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## Review of: Ancient Astronomy and Civilization by Norriss S. Hetherington

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Ancient Astronomy and Civilization by Norriss S. Hetherington

Review by: James Evans

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matters of social, cultural and economic development, can provide us with insights impossible to gain by other means." When you make an ambitious claim like this, you must deliver. This book does not. Where it is good, it is not a source of insights impossible to gain by other means. And where it strains for general insights, it is not very good. Strike three.

First the good parts. Embedded in the middle of the book are two fine essays. In "The Transition from Wrought Iron to Steel Technology at the Dowlais Iron Company, 1850–1890," Edgar Jones describes one moderately large firm's response to innovation in the manufacture of wrought iron. It is particularly interesting in demonstrating the difficulty encountered in mechanizing the key process, iron puddling. This serves as a corrective to those who, reacting against earlier attempts to depict science as the sole driving force behind technical change, have veered to the other extreme and made technical change a nearly automatic consequence of business strategy. For the Dowlais Iron Company, faced with the type and degree of innovation that nature and the state of knowledge would permit, flexibility served better than attempts to tie science to strategy.

The following essay, "Science, Innovation and the 'Rule of Thumb' in the Development of British Metallurgy to 1945," by Geoffrey Tweedale, is similarly straightforward and illuminating. It addresses the question whether the delayed creation of formal, academic-style research laboratories in the British iron and steel industry in the late nineteenth and early twentieth centuries indicated a failure on the part of British industry. The author's answer is no. The slender scientific foundation for metallurgy over most of the period made the combination of rule of thumb, fruitful industry-academic interaction, and insightful individual researches, such as those of Robert Hadfield on alloy steels, more effective than a massive scientific attack would have been. Once again, knowledge, like Glendower's spirits from the vasty deep in Shakespeare's *Henry IV*, is not something that will necessarily come when you do call for it.

A book full of such useful essays, under a less pretentious title, might have been worth publishing. But the rest of this volume meets this standard only in places. Certainly it nowhere achieves the ideal of

insights impossible to gain by other means. Rather, it touches on well-established issues in a not particularly insightful manner. Indeed, U.S., German, and British industrial research laboratories were not merely copies of an ideal form but, rather, institutions fit to particular national styles: in the United States, they were clearly separated from the factory and the university; in Germany, closely tied to factory and university; in Britain, small string-and-sealing-wax affairs. Indeed, the dangers in drawing conclusions from merely counting patents should not blind us to the importance of the patent as a business weapon. Indeed, business scholars claim that firms founded internal labs to minimize "transaction costs" (costs arising from such elements as the expense of communication or missed opportunities due to poor communication). Indeed, that claim is borne out by little if any evidence that firms carried out actual studies or calculations of transaction costs or could have if they had wanted to. And, indeed, creation of the great industrial laboratories more typically followed from pressures inside the firm than from external forces. But these points, as well as the editor's thesis that the "clearest view of technical change can be had from the vantage point of the history of the firm" (p. 2), have been not merely asserted but exemplified in a number of recent books, for example, *Science and Corporate Strategy*, by David A. Hounshell and John Kenly Smith (Cambridge, 1988). This slim, sparse one adds little.

GEORGE WISE

#### ■ Antiquity

**Norriss S. Hetherington.** *Ancient Astronomy and Civilization.* (History of Astronomy, 6.) 187 pp., figs., index. Tucson, Ariz.: Pachart, 1987. \$26 (paper).

*Ancient Astronomy and Civilization* is a reader that would serve well in a college course devoted to ancient Greek astronomy or to Greek science in general. The book consists mostly of extracts from Greek writers, from the Presocratics to Ptolemy, bearing on the quest for knowledge of the physical world in general and on astronomy in particular. The extracts, all borrowed from earlier English translations, are accompanied by brief remarks that provide a

historical context and explain the astronomical details essential for understanding the ancient writers. The author, Norriss Hetherington, has kept his remarks to a bare minimum and has mostly let the ancients speak for themselves.

