these two volumes a complete and comprehensive survey of the technical aspects of the bubble-chamber field. While adequate quantitative information is contained, the presentation is mainly descriptive, and this work is reminiscent of an "encyclopedia." It must be mentioned that the editor and the 13 authors he has selected have all pioneered in the construction or use of bubble chambers and are among the leading experts in the field. The material is carefully chosen and presented clearly and precisely.

The major part of the book is devoted to bubble-chamber problems. Information that until now has existed only in scattered review articles is presented in coherent form. Some examples of subjects thus treated are the theory of bubble formation and the intricacies of cryogenic engineering and chamber illumination, so frequently taken for granted by the users of bubble-chamber film. In the second volume the problems involved in retrieving the pertinent information from the film are discussed; by necessity this can be done only in a very descriptive fashion. An excellent chapter on the design of particle beams suitable for feeding high-energy experiments is written by J. Sandweiss. J. W. Cronin wrote the one chapter devoted to spark chambers; it is complete and thorough.

The authors have justly avoided mixing the physics results obtained with bubble and spark chambers with their presentation of the technique. Therefore the book will be of greatest use to the many students and high-energy experimenters who are not already experts in the field. However, the experts also will find this book quite valuable to consult whenever facts or references are needed.

A. C. MELISSINOS
Department of Physics and Astronomy, University of Rochester, Rochester, New York

Plasma Chemistry

The Application of Plasmas to Chemical Processing. RAYMOND F. BADDOUR and ROBERT S. TIMMINS, Eds. M.I.T. Press, Cambridge, Mass., 1967. xviii + 206 pp., illus. $12.50.

A glance at the contents of this book immediately conveys the interdisciplinary nature of plasma chemistry. To achieve an overall, coherent, and usable description of the subject, the editors have drawn upon the expertise of recognized authorities in various fields.

The authors of the nine chapters have effectively woven the threads of gas-discharge physics, plasma-reactor design, and plasma diagnostics into the broad fabric of chemical reactions suited to plasma processing. Chapters entitled "The physical characteristics of electric discharges," by A. Bell, and "Techniques for the generation of continuous high-temperature gas flows," by R. R. John, illustrate these disciplines. From the point of view of scientists engaged in research and development aspects of plasma processes, the chapter "Plasma diagnostics," by J. C. Ingraham and S. C. Brown, represents perhaps the least familiar of the nonchemical aspects of the work.

Six chapters are devoted to the application of d-c, radiofrequency, and microwave plasmas to chemical reactions and processes. Comprehensive reviews of specific chemical systems involving largely the results of d-c plasma studies are given in "Nitrogen fixation," by R. S. Timmins and P. R. Ammann, and "Fluorine reactions in plasma," by B. R. Bronfin. These authors clearly show the importance of kinetic and thermodynamic considerations in planning and effecting successful plasma processes. Important uncertainties inherent in the related thermochemical calculations are indicated. In "Reaction of graphite and hydrogen above 2000°K," by J. T. Clarke, data from studies utilizing resistivity-heated solid carbon and carbon vapor generated in a high-intensity arc are employed to elucidate the kinetics and mechanism of acetylene formation.

In "Chemical uses of induction plasmas," T. B. Reed makes a lucid comparison of electrode- and induction-generated plasmas and summarizes the demonstrated applicability of the latter to gas-solid reactions at near-atmospheric pressures. Again for the case of a "thermal" plasma, the design criteria and application of a radiofrequency plasma torch to gas-phase reactions are given by C. P. Beguin *et al.* in "Chemical syntheses in radio-frequency plasma torches." Characteristics of a low-pressure or "cold" microwave plasma and the commercial limitations of this type of discharge are realistically described by R. F. Baddour and P. H. Dundas in "Chemical reactions in a microwave discharge."

Based on the available published data, a definitive and highly readable work on plasma chemistry has been produced. One would hope that similar efforts in the future might mirror the authors' access to the now large backlog of unpublished results in this field.

MARILYN ALDER MARQUIS
Plasma Physics Department, Aerojet-General Corporation, San Ramon, California

In Honor of Struve

Modern Astrophysics. A Memorial to Otto Struve. M. HACK, Ed. Gauthier-Villars, Paris; Gordon and Breach, New York, 1967. 360 pp., illus. $19.50.

Otto Struve combined skill in research and in administration to an extraordinary degree. Thus it was that, in serving successively as director of the Yerkes Observatory and chairman of the Department of Astronomy at Chicago, as chairman of the Berkeley Astronomical Department of the University of California, and as director of the National Radio Observatory at Greenbank, he collaborated at one time or another with a large fraction of the astronomers who contributed to the growth of astrophysics between 1920 and 1960. For this same reason it was inevitable that there should be rivalry between editors eager to bring contributions by these authors together in volumes that would serve as lasting memorials to Struve. Nevertheless, the editor of the present work, Margherita Hack of the Osservatorio de Trieste, has succeeded in including 29 papers, including 15 that are from European astronomers.

To dispose of an obvious criticism quickly, so many cooks tend to produce an *olla podrida* in which not all the ingredients blend equally well. Thus there are a few papers by authors who had little contact with Struve, or who have written reports on whatever they happen to have been working on recently even if it has only remote connection with anything with which Struve was closely concerned. In answer the editor would doubtless point out that there was scarcely an area in modern astronomy in which Struve had no interest, as is shown by the wide range of the series of survey articles that he wrote for *Sky and Telescope*. Yet it remains true that readers are most likely to turn to this volume in the expectation of learning of recent work on those astrophysical