and physiological work of Andreas Vesalius, William Harvey and their kind. Other vignettes describe Renè Laënnec's invention of the stethoscope; William Beaumont's experiments on Alexis St Martin, whose injury to his stomach left a hole large enough for Beaumont to monitor digestion as it was occurring; the development of blood transfusion; and Christiaan Barnard's first heart transplant in a human.

Jennings reserves her longest section for infectious diseases, in which we are treated to the doings of Anton van Leeuwenhoek ('Tony' to his friends, who include Jennings' readers), Ignaz Semmelweis ('Iggy') and Joseph Lister ('Joe'). Florence Nightingale, Edward Jenner, John Snow and Louis Pasteur also figure, but with less familiarity. William Halsted's introduction of rubber gloves in the operating theatre, partly out of concern for the rough, reddened hands of his nurse (and fiancée), offers the opportunity for a digression on the entry of women into medicine. The episode is rather spoilt by the misspelling of Halsted's name and place of work (here dubbed John Hopkins).

This being a modern book, it ends appropriately ambiguously, with the uncertain prospects of gene transplants and human clones. And Mabel's computer having crashed (or at least violently ejected the CD-ROM), she wisely goes out to play with Max, contemplating whether medicine is a suitable profession for her.

Anything that encourages children to think about science and medicine, and their history, is to be welcomed, and *Sick!* is a brave first book. Even though it's a work about heroes and heroines, it is not as relentlessly presentist as comparable books would have been 20 years ago. There are some problems, however. The computer conceit is clumsy and doesn't work very well. The book is too elementary for my son (aged 30), and I think too advanced for my grandsons (aged 1 and 4). It seems to be aimed at the 8–10 age group, although with a lot of technical words thrown in. The level of historical accuracy is just about acceptable, but there are too many careless mistakes, and I cringed when the origin of the "weird practice" of bloodletting was traced to our hairy prehistoric ancestors watching hippopotamuses bleed themselves.

This book set me thinking about the tension that exists between drama, good historical stories and accuracy, and it reminded me that in history (as in science), questions can crop up at any time throughout our lives, but the answers need to become better. The questions posed by *Sick!* are better than the answers it offers. ■

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Science in culture

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Vaulting space

The construction of vaulted roofs through the ages.

Britain's Millennium Dome (above) and the Pantheon in Rome.

Beams make roofing easy, but clear spans are limited by the capacity of materials to take a load in tension. Stone, excellent in compression, is not very good at that: the Parthenon (447 BC) may be Greek civilization's most perfectly proportioned building, but its architraves of Pentelikon marble span just 2.5 metres.

The challenge of creating spans increases by imposing a curve: vaulted space looks lighter and more elegant — but it is trickier to construct. Only the invention of concrete made vaulting easier. The pinnacle of this Roman achievement still stands in the heart of Rome's old city. The Pantheon's bold dome, spanning 43.2 metres, consists of five rows of square coffers of diminishing size, converging on the stunning, unglazed central circular opening, the oculus. The dome's most intriguing property is its vertically decreasing specific mass, achieved by using progressively thinner layers of concrete made with lighter aggregates.

No pre-industrial builders ever topped this span — but one of the signature buildings of the Renaissance came close to the Pantheon's vault in size, and rivals it in its ingenious construction. In 1420, Filippo Brunelleschi — a prominent Florentine painter, sculptor and architect — won a competition to build an eight-sided vault without exterior buttresses over the Santa Maria del Fiore, the city's cathedral (duomo). He proposed to do so without using any wooden armature, by laying bricks in herringbone courses between a framework of stone beams, and by building "one vault inside and the other outside so that a man can walk upright between them". As the artist and Renaissance historian Giorgio Vasari wrote in 1550, the trustees of the duomo and the workmen thought "that this method was that of a madman". But the cupola, with an inner span of 41.5 metres, was completed in 1436.

Only the new materials of the nineteenth century made a rapid, and elegant, difference: the combination of cast-iron truss work and inexpensive plate glass enabled sizeable vaults to be built over greenhouses sheltering tropical trees in light-filled interiors of temperate Europe — and much bolder iron–glass vaults to cover the smoky railway stations of large cities.

Steel became the twentieth century's principal structural metal, and it is now combined with aluminium, plastics and composite materials to vault spaces of unprecedented size — but for a different worship. Modern secularism has been erecting its vaulted monuments almost exclusively for entertainment. Houston's Astrodome, completed in April 1965, was the world's first all-weather domed stadium. Its steel skeleton — a lamella frame incorporating trussed beams arching towards the centre and braced in a diamond pattern — supports a roof made of cast acrylic skylights with a clear span of nearly 193 metres. Atlanta's oval-shaped Georgia Dome has a Teflon-coated fibreglass roof whose long axis spans 225 metres. Many cities now have similar secular cathedrals for sports, entertainment, exhibitions and shopping.

Recent vaulting records go to a new airport and to a dome whose *raison d'être* appears to be quasi-religious. Hong Kong's Chek Lap Kok airport terminal, now the world's single largest building, covering more than 500,000 square metres, is vaulted in a spectacular, light-suffused style by a modular waveform roof. Its segments are constructed from I-beams forming parallelograms joined together in 36 × 36-metre vaults supported by slender beams, and daylight reflectors diffuse the subtropical sun on millions of travellers.

London's Millennium Dome is not particularly tall (just 50 metres), but its shallow curve — fashioned from coated fibreglass and suspended from twelve 100-m-high steel masts held by a net of high-strength steel cables — is 320 metres in diameter. This is an order of magnitude larger than the largest Renaissance vaults — but whether the dome above the Thames will rival the longevity of Brunelleschi's creation is another matter. ■

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