The only exceptions the author has allowed himself are two short introductory chapters that deal with megalithic astronomy (mostly Stonehenge) and with the record of Babylonian astronomy as deciphered from clay tablets. Chapter 3 is devoted to the Presocratics. Chapter 4 addresses Plato's attitudes toward mathematics and astronomy and toward the problem of knowledge in general. The extracts are from the *Timaeus* and the *Republic*, including the myth of the cave and Plato's famous disparagement of empirical astronomy. Chapter 5 takes up Aristotle, with extracts from the *Physics* and *On the Heavens*, and concludes with the well-known passage from Simplicius's *Commentary* on the *Physics* that sets out the relation between the tasks of mathematics and of physics. Chapter 6 is devoted to the homocentric spheres of Eudoxos and includes the two most important ancient accounts, those of Aristotle in the *Metaphysics* and of Simplicius in his *Commentary* on Aristotle's *On the Heavens*. Chapter 7 deals with ancient attempts to measure the scale of things and includes an extract from Aristarchus's *On the Sizes and Distances of the Sun and Moon*. The final chapter is devoted to Ptolemaic planetary theory and includes extracts from Book I of the *Almagest* and the introductory sections of Books III, IX, and XIII. These are the places in which Ptolemy discusses his fundamental hypotheses.

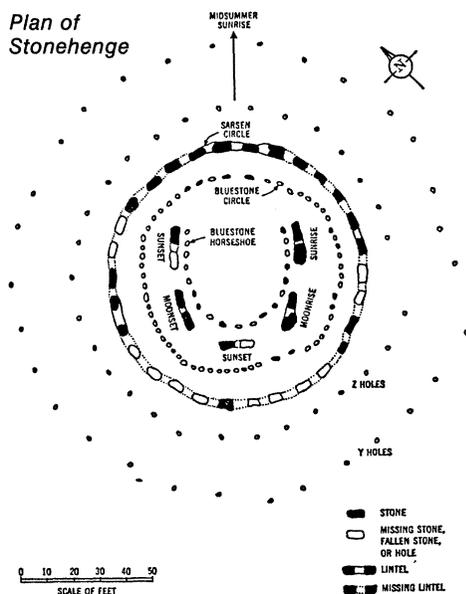
The selection of texts is a very intelligent one. A coherent course (or a portion of one) could easily be constructed around these readings. A shortcoming that is hard to fathom is the failure to provide full citations. Thus, in the chapter on the Presocratics, half a dozen stories about Thales are quoted, but with no indication of the ancient sources in which they are found. Extracts from Plato or Aristotle are indicated as "from the *Timaeus*" or "from Aristotle's *Physica*," with no more precise information to guide a reader to the right pages in a full edition of those works.

The commentary, always succinct, is usually helpful, especially on technical matters. However, the book does not really

live up to the "and civilization" part of its title. Large issues are sometimes hinted at: Did astronomy develop in Mesopotamia but not in Egypt because the Mesopotamians, in their insecure geographical position, needed the security offered by astrology? Did medieval Islam and Christianity discourage the search for knowledge of the ancient past? These are interesting ideas, worthy of serious consideration, but the author simply mentions them and lets them drop, without discussion or supporting evidence. This is not necessarily a drawback in a book intended for use as a reader. The large societal issues that the book occasionally brings up could serve as the subjects of class discussions. Each chapter concludes with a brief bibliography that not only makes suggestions for further reading, but also lists films and filmstrips appropriate for use with the given chapter.

JAMES EVANS

Plan of Stonehenge



**Robert Maddin (Editor).** *The Beginning of the Use of Metals and Alloys.* (Papers from the Second International Conference on the Beginning of the Use of Metals and Alloys, Zhengzhou, China, 21–26 October 1986.) xiv + 392 pp., illus., bibls., index. Cambridge, Mass./London: MIT Press, 1988. \$55.

The historical impact of the development of metallurgy is clear from the use of metals