near a fence . . . the one down the street, you know. But what happened was that the image fused with that of the fence and I walked right on past without noticing it. . . . *Banner*, of course, means the Red Banner. But, you know, the building which houses the Moscow City Soviet of Workers' Deputies is also red, and since I'd put the banner close to one of the walls of the building I just walked on without seeing it."

We can well imagine that while with many people the problem is how to remember, S.'s problem is how to forget. He suddenly discovers one day that if he *wishes* the accumulated pile of irrelevant nonsensical material to disappear, it will disappear, blow away, without any sign of direct effort. "What explanation was there for the fact that the hundreds and thousands of series he recalled did not have the effect of inhibiting one another, but that S. could select at will any series ten, twelve, or even seventeen years after he had originally memorized it?"

Luria describes tests that show some voluntary control of pulse and body temperature. S. simply imagines himself running or slowing down, and his pulse goes from 70–72 to 80–96 and finally to 100, and then slows down to 64–66. He imagines he is holding a piece of ice in his left hand, and the hand becomes measurably colder. He reports voluntary control likewise over pain: "I'm going to the dentist. . . . when the pain starts I feel it . . . it's a tiny, orange-red thread . . . So I cut the thread, make it smaller and smaller, until it's just a tiny point. And the pain disappears."

Luria makes the case that there is much more here than extraordinary memory, that there is a wide variety of curious perceptual, imaginative, and what appear to be autonomic effects as well. He believes not only that S. was gifted with unusual powers, but that his personality was profoundly molded by these capacities. The book is essentially a rich, ingenious documentation of a very extraordinary gift, which, along with real satisfaction, brought some strange consequences upon its possessor.

Jerome Bruner, who writes a vivid foreword to the book, comments wisely upon Luria's experimental and clinical skill.

GARDNER MURPHY
Menninger Foundation, Topeka, Kansas

Lavas from the Earth's Mantle

Basalts. The Poldervaart Treatise on Rocks of Basaltic Composition. H. H. HESS and ARIE POLDERVAART, Eds. Interscience (Wiley), New York, 1967–68. Vol. 1, xvi + 495 pp., illus.; vol. 2, viii + 400 pp., illus. $22 each.

Experimental laboratory studies on silicate systems at high pressures and temperatures, hydrous and anhydrous, have increasingly in the last two decades come to provide critical data in the field of petrogenesis. This new experimental approach has been especially fruitful in tackling the genetic problems of the more common rock types. The decade of the 1950's saw the rise and decline of the "granite controversy," a debate eventually much resolved by the impact of experimental studies. In the present decade attention in research and discussion has turned particularly to basalts, the most widespread of superficial volcanic rocks. Experimental studies both at atmospheric and at high pressures have played and continue to play an even more significant part in genetic studies of lavas and their melts.

The volumes now under review purport to give a modern account of basaltic rocks, their nature, their physical and chemical properties, and the source and mode of generation of their magmas. The symposium project was conceived and organized by Arie Poldervaart, who invited manuscripts from contributors and acted as editor until his untimely death in 1964. The project was taken over and completed under the editorship of H. H. Hess.

The two volumes consist of 20 chapters contributed by 21 authors, the first volume being prefaced by a biographical memoir of Poldervaart contributed by the late Walter Bucher. Almost every aspect of the study of basalts is represented. Their geologic setting, their mineralogy and petrography, their classification and differentiation, their trace elements and isotope geochemistry—all are systematically treated.

Many experimental data are incorporated in the articles. There are four chapters devoted almost wholly to pressure-temperature laboratory studies—of the effects of water and oxygen pressure on the crystallization of basalts, silicate systems related to basaltic rocks, and the generation of melts at high pressures comparable to those prevalent in the earth's upper mantle.

Missing is a description of anhydrous low-pressure experiments on the melting behavior of basalts in the laboratory. The rich harvest of results on the field measurement of temperatures and crystallization of lava lakes at Kilauea (particularly of 1959–1960) made available by the U.S. Geological Survey in 1966 possibly came too late for insertion.

The scope of the whole project has been very liberally interpreted, for the survey includes chapters on the recrystallization of basalts under graded metamorphic conditions and on their eclogitic representatives. A place has even been found for a chapter on rhythmic and cryptic layering in mafic and ultramafic layered intrusions.

The wide coverage of these volumes, the clear, factual, and well-illustrated presentation of individual chapters, and the welcome emphasis given to the results of experimental laboratory studies serve to provide an authoritative modern survey which should prove indispensable to specialist researcher and student alike. The editors are to be congratulated on the selection and marshaling of the collective contributions.

C. E. TILLEY
Department of Mineralogy and Petrology, University of Cambridge, Cambridge, England

Detectors

Bubble and Spark Chambers. Principles and Use. R. P. SHUTT, Ed. Academic Press, New York, 1967. Vol. 1, xiv + 425 pp., illus., $18.50; vol. 2, xii + 319 pp., illus. $16.

The use of the bubble chamber as a detector in high-energy physics experiments has had a momentous impact in this field of research. Even though bubble chambers have been in use only for a decade, their construction and operation involve a large effort; the analysis and digestion of the data collected on bubble-chamber film involve an equally large effort. As a consequence, a new and separate discipline has evolved to the point that an experimentalist in high-energy physics is characterized as a "bubble-chamber man" or a "counter man" and only seldom as both. A spark chamber is easier to construct and operate, and even though it has, as a detector, topological similarities to the bubble chamber, it is a quite different instrument.

It is therefore fitting and most welcome that R. P. Shutt has collected in

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