Structural Geology

Folding and Fracturing of Rocks. JOHN G. RAMSAY. McGraw-Hill, New York, 1967. xvi + 568 pp., illus. $17.50. International Series in the Earth and Planetary Sciences.

Recent progress in structural geology has been concentrated in two quite distinct areas: the solid mechanics of rock deformation, and the structural geometry and kinematics of deformed rocks, particularly folded metamorphic rocks. Progress in both areas has been considerable, but interaction between them has been slight. Ramsay's book bridges the gap between the two in the analysis of folds. The broadest area of overlap between solid mechanics and structural studies lies in the study of finite strains, which occupies a large portion of the book. The book contains an extensive introduction to solid mechanics, and is completed by an excellent discussion of the geometry and mechanics of folding.

The discussion of finite strain is exceptionally thorough; the subject is very well handled, and the chapter contains much material that is not available elsewhere. The discussion is complicated because the subject matter is, but it is still lucid and readable. The chapter on the practical determination of finite strain in rocks summarizes a large number of methods, many of them new to me; I hope that it will stimulate more geologists to measure finite strains in the field.

The material on finite strain forms the background for the author's discussion of folds. This chapter (nearly 120 pages long) is the best discussion of folding I know of in the geological literature. A classification of fold types, based ultimately on variations of layer thickness within the fold, is given, and a variety of finite-strain distributions which could produce the various fold types are presented. One of the real strengths of this discussion is that the author does not restrict himself to one or two finite-strain fold models but considers a variety of models. This multiple-model approach is carried over into succeeding chapters on the folding of linear structures and obliquely inclined surfaces. Although folding is approached more from the standpoint of geometry than mechanical origin, existing theoretical investigations of the mechanics of folding are critically discussed, and mechanical considerations are skillfully incorporated in the treatment. The author's work on the geometry of folding will prove invaluable to future workers on the mechanical origin of folds.

My principal criticisms concern the treatments of solid mechanics and experimental rock deformation. The treatment of solid mechanics seems to me to emphasize formal mathematics to the neglect of the underlying physics of the deformation process. For example, in the derivation of the formulas for the stress acting across a plane as a function of its orientation, the use of the principle of the equilibrium of a small volume element under the forces on its faces is never explicitly acknowledged. The relatively abstract mathematical style and the lack of examples using solutions of the partial differential equations of solid mechanics would make it rather difficult to use the book as an introduction to solid mechanics. Only one error of any consequence was found, however: the symmetry of the stress tensor is not dependent on static equilibrium, as is implied on page 283; an asymmetric stress tensor can exist only in a body with internal couples, such as one in a strong electromagnetic field.

The coverage of experimental rock deformation is surprisingly brief. This brevity is a consequence of both the emphasis on continuous deformation rather than faulting and the decision not to treat petrofabrics. Since the experimentally developed techniques for dynamic analysis using quartz deformation lamellae and calcite twin lamellae have yielded interesting results regarding the stress distribution in folds, this decision seems unfortunate.

These criticisms relate mainly to matters of style and emphasis; the topics which make up the bulk of the book are extremely well treated. Supplemented by additional material on solid mechanics and experimental rock deformation, this book would make an excellent text for an advanced course in structural geology. As a reference or text in the more restricted fields of finite strain and folding, it is clearly without equal. It is unfortunate that the price is so high.

WILLIAM M. CHAPPLE
Department of Geological Sciences,
Brown University,
Providence, Rhode Island

Primatology: A Basic Reference Work

A Handbook of Living Primates. Morphology, Ecology and Behaviour of Nonhuman Primates. J. R. NAPIER and P. H. NAPIER. Academic Press, New York, 1967. xiv + 456 pp., illus. $21.50.

This book, the senior author of which is a distinguished primatologist, is addressed to all students of the order Primates, whatever their precise fields of interest. Basically a reference book, it will prove to be of great value not only to professional primatologists but also to workers in collateral fields, such as zoology, anthropology, and medical research.

The data are arranged in three sections. Part 1 deals with functional morphology, presenting an overall survey of the structural, functional, and behavioral characters found within the order. Inasmuch as the primates have adapted themselves to arboreal and terrestrial life in various ways, the limbs are given special consideration. Truncal posture, vision, olfaction, audition, the brain, the dentition and digestive system, placentation, and growth rates also receive attention.

Part 2 consists of useful profiles of the various primate genera. Included are more than 100 truly superb photographs of the animals, which the authors have obtained from numerous sources. The textual data, which are succinctly presented, will no doubt prove to be of great service to a variety of people. They deal with geographical range, ecology, morphology, behavior, reproduction and development, and captivity. Included are a liberal number of references to the pertinent literature, a feature which greatly enhances their value.

The final section, part 3, comprises supplementary and comparative information brought together from many sources. It consists of many useful data concerning taxonomy and nomenclature (including common names from various languages), habitats, limbs and locomotion, macaques (which should have a broad appeal, since these particular primates are widely used for experimental purposes), and vital statistics.

The list of literature is remarkably extensive, consisting of nearly 900 references, all of which apparently are cited in the text. The text also contains numerous tables presenting useful basic data.

