Illuminating astronomy

Owen Gingerich

Man's View of the Universe: A Pictorial History. By G.E. Tauber. Pp. 352. (Crown: New York, 1979.) $19.95.

TAUBER'S elucidation of "evolving concepts of the universe from ancient times to today's space probes" belongs to the genre of history of astronomy in the service of popularisation. He thus joins the class whose predecessors range from Camille Flammarion to Patrick Moore and Fred Hoyle.

An historical approach is particularly felicitous for astronomy, with its long and nearly continuous development. It has the advantage of starting with the simplest observations and theories, which can introduce the novice to the sky as it still appears. The story then leads through the drama and pathos of Galileo, to the puzzling and curious genius of Newton, and finally in a modern climax to Einstein and relativity. Tauber exploits the anecdotal and the picturesque to leaven what is essentially a popular textbook, and in so doing produces a guide to modern astronomy far more readable than the typical elementary textbook. He is obviously most at home with relativity and with cosmology, and there his presentation is outstanding. But the subtitle, *A Pictorial History,* promises us more than a mere textbook, and alas from either the pictorial or historical viewpoint the book is a considerable disappointment.

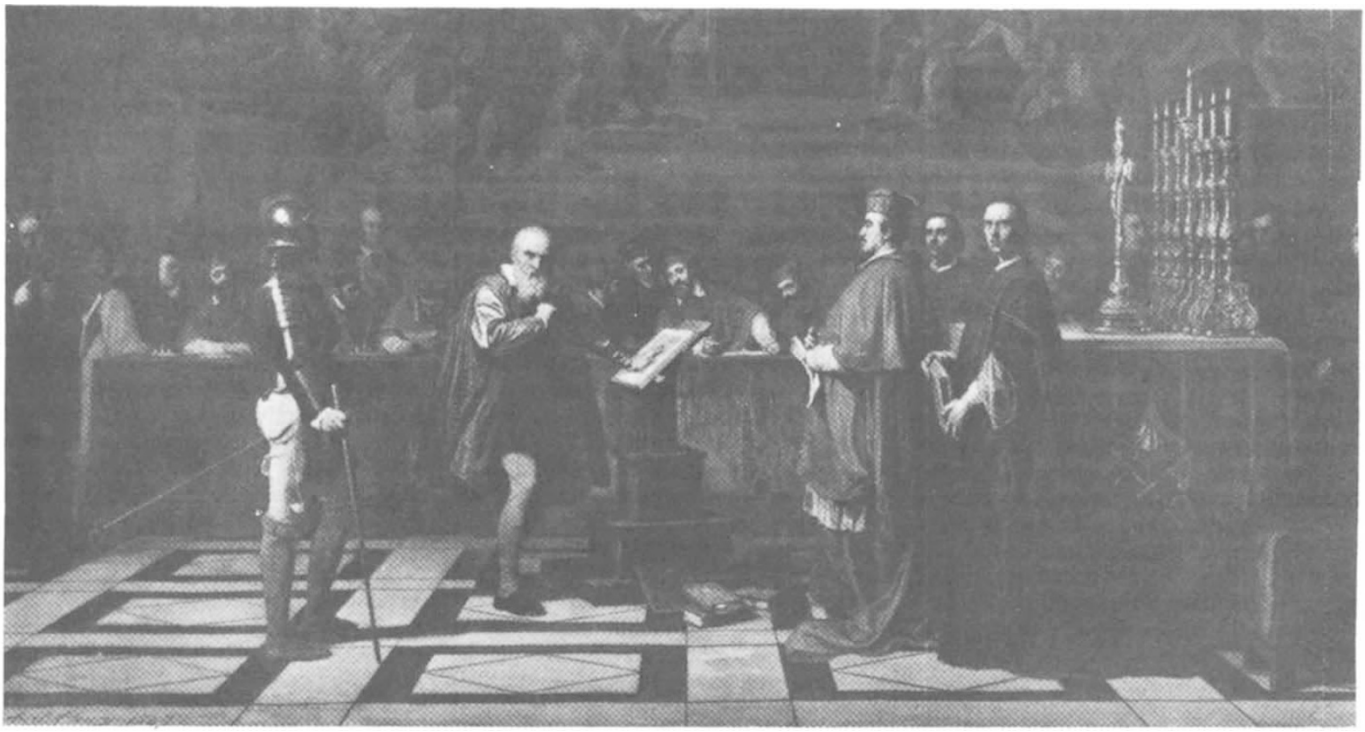
There are, to be sure, hundreds of illustrations, which in effect form a separate and parallel account, unreferenced and almost completely unlinked with the running text. Some of them are fresh and attractive, such as the pair of portraits of Wilhelm IV of Hesse and his wife, the Foucault pendulum in the Pantheon, or Robert Goddard beside an early liquid rocket. However, many are commonplace and often poorly reproduced; a significant proportion of the illustrations are line diagrams, which emphasise the textbook aspects to the detriment of the historical qualities.

