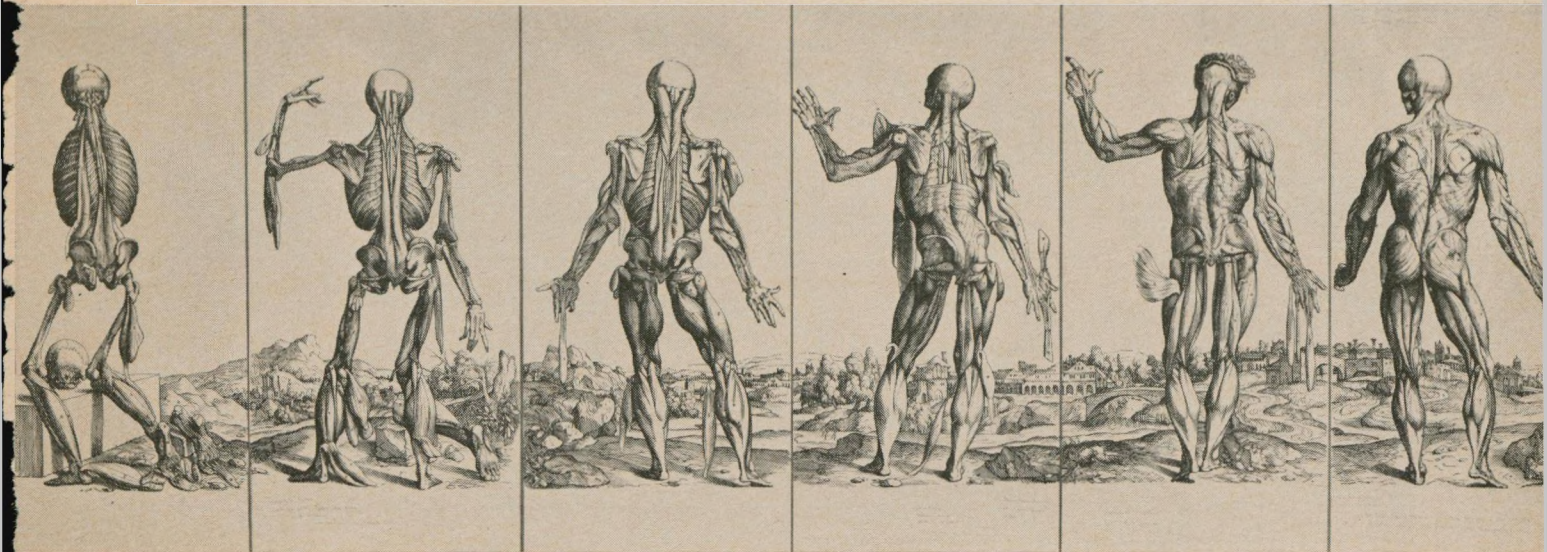
With the sons of Brussels' best families, Andreas probably attended the school of the Brothers of the Common Life, a famous teaching order in the Netherlands, where he studied the classic *trivium* of grammar, logic and rhetoric; at 15 he went to Louvain, enrolled in the century-old university where his greatgrandfather had held a chair of medicine; he entered the Castle school for his bachelor of arts degree, studied Latin, Greek and Hebrew in the Pedagogium Trilingue.

Paris. After about five years at Louvain, Vesalius transferred to the more distinguished medical school of Paris in 1533. He paid his registration fee of six sous; on the traditional opening day of the new medical term (St. Luke's, October 18), he walked at the end of the academic procession to the new chapel, heard mass in the light of stained glass windows representing the Virgin and St. Luke surrounded by kneeling students.

Shortly before Vesalius' arrival, Paris University had purchased the Greek editions of Hippocrates and Galen fresh from the Aldine press; Latin translations were increasingly available, especially a translation of the first nine books of Galen's *Anatomical Procedures* by Vesalius' own teacher Jean Guinter (Guenther von Adenach) published in 1531. Unaware of the work of Italian anatomists, who already suspected errors in Galen, the Paris teachers made him their indisputable authority; a fierce Galenist was Jacobus Sylvius, who later attacked his former student's work, saying that if human anatomy was not as Galen had described it, then human beings had changed and not for the better.

The young Vesalius prowled the boneyard of Les

Woodcut portrait of Andreas Vesalius, opposite, is from the frontispiece of the first edition of the *Fabrica*, 1543. Below are plates of muscle dissection. When placed in order from left to right a continuous landscape background is seen.



