NEUROPHYSIOLOGY

The man who bared the brain

Alison Abbott encounters the discoveries of Renaissance anatomist Andreas Vesalius.

It is only when you read the words that Andreas Vesalius wrote as an angry young man in the 1540s that you get a feeling for what drove him to document every scrap of human anatomy his eye could see. His anger was directed at Galen, the second-century physician whose anatomical teachings had been held as gospel for more than a millennium. Roman Empire law had barred Galen from dissecting humans, so he had extrapolated as best he could from animal dissections — often wrongly.

Human dissections were also banned in most of sixteenth-century Europe, so Vesalius travelled to wherever they were allowed. He saw Galen's errors and dared to report them, most explicitly in his seven-volume *De Humani Corporis Fabrica* (*On the Fabric of the Human Body*), which he began aged 24, working with some of the best art professionals of the time. His mission to learn through direct and systematic observation marked the start of a new way of doing science.

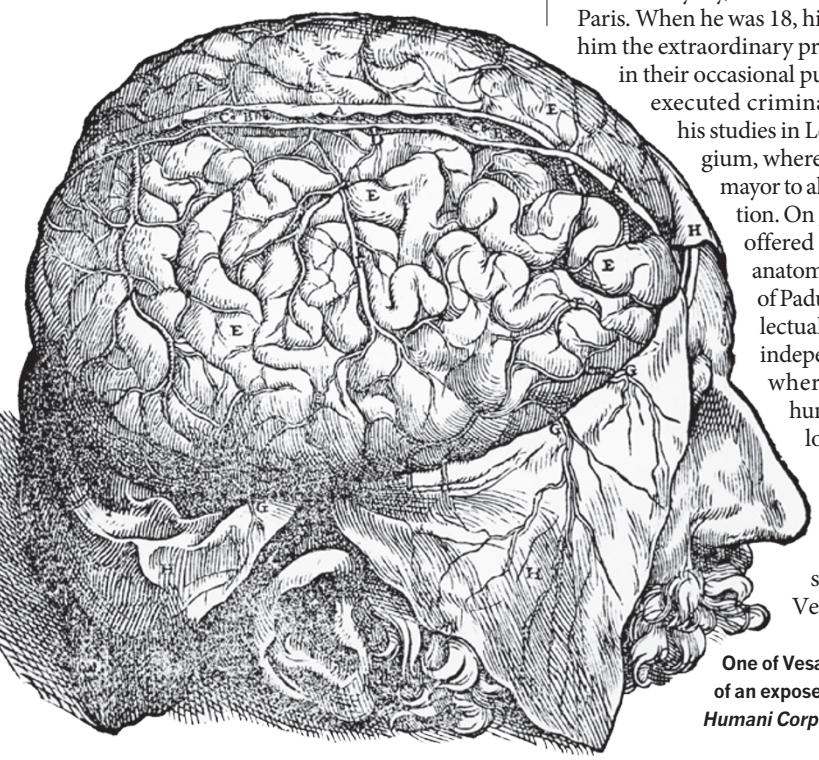
In *Brain Renaissance*, neuroscientists Marco Catani and Stefano Sandrone present a translation from the Latin of the *Fabrica*'s last volume, which focuses on the brain. Through it we can appreciate Vesalius's extraordinary attention to detail, and his willingness to believe his eyes, even when what he saw contradicted established knowledge. We learn his anatomical vocabulary. For example, he called the rounded surface protuberances near the brain stem "buttocks" and "testes"; these are now known as the inferior and superior colliculi, or 'little hills', which process sound and vision.

We hear Vesalius — who died at 49 in 1564, the year Galileo was born — berating Galen and his sixteenth-century followers with unrestrained sarcasm. But we also see a man not quite prepared to put into plain words the theological consequences of some of his discoveries, particularly his failure to find an anatomical explanation for the 'human spirit' in the brain.

Brain Renaissance is not the only English translation, but it is the only one available at a price that individuals might afford. Accompanying texts by Catani and Sandrone place the work in its historical and scientific context; a biography of Vesalius is rich in elements familiar to scientists today, such as the fear of plagiarism and pernicious academic rivalry. And a brief final section on the history of neuroscience warns against the temptation to move away from direct observation into overly abstract theory.

Born into a well-to-do Brussels family of physicians and pharmacists, many of whom attended royalty, Vesalius studied medicine in Paris. When he was 18, his teachers allowed him the extraordinary privilege of assisting in their occasional public dissections of executed criminals. He continued his studies in Leuven, now in Belgium, where he persuaded the mayor to allow human dissection. On graduation, he was offered a professorship in anatomy at the University of Padua, Italy — an intellectual hotbed politically independent of the Pope, where the practice of human dissection was long established.

Padua is close to Venice, which was home to important schools of artists. Vesalius recruited members of Titian's workshop to attend his dissections and provide the *Fabrica*'s exceptional illustrations. In the first two volumes, skeletons and flayed figures pose in romantic landscapes full of classical iconography. Figures in the other volumes are less ornate, but clear and fine. The brain is often shown encased in the skull with the top removed, revealing cross-sections at different depths; other images depict individual brain structures such as the cerebellum.



One of Vesalius's illustrations of an exposed brain from *De Humani Corporis Fabrica*, 1543.

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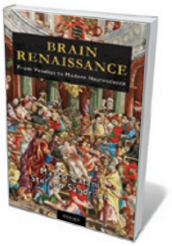

Brain Renaissance: From Vesalius to Modern Neuroscience
MARCO CATANI AND STEFANO SANDRONE
Oxford Univ. Press: 2015.

Vesalius's thinking was as influenced by prevailing technologies as ours is, and as Galen's was, note Catani and Sandrone. Whereas today we draw on computer and social networks for metaphors about brain function, for Vesalius and Galen the technology of reference was hydraulics, which almost miraculously kept the waterways and plumbing systems of their cities functioning. Both saw the brain in these terms, with the functional units being the liquid-containing ventricles rather than grey and white matter. Galen held that the vivifying force of the *pneuma physicon*, or 'animal spirit', flowed down through the ventricles, then through hollow nerves to nourish all parts of the body. Vesalius ruled this out on anatomical grounds: he showed that there is no physical outlet through the skull. But he still searched for flow routes that would, for example, funnel 'brain phlegm' into the nostrils.

Vesalius was aware of the value of his work, and of the academic jealousies that could work against him. He chose not to use a Venetian printer who was producing a rival, Galen-based anatomical tome, perhaps because he feared that the printer would deliberately delay publication of his own study. Instead he crossed the Alps to Basel, Switzerland, where, still fearing intellectual theft, he stayed to oversee the printing. He whiled away his time by boiling the body of an executed murderer to get at his bones. The reassembled skeleton is still displayed in the city's university. ■

Alison Abbott *is* Nature*'s senior European correspondent.*