Consider, for instance, the section on Newton: the best of the illustrations is a fine manuscript drawing of Newton's telescope, and there are halftones of Newton, Woolsthorpe, a modern painting of Newton with his prism, plus muddy views of Huygens and conic sections. But these are overwhelmed by a score of diagrams representing everything from the graph of an inverse square law, a hopelessly wrong scheme of recombining coloured light with a second prism, a redrawing of Newton's famous (and incorrect) diagram on free fall from his letter to Hooke, precession, tides, and so on. The Newtonian section epitomises the pictorial problems of the entire work: squeezed and uninviting layouts, erratic quality of reproduction, and uninspired typography. It would be heartless to dwell further on these inadequacies, for which the publisher is probably more to blame than the author.

Several pictures are erroneously captioned or credited. The widely copied traveller poking his head through the vault of the heavens to see the celestial gearwork beyond is here reproduced as a sixteenth-century woodcut, although it is now definitely established as late nineteenth-century art nouveau, probably from the hand of Camille Flammarion. It is hard to believe that the photograph purporting to be the Magellanic Clouds on page 241 really shows those objects. On page 36 there is "an artist's view (date unknown) of Thales' universe", in the public domain according to the list of credits. In fact, the figure was specifically drawn for Carl Sagan's Time-Life book, *Planets* (1966). The drawing that decorates the title page has been adapted from the same source.

As a pictorial *history,* Tauber's production fares even worse. Factual errors abound. Contrary to his text, there is absolutely no evidence that Copernicus had to occupy himself with astrology (page 98), and in Kepler's music of the planets, the faster the planet, the higher the notes (page 124). Galileo's telescope did not contain three convex lenses (page 196), and Herschel never became Astronomer Royal (page 212).

Actually such flaws are rather minor, and although they detract from the book's reliability, they scarcely interfere with its pedagogical exposition. What dismays the historian of astronomy far more than a peppering of factual errors is the writing of "Whig history". That expression, introduced by Herbert Butterfield, refers to history seen from the vantage point of the victor; in the history of science, it means evaluating the past in the light of today's theory. It is Whig history of science, for example, to give the ancient heliocentric schemes of Aristarchus any special prominence. As physicist-historian Stephen Brush has said, credit for discovery should be given not so much for the originality of the concept as for the persuasiveness of the arguments; certainly



Galileo Before the Holy Office by J. N. Robert-Fleury, 1847

Photo: Louvre, Paris

the single sentence that has come down from antiquity about Aristarchus' cosmology contains no persuasive arguments.

Tauber gives a column to Aristarchus but his Whiggishness is generally more subtle, precisely the kind that distingushes textbooks and popular science from history. In describing the distances of stars, he goes straight to the trigonometrical parallaxes finally established by 1840, thus ignoring the intellectual breakthrough of the late seventeenth-century when astronomers recognised that stars were really distant suns and when they began to calculate reasonable distances photometrically. Similarly, in telling of Huygens' discovery of the rings of Saturn, he places this in the context of building better telescopes, not realising that the Dutch astronomer made his interpretation in mind's eyes at a time when the ring system was actually edge-on and invisible.

Tauber's presentation is rich in chronological facts rather than the historical facts that illuminate the actual process of discovery. In introducing galaxies under the heading "Island Universes" he alludes to Kant, Messier, the Herschels and Lord Rosse in a swift succession leading to the Shapley-Curtis debate in 1920.

