

Book Reviews

Stellar Spectra

Spectroscopic Astrophysics. An Assessment of the Contributions of Otto Struve. G. H. HERBIG, Ed. University of California Press, Berkeley, 1970. xii, 468 pp., illus. \$10.

This memorial volume is not only a tribute to a great astronomer; it also gives testimony to the influence that Otto Struve has had on other astronomers and their work. As Herbig says in a beautiful introduction, Struve was a great worker and his philosophy was, "If something is worth doing, it is thereby worth publishing. . . . He was impatient with those who, in search of perfection or for other reasons, did not justify their scientific existence by publication."

The work consists of reprints of ten papers by Struve, published between 1929 and 1952, in ten of the fields in which he was interested and in which he was a scientific leader. Following each paper is an article by a specialist in the field who shows the present state of knowledge. This kind of presentation is particularly appropriate for showing the modernity of Struve's work. Take, for instance, the first paper, on spectral classification. Struve in 1933 poses problems which are still open, like those of narrow-line B-type spectra, which belong to two classes of objects; intrinsically slow-rotators and pole-on rotators. "We do not yet know whether the spectra of these two groups of stars are identical," Struve remarks. An answer to this question is just now beginning to be given by theoreticians, while observations are unable to discriminate. The existence of peculiar B stars with weak helium lines or other abnormalities has been underlined by Struve, and only in these last years has it become clear that these peculiar B stars represent the extension to high temperatures of the group of magnetic stars of type A. The conclusion by Struve is that two parameters are insufficient to describe the spectrum of an early-type star, a conclusion which is still valid, as the comment by W. W. Morgan, a pioneer in two-dimensional spectral classifications, underlines: "Struve's discovery was the

forerunner of the present fantastic complexity of the classification of the B stars."

The papers on shell stars, symbiotic stars, and spectroscopic binaries indicate the richness of physical phenomena that the spectra of these objects reveal. Specially close binaries, to which Struve devoted a long series of observations summarized in his famous book *Stellar Evolution* (1950), pose a lot of problems owing to the closeness of the two components and therefore to their physical interactions, like exchange of mass between the two components, formation of streams and envelopes surrounding the whole system, and reciprocal excitation by radiation and possibly by corpuscular radiation. Many of the problems Struve set are now objects of study by theoreticians and have been partly solved; many, as Popper observes, "remain largely unanswered." A difficult observational problem that could now be solved by means of the image intensifiers, which permit spectra of relatively faint stars to be obtained in a few minutes, is that of the limb spectra. Struve pointed out that anomalous intensities of the lines are observed when only a crescent of the eclipsed star is visible, but this problem, as Popper observes, has received little attention, and the few existing observations are in contradiction.

In my opinion, this book can be extremely useful to students and to researchers. Don't think of it as a historical book. The papers by Struve are an example of how criticism and knowledge of physical laws must be used in order to understand observational data. The only criticism that can be made is that the style of the articles of the contributors is not consistent. In some cases the articles are excellent and stimulating reviews of the various subjects, like those one expects to find in such collections as the *Annual Review of Astronomy and Astrophysics* or *Stars and Stellar Systems*; in a few other cases they are personal judgments of Struve's work and his way of attacking problems.

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Pre-Civil-War Science

Physician to the West. Selected Writings of Daniel Drake on Science and Society. HENRY D. SHAPIRO and ZANE L. MILLER, Eds. University Press of Kentucky, Lexington, 1970. xl, 424 pp., illus. \$12.50.

Through their selection of writings and introductory essays, the editors present Daniel Drake (1785–1852), the outstanding physician of the Ohio and Mississippi valleys before the Civil War, as scientist and citizen concerned with promoting the intellectual and economic advancement of the entire area.

As a scientist, Drake, in a spirit characteristic of American science at this time, promoted "Baconian" method, repeatedly emphasizing the importance of gathering facts through observation and organizing them with the intent of inducing generalizations. In this Drake followed his teacher Benjamin Smith Barton rather than Benjamin Rush. As the editors point out, the method was particularly suited to the time and place: in a new country even the amateur could make significant contributions by gathering facts, thus furthering the democratization of science. In accordance with his views, Drake played a leading role in the establishment of museums, journals, and similar institutions. His own scientific writings, from an account of an epidemic in 1808 to the monumental *Principal Diseases of the Interior Valley* (1850), exemplify his adherence to the method. It enabled him to examine critically existing theories, but proved inadequate for the construction of new generalizations.

Shapiro argues that Drake's Whiggery was the social-political counterpart to his Baconianism. Miller pays more attention to Drake's interest in urban economic development, and in building unity throughout the West by railroads as well as by scientific institutions. Other selections published here illustrate Drake's concern, especially in his later years, for temperance and good order. Several selections present his ideas on medical education. That he found it necessary to tell entering medical students they must be good boys, not skip class, and work hard tells a lot about the schools of his day.

Overall, the selections, of which most are printed entire and the rest in generous segments, tend to emphasize Drake's scientific method, policy, and program and other public questions more than the medical side of his career. Although it seems to this reviewer that the editors have sometimes strained