Innocents cemetery and the executioner's dumping ground at Montfaucon, fought off scavenger dogs for the bones he wanted to study. In the anatomy theatre the professor in his high-backed chair droned from the Latin text while a barber servant far below crudely carved the corpse; Vesalius saw demonstrated the eight abdominal muscles, mangled and in the wrong order, but no other muscles and no bones, nerves, veins or arteries; wrote he in the *Fabrica*: "In such confusion less is presented to the spectators than a butcher in his stall could teach a physician." He contrived to become Guinter's student assistant and took the barber's place at the dissecting table; one of his subjects was a prostitute of fine figure who had been hanged.

Louvain. In August of 1536 the struggle between Emperor Charles V and France's King Francis I exploded into war and forced Vesalius, a subject of the Holy Roman emperor, to break off his Paris studies and return to Brussels; here he assisted at an autopsy on a young lady-in-waiting of the Countess of Egmont, who had shown pallor and difficulty in breathing and was thought to have been poisoned. Impatient with the barber's lack of skill, he took over the dissection and found that death was probably due to the compression of the hypochondrium and lungs by the corset the girl had worn to make her waist slender; added Vesalius: "The attendant women left to shed their corsets as quickly as possible." He and the physician in charge remained to investigate the reproductive system where he found but misinterpreted a corpus luteum.

Back in Louvain he found a conservative medical faculty still sunk in medieval and Moslem texts and indifferent to the newly available Greek classics. As a Paris University disciple he was soon in open controversy with his teachers; he conducted anatomy demon-

strations, lecturing and dissecting at the same time, watched by students, teachers and townsfolk, including the burgomaster who offered to provide cadavers.

One day, while strolling outside the city walls where the condemned were left as they had perished, he found a corpse still chained to the stake, stripped clean by the executioner's fire and scavenging birds. By successive trips at dead of night he brought the bones home to his lodgings and assembled his first skeleton. Published during his one year in Louvain's medical school was Vesalius' first independent treatise, the *Paraphrase* of nine books of Rhazes, a comparison of Arabic medicine with the methods of the Greeks.

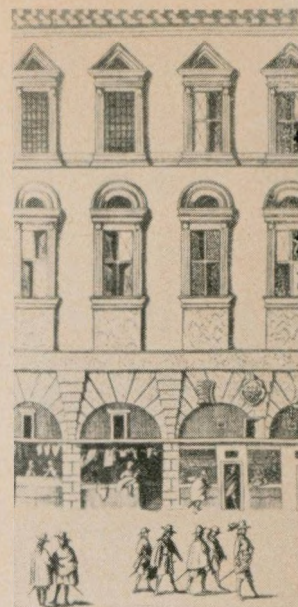
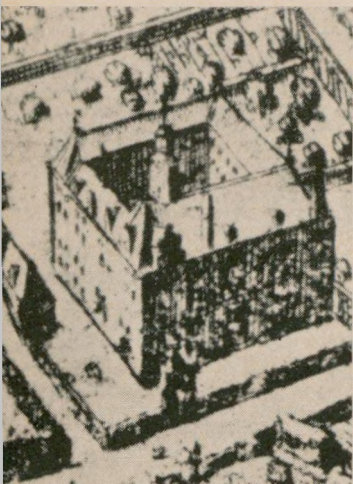
Padua. In December, 1537, Vesalius passed his examinations before the Padua medical faculty, obtained his degree of doctor of medicine on the same day and on the following day was given his professorship. He took the chair of surgery and anatomy, delivered a lecture on treatment of a phlegmon and followed it with a dissection.

Vesalius lodged like his students in a private house, gave his lectures and dissections in one of several houses scattered through the town or possibly out of doors*; the converted Hospitium Bovis Magnificum, or inn of the Magnificent Ox, which gave the university its affectionate student name of *il Bó* (The Ox), did not have space for the medical school until 1542.

Stocky and self-assured, the new 23-year-old anatomy teacher followed Mondino's medieval dissection procedure of working on the abdominal cavity, thorax, head and neck, brain, extremities; the classic sequence was a race with decomposition in the heat, the last muscles were often too far gone in putrefaction to be demonstrated. He used a dissected dog for comparative anat-

*As suggested in *Fabrica's* frontispiece, in the university quadrangle.

Below, left, is a view of Vesalius' home in Brussels as it appeared in 1639. Louvain University as it appeared about 1600 is seen below, right. At left is the façade of the University of Padua about 1600. The building was not completed until Vesalius' last year of residence.



my and then assembled the skeleton for his students.