As might be expected in a work of this scope and magnitude, there are some errors and omissions. These, however, appear to be of minor nature and do not detract from the value of this scholarly book—a book which represents a truly outstanding contribution to the literature of primatology.

WILLIAM L. STRAUS, JR.
Department of Anatomy,
Johns Hopkins University,
Baltimore, Maryland

Theoretical Physics

Proceedings of the Fifth Annual Eastern Theoretical Physics Conference. Providence, R.I., Nov. 1966. DAVID FELDMAN, Ed. Benjamin, New York, 1967. x + 248 pp., illus. $6.95.

A question may be asked as to the purpose of publishing proceedings of *theoretical* conferences. To those active in the field the results presented in any particular paper are probably well known, and in general the presentation is too concise to be of practical use. The conciseness of the papers likewise limits their utility to a physicist interested in starting research in a new area. Even if he is too lazy to search the journals, a random sampling of recent summer-school notes will provide a more detailed exposition. A good purpose such published proceedings might serve is to give a professional survey to physicists not directly involved in research discussed in a particular article. If we keep this view in mind, then the proceedings under review here do a good job. The topics discussed cover three fundamental, active, and exciting areas of theoretical research. These are astrophysics, high energy physics, and topics loosely grouped as many-body physics.

It is gratifying to note that, in spite of familiarity, those engaged in cosmology and astrophysics have not lost awe for the large numbers they play with. There is excitement generated in discussing processes, already encountered in undergraduate physics, occurring at 10^{10}°K with a density of 10^{10} g/cm^3 over a period of 10^{10} years. Most of the articles in this section are down-to-earth discussions of everyday physics applied in a sophisticated way to stellar or nebular occurrences. Among these we have a talk on the application of molecular physics to the cooling of gaseous clouds or the joint use of hydrodynamics and nuclear physics in setting up models for the last gasps of a star. This section demonstrates that in astrophysics we have a synthesis of all of physics.

Approximately two-thirds of these proceedings are devoted to high energy or elementary particle physics. One has a sampling of most of the current ideas about fundamental interactions. The talks are mainly evaluative in nature. The results of current algebra as well as its difficulties are aptly presented. Likewise, various recent developments of the dispersion and field theory approach are reviewed. One talk in this section stands out as having interest to a broader audience than just high energy physicists. A. S. Wightman's paper should be of value to those desiring a deeper understanding of some mathematical details of ordinary quantum mechanics.

The talks on many-body problems do not do justice to all areas now being investigated, but what is covered is covered in an interesting and easy manner. F. Dyson's discussion of the status of quantum mechanics for systems of many charged particles and bounds on their energy will be of interest to many physicists.

One minor objection that may be raised to these proceedings is that several of the talks are either inadequately referenced or not referenced at all. With the need for better referencing obvious, it is hoped that editors of future proceedings will pay more attention to this matter.

MYRON BANDER
Department of Physics,
University of California, Irvine

Microbial Metabolism

Respiration and Phosphorylation of Bacteria. NINA S. GEL'MAN, MARINA A. LUKOYANOVA, and DMITRII N. OSTROVSKII. Translated from the Russian edition (Moscow, 1966). Gifford B. Pinchot, Translation Ed. Plenum, New York, 1967. x + 238 pp., illus. $12.50.

This volume is an excellent summary of the information available on the respiratory pathways in bacteria (in contrast to the animal). The first two chapters discuss the nature and structure of bacterial membranes, which are the sites of the respiratory mechanisms. There are in this discussion some dubious statements; for example, "there is no respiratory control mechanism in bacteria" (p. 3) and "It is obvious that obligate anaerobes . . . will not contain membranous structures" (p. 7). These may result from the translation, for later, in the detailed discussion of the literature, such sweeping generalities are avoided and a careful consideration of the experimental observations is given which shows that there is such control and that there are membranes in anaerobes. A third chapter takes up the respiratory chain of bacteria, and the fourth and last chapter discusses oxidative phosphorylation in bacteria with detailed consideration of the five somewhat unrelated cases known. There is then a summary of ten pages, which is less useful. About a thousand recent papers are referred to. Most of the literature is from the West, and most of the Soviet literature is that produced by the authors.

W. W. UMBREIT
Department of Bacteriology, Rutgers University, New Brunswick, New Jersey

Halley's Activities

Edmond Halley. ANGUS ARMITAGE. Nelson, London, 1966. xii + 220 pp., illus. 42 s.

Edmond Halley flourished in England in the last half of the 17th century and the first half of the 18th—at the summit of what can be called the scientific revolution in the country most involved in it. Halley's contributions to many of the facets of this revolution, with only so much of his biography as is necessary to illuminate them, form the subject matter of this study.

Halley improved astronomical instruments, both those for use on land and those for use at sea. He urged the use of telescopic sights and visited and observed with Hevelius, who did not use them. Halley determined the positions of numerous stars in both hemispheres and catalogued them, traveling to St. Helena to chart southern stars. He devised a method for determining a planet's orbital elements from three determinations of the planet's position. He suggested many refinements of the methods for determining longitude at sea and made numerous observations of the moon for that purpose. He consulted with Newton on the theory of gravity, predicted the periodicity of a comet, explained the rainbow, plotted compass variations, charted the oceans, took barometer readings for a study of the atmosphere, observed eclipses, ob-