problems," runs a large risk that it will intensify such a feeling. On the other hand, books in which the exposition of the ideas reaches rather sophisticated levels, but in which the majority of the problems are either routine or unvaried (there are some) tend to invoke a "tempest in a teapot" reaction among students. Although the author does not so state, this book may have been written to supplement such texts; it appears that if used in that way the book may be worthwhile.

As its title implies, this book is almost entirely devoted to problems, either solved for the student or to be solved by him, with generous hints about solving the more difficult. The discussion (other than the explanations of the solutions), which the author tries to keep minimal, is also minimal in the information that it imparts to the reader. There is occasional use of the defensive clause "it is clear" and an offhand way of making explanations—for example, the argument about why an additive constant appears in finding an antiderivative (p. 134).

The problems are generally well chosen. There are many routine exercises, some old standbys but also a variety of novel exercises touching on all the usual topics. A haphazard check of the problems indicates they are generally well stated, a few incompletely. However, for a problems book, it may also be a good exercise to pick out these.

As a reference and as a supplement to a good expository calculus book, this is to be recommended.

EDWIN HALFAR
Department of Mathematics, University of Nebraska

Carus Mathematical Series

Combinatorial Mathematics. Herbert John Ryser. Published for the Mathematical Association of America by Wiley, New York, 1963. xiv + 154 pp. Illus. $4.

Although combinatorial mathematics is several centuries old, it has achieved a new appeal and prominence in the past quarter century, owing partly to developments within the field and partly to its growing importance with respect to cryptography, computer programming, information theory, operations analysis, the design of experiments, and other subjects of scientific, industrial, or military significance. As the author observes, "Combinatorial mathematics cuts across the many subdivisions of mathematics, and this makes a formal definition difficult. But by and large, it is concerned with the study of the arrangement of elements into sets. . . . Two general types of problems appear. . . . In the first, the existence of the prescribed configuration is in doubt, and the study attempts to settle this issue. These we call existence problems. In the second, the existence of the configuration is known, and the study attempts to determine the number of configurations or the classification of these configurations according to type. These we call enumeration problems." (He might well have added "efficiency problems," in which the existence of the configuration is known and enumeration is unimportant, but in which the demand is for an efficient algorithm that will actually produce the desired configuration; such problems arise commonly in many applications of combinatorial mathematics.)

This polished and readable account of some fascinating aspects of the subject is devoted mainly to existence problems, including several basic, original contributions made by the author himself. A good indication of coverage is provided by the chapter headings: "Fundamentals of combinatorial mathematics" (16 pages); "The principle of inclusion and exclusion" (12); "Recurrence relations" (9); "A theorem of Ramsey" (9); "Systems of distinct representatives" (14); "Matrices of zeros and ones" (18); "Orthogonal Latin squares" (17); "Combinatorial designs" (35); "Perfect difference sets" (12).

Most of the material is "elementary" in the sense that its understanding does not require an extensive mathematical background. Nevertheless, the subject is justly known for its difficulty, and Ryser is to be congratulated for his clear presentation. The exposition is supplemented by a good index and an appropriate bibliography for each chapter. An attractive feature is the mention of various interesting unsolved problems, in which the field abounds. As the author concludes in his preface: "Combinatorial mathematics is tremendously alive at this moment, and we believe that its greatest truths are still to be revealed."

VICTOR KLEE
Department of Mathematics, University of Washington, Seattle

Geochemistry

Earth Science and Meteoritics. Compiled by J. Geiss and E. D. Goldberg. North-Holland, Amsterdam; Interscience (Wiley), New York, 1963. xvi + 312 pp. Illus. $10.50.

The variety in this collection of 15 articles is an admirable tribute to the versatility, wide interests, and stimulating personality of Fritz Houtermans, professor of physics in the University of Berne. The articles cover a number of topics of great current interest and research activity, and the list of authors is a guarantee of careful and judicious treatment. The extreme variety of the topics, however, may militate against the wide circulation this book deserves, since most people, other than specialists in radiochemistry and isotope geochemistry, are likely to find their interest limited to one or a few of the articles. The book would be useful collateral reading for graduate courses in geochemistry.

The articles are "Early history of the Earth" (30 pp.), by W. M. Elsasser; "Radioactive heat production in eclogite and some ultramafic rocks" (12 pp.), by G. R. Tilton and G. W. Reed; "Some recent researches on lead isotope abundances" (29 pp.), by R. D. Russell; "The concentration of common lead in sea water" (15 pp.), by M. Tatsumoto and C. C. Patterson; "Rates of sediment accumulation in the Indian Ocean" (12 pp.), by E. D. Goldberg and M. Koide; "The natural distribution of radiocarbon: Mixing rates in the sea and residence times of carbon and water" (12 pp.), by H. Craig; "On the investigations of geophysical processes using cosmic ray produced radioactivity" (26 pp.), by D. Lal; "Neutrons in meteorites" (24 pp.), by P. Eberhardt, J. Geiss, and H. Lutz; "The tritium content of atmospheric hydrogen and atmospheric methane" (17 pp.), by F. Begemann; "Tritium in rainwater" (17 pp.), by H. v. Buttlar; "Cosmic ray produced Na^{22} and Al^{26} activities in chondrites" (11 pp.), by M. M. Biswas, C. Mayer-Böricke, and W. Gentner; "Isotopic and chemical composition of some terrestrial natural gases" (21 pp.), by G. J. Wasserburg, E. Mazor, and R. E. Zartman; "Rare gases in the sun, in the atmosphere, and in meteorites" (30 pp.), by P. Signer and H. E. Suess; "The half-life of ^{187}Re" (7 pp.), by B. Hirt, G. R. Tilton, W. Herr, and W. Hoffmeister;

"Reversible and irreversible thermal effects on the thermoluminescence of limestone" (31 pp.), by E. J. Zeller and L. B. Ronca.