His great innovation was that he took the scalpel in his own hand and lectured while dissecting. Another innovation was a series of anatomic charts which he drew for his students; these were in such demand that he combined them with three drawings of the skeleton by Joannes Stephanus of Calcar and published them as the *Tabulae anatomicae*, or *Tabulae sex*. Evident in this work are Galenic errors such as the five-lobed liver presumably taken from the ape; *venae cavae* drawn from the sheep; the *rete mirabile* or "marvelous network" of blood vessels at the base of the brain where vital spirits supposedly were converted to animal spirits.

During a visit to Bologna Vesalius entered into a controversy with its leading anatomist, Matteo Corti, over the Aristotelian-Galenic doctrine that certain fibers in the veins performed specific physiologic functions: Corti denied the notion while Vesalius clung to it. Years later in the *Examen* (1564) he ruefully recalled the quarrel and admitted his error. Wrote he: "For when I had separated the substance of the veins in search of the fibers, I dissected it raw and boiled, and, by Hercules, to tell the truth, the fibers had come from the imagination of our authors. Finally . . . our dispute over what vein ought to be opened in venesection was so much goat's wool."*

Roles were reversed when at the invitation of Bologna students Vesalius performed dissections while Corti gave the lectures. In the church of San Francisco, transformed into an anatomy theatre, some 200 spectators heard Corti insist that Galen's description of the insertion of the rectus abdominis muscle was correct; Vesalius at the dissecting table blatantly demonstrated Galen's error. Some faculty members walked out in protest, but the students hailed Vesalius, and for the remainder of his stay provided him with stolen cadavers of all ages. This gave him an opportunity to demonstrate the changes in bones from childhood to old age. He also assembled a human and an ape skeleton as a demonstra-

*I.e., nonsense, since goats have no wool.

tion of comparative anatomy, incidentally proved that Galen's description of the lumbar vertebrae applied to the simian and not to the human spine.

The Fabrica. Between the winter of 1539 and the summer of 1542 Vesalius completed his great work, *De humani corporis fabrica*, a textbook of human anatomy in seven books copiously illustrated with woodcuts, and the *Epitome*, an accompanying manual. In its rejection of authority for its own sake and its scientific approach to knowledge by direct observation, the *Fabrica* marks the turning point from medieval to modern anatomy. It has also stood the test of four centuries as a work of art and literature, the highly personal expression of a youthful genius, dynamic and self-confident.

He had arrived by cautious steps at his revolutionary conclusion that Galen could be in error: although the physiology of the *Fabrica* was still Galen's, Vesalius could now demonstrate in the course of a single human anatomy (i.e., the dissection of one cadaver) more than 200 discrepancies in structure and function between Galen's description and the observed fact.

Galen's avowal that he had used only animal subjects had been forgotten or ignored through a millennium of medieval teaching; Vesalius arrived at the explanation independently and was appalled at not having discovered it sooner. He wrote: "I could not get over wondering at my own stupidity."

In producing the illustrations for the *Fabrica*, he supervised the artists, made many preliminary drawings himself; certain of the smaller illustrations are believed to be from his hand. The artistic work has been credited to Calcar and at various times to Titian; internal evidence and contemporary references have convinced scholars that several artists of Titian's studio contributed to the work, including Calcar.

In his text Vesalius described the tools and techniques of dissection, also his manner of suspending a cadaver by a rope passed under the lower jaw so that it could be readily turned for dorsal or ventral approach. In the plates he gave the earthy Renaissance sense of humor full rein: one skeleton leans on a spade, another philo-



Jacobus Sylvius, below left, one of Vesalius' professors in Paris, viciously attacked the Fabrica and referred to Vesalius as a madman. Below right, title page, Paraphrasis, Vesalius' first published work.



IACOBUS SYLVIVS
Regius Lutetia Professor

PARA
PHRASIS, IN NONVM LI-
brum Rhazæ Medici Arabis clariss. ad
Regem Almanforem, de singulari
corporis partium affectuum
curatione, auctore An-
drea Vesalio Bru-
xellensi Medi-
cine candi-
dato.

Louanij ex officina Rugeri Reischij
Mense Februar.
1537.

sophically contemplates a skull; decorated initial letters show boisterous *putti*, the cherubs beloved of Renaissance artists, engaged in body snatching, vivisection, dissecting, articulating a skeleton.

The plates that show progressive stages of musculo-skeletal dissection are placed against sections of a typical Italian landscape, which can be reassembled by placing them side by side to form a continuous panorama; the scene has been identified as the Euganean hills six miles southwest of Padua. The title page shows Vesalius performing a public anatomic demonstration on a female body before an audience of students, faculty and townsfolk; the scene is the first published depiction of an anatomy theatre, apparently outdoors and probably in the university quadrangle, with the Lion of St. Mark and the Ox (*il Bó*) identifying the university of Padua.

