A Prospectus of Astronomy

The General History of Astronomy. MICHAEL HOSKIN, Ed. Vol. 4, Astrophysics and Twentieth-Century Astronomy to 1950, Part A. OWEN GINGERICH, Ed. Cambridge University Press, New York, 1984. xii, 198 pp., illus., + appendixes.

Before the 1950's astronomers wrote nearly all the histories of astronomy. In recent decades, however, historians of science have come to dominate the field, particularly the study of astronomy from antiquity to the mid-19th century. By and large, the historians have been more dedicated than their forerunners to comprehending the goals, methods, and conclusions of astronomers working in earlier times. The better historians have also given more attention to integrating enough biographical, institutional, and social-cultural detail into their studies to make them satisfying interpretations of the development of the discipline. One consequence of the historians' greater commitment to interpretative depth has been an aversion to writing comprehensive narrative histories like those published by the astronomers A. Pannekoek in 1951 and G. Abetti in 1952. Hence it is virtually impossible for lay readers, and quite difficult for specialists, to acquire an overview of the new history of astronomy. *The General History of Astronomy*, which is being written under the joint auspices of the International Astronomical Union and the International Union for the History and Philosophy of Science, has the laudable purpose of providing just such an overview.

To judge from the present volume, the first to appear in the series, the *General History* will not only achieve its purpose but also serve as a benchmark for future historical inquiries. Volume 4, part A, covers the birth of astrophysics and the development of major observatories, big telescopes, and important auxiliary instruments and techniques; its companion will cover the history of modern astrophysics and cosmology and the sociology of astronomy. Written by 18 authors from eight countries, the 11 chapters and appendix of part A have a surprising degree of coherence, thanks to the volume editor, Owen Gingerich, once a solar physicist and now a historian of astronomy with exceptionally broad-ranging interests, and the general editor, Michael Hoskin. Another pleasing feature of this volume is its nearly 80 illustrations, a large majority of which have not been published, or widely published, before. Though the editors deserve praise for the volume's coherence and for its illustrations, their decision to encourage (or perhaps require) the authors to hold back much of their documentation was unfortunate. Readers wishing to follow up on the subjects covered are likely to encounter many needless frustrations as a result of the stingy policy regarding references.

Several of the contributions exemplify the strengths of the historian's approach to the history of astronomy. John Lankford does an excellent job of recounting the complex technical developments and social interactions that led to the emergence of photography as a major astronomical research tool between 1880 and 1900. Albert Van Helden contributes two fascinating chapters that illuminate the technical, institutional, and scientific trends influencing telescope building between 1850 and 1950. His chapters are nicely complemented by Barbara Welther's appendix listing the world's largest refractors and reflectors in such a way that the reader can easily identify the four largest telescopes of each type extant at any date within this century. David DeVorkin provides a fine synthesis of his pioneering studies of the origin and early interpretation of the Hertzsprung-Russell diagram. Though the other contributions are all solid, they are generally less ambitious. In particular, the authors of the chapters on the principal observatories seem not to have been given sufficient space to do more than chronicle changes in personnel and research resources.

If they can maintain the standard set in the volume under review and at the same time embrace more generous referencing practices, the *General History*'s editors will be doing very well indeed.

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Processes in the Ocean

Hydrothermal Processes at Seafloor Spreading Centers. PETER A. RONA, KURT BOSTRÖM, LUCIEN LAUBIER, and KENNETH L. SMITH, JR., Eds. Plenum, New York, 1984. xiv, 796 pp., illus. $110. NATO Conference Series IV, vol. 12. From an institute, Cambridge, England, April 1982.

One of the most exciting developments in the earth sciences during the past ten years has been the accumulation of evidence that the world's oceans convect through sea-floor spreading centers driven by heat derived from the creation of the oceanic lithosphere. The discovery in 1979 of hydrothermal (350°C) fluids discharging from chimney-like structures composed of sulfide and silicate precipitates at the axis of the East Pacific Rise at 21°N represented the culmination of many other more indirect investigations into a geologic process of obvious global importance. Hydrothermal convection at sea-floor spreading centers plays an important role in the cooling of newly formed oceanic lithosphere, in the global geochemical cycles and mass balances of many elements found in seawater and the oceanic crust, in the formation of metallic mineral deposits analogous to some types of ancient ore deposits, and in the development of biological communities based on a previously unrecognized form of chemosynthesis. The first workshop devoted to interdisciplinary studies of such processes resulted in the volume reviewed here.

The 30 papers in the volume are grouped into eight sections each of which begins with an overview paper. The book includes a useful 13-page appendix that summarizes landmark studies related to hydrothermal processes at sea-floor spreading centers in approximate chronological order.

The most interesting sections in the volume are those on hydrothermal convection, basalt-seawater interaction, mass balances and cycles, and hydrothermal mineralization. In the section on hydrothermal convection, the overview paper, by Sleep, reviews controversial subjects such as the mechanism by which seawater penetrates deep levels of the oceanic crust and the geometry of hydrothermal circulation and its relationship to the magma chamber and discusses the two other papers in the section, by Taylor and Lister, and then proposes an alternative geometry for axial hydrothermal circulation.

The section on basalt-seawater interactions contains relatively little new material. It is dominated by discussions of the results of experimental studies, although attempts to integrate such results with the measured vent-water chemistry and the petrography of samples recovered from the sea floor are described (for example, by Mottl). In general, the papers in this section serve to point up unresolved problems, such as the failure of the experimental runs to produce significant quantities of chlorite or albite (which are abundant in the sea-floor samples) and the lack of water and rock samples from a single locality or hydrothermal system. The latter problem