be misled by the work's four lines (and one word more) on "Rubin, Vera Cooper (1928–)," the contemporary investigator of velocity fields in galaxies, but neither will you be well informed on this much-honored astronomer's accomplishments. The 21-line entry on "Sandage, Allan Rex (1926–) has no room for the famous controversy over the Hubble constant in which Sandage was a central figure, or for the discovery of blue stragglers, reported in his PhD thesis. In the latter case, fortunately, what is not mentioned in the biographical entry can be found in the main article, "Blue Stragglers."

If this four-volume work were magically compressed into a single manageable volume, the myriad short entries would make more sense; the book would be "one-stop shopping" for astronomical and astrophysical reference reading. But since almost all copies of the *Encyclopedia of Astronomy and Astrophysics*, at four volumes and $650 for the set, will necessarily be found in reference libraries, why include the short entries? If you are in the library, it's a lot easier to pick up a single volume appropriate to meteor showers, Mitton's *Dictionary*, Zimmerman's *Chronological Encyclopedia of Discoveries in Space*, or a current college text. I'd still go to the library to consult the main articles in Murdin. They're a splendid resource, but his *Encyclopedia* would have been more user-friendly if the short stuff had been omitted.

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East Asian Archaeoastronomy: Historical Records of Astronomical Observations of China, Japan and Korea

Zhentao Xu, David W. Pankenier, and Yaotiao Jiang
Gordon and Breach Science, Amsterdam, the Netherlands, 2000. $115.00 (430 pp.)
ISBN 90-5699-302-X

The earliest preserved records of astronomical observations come from two principal cultures: Mesopotamia and China. The Mesopotamian records are found in cuneiform writing on clay tablets that have been recovered from the ruins of Nineveh, Babylon, and other cities in the Near East. They date primarily from the last seven or eight centuries BC, and are superior in detail and accuracy to their Chinese counterparts of the same period.

However, the Chinese records have two great advantages over the Mesopotamian material to astronomers and historians today: (i) whereas the latest cuneiform records date to the first century AD, more or less continuous records of Chinese astronomical observations are preserved up to the present, and (ii) the Chinese records are of a wider range of celestial phenomena; there is, for example, no specific interest in cyclical phenomena.

In total, East Asian sources contain more than two and a half thousand years' worth of records, providing the historian with an abundance of material to use in tracing the development of astronomy in China, and offering a long baseline of data for the astronomer to search for events that occur very rarely (such as nearby supernovas) or change very slowly (such as the Earth's rate of rotation).

Chinese astronomy can be divided into two main parts, one observational, the other theoretical. The observational material includes records of eclipses, comets, guest stars (novas), and other celestial phenomena visible to the naked eye. Because most of these could be—and were—interpreted astrologically for the emperor, Chinese astronomy was essentially an official activity, conducted by scholars employed by, and under the control of, the government. This was a double-edged sword as far as scientific progress was concerned: At some periods official interest led to the development of new theories and instruments, while at others it forced astronomy into a retrograde step. Chinese astronomy dominated East Asia up until at least the seventeenth century, and its basic methods and goals were followed, often slavishly, in Korea and Japan from the late first millennium AD.

East Asian Archaeoastronomy, by Zhentao Xu, David W. Pankenier, and Yaotiao Jiang, aims to collect all known observations of certain astronomical phenomena from East Asian sources and translate them into English. This is a laudable aim, and undoubtedly, by translating the records, the authors are opening up a field that has previously been accessible in the west to only a handful of people. However, the project is not without its dangers, as we shall see.

In choosing to concentrate solely on observations, the authors are presumably aiming their book towards astronomers rather than historians. Indeed, the astronomer can learn much from the observations collected here. For example, the past viewings of Halley's comet can be traced back to 240 BC with only the return in 164 BC missing, and the many hundreds of observations of lunar and solar eclipses provide essential information on the long-term changes in the Earth's rate of rotation.

Unfortunately, by quoting only the lines of the text in which these observations are recorded, the accounts can often be misinterpreted. In the worst case, what may in fact be a calculated event can be interpreted by the unwary as an observation. Many early eclipse records, for example, do not correspond to real events. Some are genuine predictions, but others are apparently "fake" events which, because of their astrological interpretation, were inserted into the record for political purposes. Some observations were omitted for the same reason. In order to safeguard against using such a polluted dataset, one must understand the context in which the records were written. Unfortunately, selective quotation by the authors, and their failure to provide any information about the various sources from which the records are taken, prevent this.

It is disappointing also that the authors have decided to omit most of the astrological material in the translations. Comparisons made by the Chinese astronomers between the observations they made and the results of calculations using the theories they developed are also omitted in the translations provided. This is a pity, for these both provide very interesting material for study by historians of Chinese science and its role in Chinese society.

Bearing in mind these reservations, *East Asian Archaeoastronomy* is still a useful reference book, but one that should be used with great caution, and as a starting point for locating material in the original sources, not as a definitive work in itself.

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Atom, Molecule, and Cluster Beams

Hans Pauly
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In *Atom, Molecule and Cluster Beams*, Hans Pauly has emphasized areas in