When his work was completed Vesalius packed the text and woodcuts with utmost care and elaborate instructions, sent them over the Alps on mule back to Joannes Oporinus (or Herbst) of Basel, a printer who had taught Latin and Greek, and had served Paracelsus as secretary. Vesalius followed soon after, watched over the printing and is believed to have chosen the paper. He found time to perform a public dissection and to assemble the skeleton, which is still on view in the Anatomical Institute of Basel University.

The completed *Fabrica* was folio size (16 by 11 inch pages) bound in vellum according to 16th century custom, its front cover adorned with blind tooling (tooling without gilding or coloring). Its pages numbered 663 or in some copies 659, with five unnumbered leaves at the front and 18 at the back, printed in Roman type on laid paper; it had 277 plates of full page and smaller sizes, sometimes two or three on a page, with a large illuminated initial at the beginning of each book and smaller ones for the many chapters. The seven books, or sections, followed Galen's rather than Mondino's order of dissection: Book I dealt with the bones; II, muscles; III, vascular system; IV, nerves; V and VI, the internal organs and VII, the brain. The title page with its fa-

mous frontispiece, the portrait of the youthful author, and the dedicatory introduction occupied the first five leaves. Addressed to the emperor, the introduction deplored the decline of medicine and urged the importance of the study of anatomy.

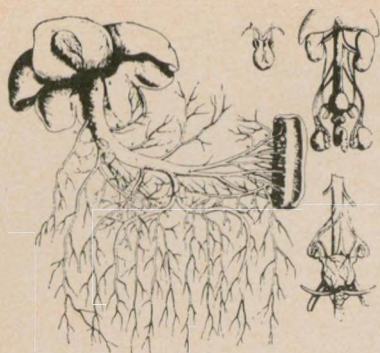
Bound copies of the *Fabrica* and the *Epitome* in Latin were ready on August 1, 1543, the German translation of the *Epitome* a few days later. Vesalius dedicated the *Fabrica* to Emperor Charles V and the *Epitome* to his son who would succeed him as Philip II of Spain. He sent the *Epitome*, probably also a presentation copy of the *Fabrica* on vellum, to Philip in Spain; the presentation copy for the emperor he carried himself to an audience with Charles who was then at Mainz. It won him an appointment as *medicus familiaribus ordinariis* of the emperor.

Late in the year Vesalius made a triumphant tour through Italy: at Padua he performed his last dissection on a beautiful prostitute taken by the students from a tomb in the church of San Antonio; he revisited Bologna, gave a course of lecture demonstrations at Pisa where students provided the bodies of a nun dead of pleurisy and a hunchbacked young girl.

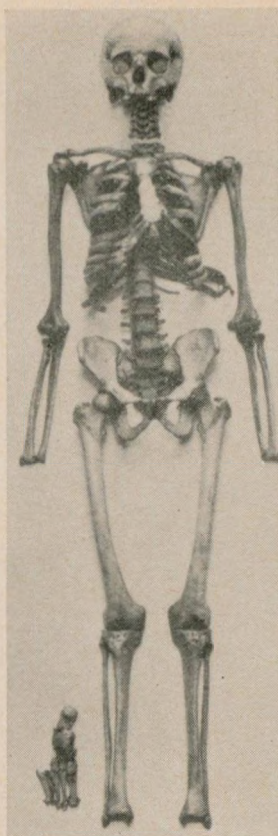
En route to rejoin the emperor he stopped in Brussels to marry Anne von Hamme, daughter of a Brussels town councilor; the following year (1545) his daughter Anne was born. Little is known of Vesalius' family life, except that he owned a sumptuous new house and was heir to a considerable paternal fortune.

Imperial Physician. The prize of being a court physician at 29 soon tarnished: his imperial patient was a gout sufferer and insomniac, a gluttonous eater, a willing prey to quacks and addicted to self-medication. Older court physicians attacked the *Fabrica* to discredit Vesalius with the emperor.