He refers implicitly to the rotations of spiral nebulae found by van Maanan, but by Whiggishly suppressing explicit mention of these now-discredited measurements, he plants a confusing discontinuity into his story. Nor does he mention novae or red shifts, because he sorts these key elements in the historical account into other bins. There is nothing reprehensible about organising the material this way for instructional reasons — indeed, it probably leads more rapidly to an understanding of our modern ideas of the Universe.

In contrast, it is the task of the historian of science to show the development of science as a creative human activity, which for past science requires a sympathetic reconstruction of the motivations and limitations of a bygone period; this demands a selection of those facts that illuminate the understanding at that time, not the rather different group of facts now woven into our contemporary knowledge. I suspect that most prospective owners of Tauber's *Pictorial History* will be quite satisfied to get a relatively painless and accurate survey of modern astronomy, and would probably be disappointed if they got serious and accurate history of science. My plea to my scientific colleagues is that Tauber's work should be seen as a somewhat successful popularisation of science, but not as history of science. □

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Prehistoric Avebury

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Prehistoric Avebury. By Aubrey Burl. Pp. 275. (Yale University Press: New Haven, Connecticut, and London, 1979.) $19.95; £8.95.

NEXT to Stonehenge, Avebury is better known than any other prehistoric monument in Britain. About Stonehenge countless books have been written, good, indifferent and frankly lunatic; but about Avebury very little, even though, in the words of its first recorder, John Aubrey, it "does as much exceed in bigness the so renowned Stonehenge, as a Cathedral doeth a parish church". It has not escaped, even recently, the weird and uncritical lucubrations of the lunatic fringe; but until now there has been no comprehensive treatment of Avebury and its archaeological setting which could rival William Stukeley's *Abury* of 1743. This is not to ignore, of course, Dr Isobel Smith's *Windmill Hill and Avebury* (Oxford University Press, 1965) or *The Avebury Monuments* (HMSO, 1976) by the late Faith Vatcher and her husband, which are primary sources; but the first is an excavation report, and the second a concise guide for the visitor.

Aubrey Burl has now turned from British stone circles in general, on which he is the main authority, to a detailed study of one of the best known of them, on a scale and with a breadth of knowledge and vision rivalled only by Stukeley. This is a quite remarkable book, and a pleasure to read. It is intended for the intelligent layman, and in its presentation it has many of the attributes of more expensive 'coffee-table' books, with large format, well-spaced type and lavish illustrations, including more than a dozen full-page colour plates; but it also contains a very full set of notes and references, a comprehensive bibliography and a well-designed index.

The specialist reader (and maybe others as well) must make full use of the index, because the treatment is markedly discursive and the discussion of parts of Avebury, and of neighbouring sites, is widely dispersed throughout nine chapters. These are thematically arranged, with an underlying but not explicit chronological order, which is not that of the chronology of Avebury itself. As one familiar with the monuments from childhood, and with something of their archaeology from adolescence, I find this confusing and sometimes irritating; but I am not perhaps the reader Burl had in mind.

Throughout the book Burl has used his very wide reading to draw parallels between the available archaeological evidence, from Avebury and neighbouring sites, and sometimes from more distant sites in Britain, and ethnographical observations from other parts of the world, principally the documented customs for the living and the dead amongst various tribes of North and Central American Indians.

Some of these likenesses are so striking that the lay reader may be tempted to fall inadvertently into a logical trap, and to suppose that "because it could have been like that, therefore it was". Burl is obviously aware of this danger, and has taken some care, though perhaps not quite enough, to warn his readers of the pit-falls of facile conclusions based on comparisons of very different contexts in time and space, and of very diverse economies and environments. In the end ethnographic parallels can serve only to enlarge the field of conjecture of the prehistorian. They cannot tell us what our own past *was*, because this is unknowable in all but a trivial sense.

In the penultimate chapter ("The Purpose of Avebury") the author boldly gives his view, with suitable cautions, about the funerary and fertility rituals for which Avebury *may* have been built. Here, and indeed throughout the book, he displays the vision of a creative artist, in putting flesh and colour upon the bare bones of the archaeological evidence, no less pitifully exiguous here than in the other stone circles that he has studied. Amongst contemporary writers on prehistory he has the rare and enviable gift of evoking for the mind's eye the past-which-might-have-

Standing Stones at Avebury