The primary purpose of this book is to honor Fritz Houtermans, and in that respect it succeeds admirably. For the research worker attempting to keep informed from the current literature, a book such as this has certain drawbacks; the individual papers are usually less readily accessible and receive more limited circulation than if they were published in a standard journal. I for one feel that science would be better served if a *Festband* such as this had appeared as a special issue of a serial publication.

BRIAN MASON
American Museum of Natural History, New York, New York

The Adriatic Seashore

Fauna und Flora der Adria. Ein Systematischer Meeresführer für Biologen und Naturfreunde. Rupert Riedl. Parey, Hamburg, Germany, 1963. 640 pp. Illus. DM. 58.

This is a guide to the marine biota of a local ocean which will gladden the heart of every marine biologist. Indeed, it is exemplary in every respect. Although we have some good introductions to the fauna of other coasts and oceans, they usually concentrate on a specific aspect—identification, habitat distribution, a complete list of names, or colorful illustrations. Riedl's book is more ambitious in that it attempts to give a real introduction to the biota of the Adriatic. It includes not only a description of some 1500 species, carefully chosen among the 6000 known species of the area, but a considerable amount of valuable biological information about these species. Their life histories and development are described, as is their geographical and habitat distribution. The user of the volume receives a first-rate course in marine zoology and botany, because the higher taxa, from phylum and class down, are succinctly characterized and much helpful information is given concerning the literature on specific taxa. This information will permit more detailed study of the respective groups and identification of species not included. Riedl even treats halophilous insects, spiders, myriapods, and marine birds and mammals.

The volume is lavishly illustrated with 8 color plates and 221 black-and-white plates; the total number of figures (including text figures) is 2590, all of them of the highest quality. The line drawings are far superior to anything found in the average seashore guide. Every species mentioned in the volume is figured. Riedl was assisted by 14 other specialists, who were responsible for the treatment of particular classes or orders. Instructions are included for collecting and preserving the different groups, and by placing special stress on gaps in our knowledge the author attempts to encourage further research. German, Italian, and Serbo-Croatian names are given for all species for which vernacular names are known. With its glossaries, indexes, and other aids for the user, this is certainly an outstandingly helpful volume for the rankest beginner as well as the advanced specialist. As a matter of fact, Riedl's handbook of the biota of the Adriatic will prove most helpful not only for other areas in the Mediterranean (most of the species are widespread), but even for visitors to seashores well beyond the Mediterranean.

ERNST MAYR
Museum of Comparative Zoology, Harvard University

Johannes Kepler

An Account of the Astronomical Discoveries of Kepler. Robert Small. A reprinting of the 1804 text, with a foreword by William D. Stahlman. University of Wisconsin Press, Madison, 1963. xvi + 386 pp. Illus. $5.50.

Perhaps the most popular preoccupation among contemporary historians of science is the analysis and assessment of the work of Isaac Newton. The publication of his correspondence, a definitive variorum edition of the *Principia*, detailed studies of his work in optics, mathematics, and chemistry, as well as a new biography, all these and more, are well under way. Of course this is as it should be, yet the ancillary genius of Kepler, who not only contributed significantly to Newton's own accomplishment but who helped to mold so much of modern science itself, remains relatively unexplored.

Exegetical texts on the prolix prose of Johannes Kepler are as rare as those on Newton are abundant, and yet the need is greater. Newton can be difficult and involved, but Kepler, by contrast, plunges the reader into Stygian darkness and then leaves him to seek out for himself (as one must, for example, in the *Astronomia Nova* for two of the famous three laws of planetary motion) the singular accomplishments of Kepler's genius.

Robert Small's book, which William Stahlman has rescued from oblivion with this reprinting, gives an account (the best in English) of Kepler's astronomical discoveries. But it does more than that, for as the subtitle of the original, 1804 edition indicates, it also includes "an Historical Review of the Systems Which Had Successively Prevailed before His Time." This properly sets the background for a decent discussion of Kepler's accomplishment, so that the value of this work goes beyond the boundaries of Kepler's career. While Stahlman has aided the modern reader by providing a useful index, the publisher has failed to match the caliber of his editor. Eighty detailed diagrams are crammed onto 11 pages at the end of the text, without even the old-fashioned device of a folded page to enable the reader to bring the textual discussion and the diagrams together. In every other aspect, however, this is a well-produced book.

HARRY WOOLF
Johns Hopkins University

Note

Microbiology

Recent Progress in Microbiology (University of Toronto Press, Toronto, Canada, 1963. 735 pp. Illus. $21.50), edited by N. E. Gibbons, is a collection of the invited papers presented at 13 symposia held at the 8th International Congress of Microbiology (Montreal, 1962). Its chief value is that it provides an up-to-date summary of developments in the fields of microbiology in which one is not working. The articles that consider fields with which one is familiar are well done and informative, but, of course, one is aware of the work, and the information