Nevertheless his fame grew steadily and his opinions were sought by colleagues throughout Europe. Although he was not the emperor's personal physician, the monarch's periods of improved health were credited to Vesalius. Through 13 years of imperial service Charles' favor never waned: on the emperor's abdication in 1556

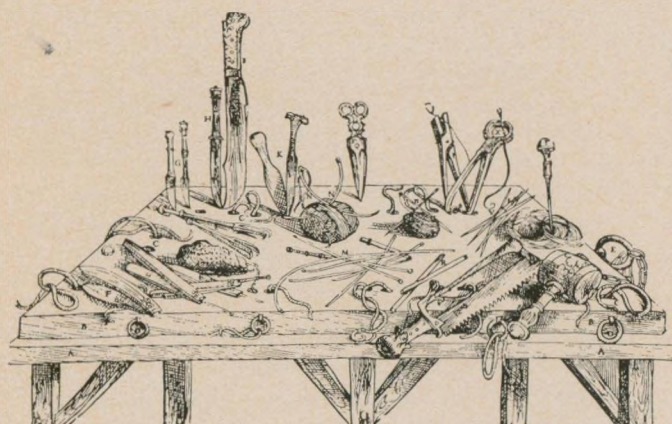


First tabula of the *Tabulae sex*, 1538, above, shows Galenic five-lobed liver and first depiction of the prostate gland.



At right, the remains of a skeleton articulated by Vesalius while visiting Basel in 1543.

Plate from the *Fabrica*, below, shows a dissection table with all the instruments Vesalius used to perform a dissection.



he retired Vesalius with a life pension, but King Philip pressed him into his own service in Spain. When in 1559 Philip's prospective father-in-law, Henry II of France, was fatally injured in a tourney at the marriage celebration, Vesalius was summoned from Brussels to take charge of the royal patient.

Again in 1562 when Philip's heir Don Carlos suffered a dangerous head injury Philip sent two court physicians, finally went himself and took Vesalius. His recommendation to incise and drain the orbits of the eyes was followed, a sequester was discharged and the prince recovered. Among many cases that swelled the growing legend, the noble death of a princely patient (Count Egmont of Buren) was credited to Vesalius for his precise prognosis of the hour of the patient's end, giving him time to be decked in full armor and make a splendid farewell to his friends and followers.

For the first decade after the *Fabrica*'s publication,

Vesalius suffered under the attack of Galenists, which reached a peak in Sylvius' book of 1551 entitled *Vaesanus* (madman). Wounded by the angry reception, Vesalius burned his remaining unpublished manuscripts; in his *Letter on the China Root* (1546)* he answered his detractors and vowed bitterly that he was finished with science. In a calmer hour he returned to the *Fabrica*, prepared a revised edition which was published in 1555.

In 1561 a copy of Gabriele Fallopio's *Observationes anatomicae* reached him in Spain; he wrote a careful review (the *Examen*), expressed generous praise for the incumbent of his old chair at Padua. On the news of Fallopio's death (in 1562, of terminal tubercular complications) a return to Padua and science became possible. Two years later he won Philip's permission to depart for the Holy Land.

Last Journey. The legend arose that Vesalius left Spain because he had begun an autopsy on a patient presumed to be dead and found the heart still beating; similar tales of unwitting vivisection were told of other anatomists, notably Berengario and Fallopio. Another report was that he had been gravely ill and undertook a pilgrimage to the Holy Land in gratitude for his recovery. A friend described Vesalius at this time as taciturn and melancholy.

By whatever circumstances, in March, 1564, Vesalius with his wife and daughter left Madrid, traveled together as far as Certe in France where (according to an eavesdropper) they parted in a bitter quarrel. The women continued to Brussels; Vesalius took ship at Marseilles for Venice, where he renewed old friendships, arranged for publication of the *Examen*.

He continued uneventfully to the Holy Land; the several versions of his tragic return journey agree that the ship was delayed by storms; food and water supplies failed and when Vesalius reached Zante and fell gravely ill the islanders feared plague and left him untended to die alone.

Epilogue. With the passing centuries Vesalius' achievement glowed ever brighter: the great teacher Hermann Boerhaave and Leyden's leading anatomist Bernhard Siegfried Albinus in 1725 collaborated on a monumental edition of his anatomic and surgical works. William Osler and his youthful fellow bibliophile Harvey Cushing in 1903 retrieved six first editions of the *Fabrica*, praised by Dr. Osler as the greatest medical work ever printed.

The original woodcuts followed a tortuous path through the centuries, were republished in the 18th century as the work of Titian, were discovered in 1893 after a long disappearance in the Munich University library. In 1934 they were published by the New York Academy of Medicine, together with the *Tabulae sex* and the *Venesection Letter* diagram, in the Academy's definitive *Icones anatomicae* of Vesalius. At that time all but 50 of the original 277 plates had survived the centuries; they perished finally in the bombing of Munich during World War II.

Summing Up. By the skeleton contemplating a skull in Book I of the *Fabrica*: *Vivitur ingenio, caetera mortis erunt*; "Genius lives on, all else is mortal." 

*Replying to a physician's inquiry about new treatment (quinine) given the emperor for his gout.