group theory and its applications to the modern gauge theories of elementary particle physics, which form the subject matter of this monograph. It is an important subject, since the gauge symmetries, based on continuous groups called Lie groups, are central to our understanding of the structure of matter and its interactions. The first half of the book, entitled Group Structure, is an introduction to Lie groups and their representations. The material is fairly standard. The author starts with the definition of a group and takes us up to Dynkin diagrams and to global group structure. The great virtues of this half of the book lie in its conciseness and mathematical detail. Even physicists familiar with the subject will probably profit from it.

The second half of the book, entitled Gauge Theory, illuminates the group-theoretical structure of the gauge theories of electroweak, strong, and grand unified interactions. Again much of the content is standard. However, most of the material in the last few chapters on orbit structure, the minimization of Higgs potentials, and symmetry-breaking patterns has not appeared before in book form.

The pedagogical value of the book is greatly enhanced by an extensive set of references to original papers and review literature (sometimes the references in the text do not adequately distinguish the two), a well-selected set of suggestions for further reading, and a seven-page glossary. The author has made a deliberate attempt to avoid extensive overlap with existing books and reviews. As a result the reader will not find much discussion of certain group-theoretic aspects of gauge theory such as homotopy theory and topological solutions, gauge-fixing, renormalization theory and BRS symmetry, and supersymmetry. The author has chosen to narrow, so as to sharpen, his focus. In this he has been successful. The writing is crisp and precise.

The book does contain a few careless errors. The most serious, since it makes the subsequent discussion hard to follow, is a statement about how fermions are assigned to representations of a grand unified group (p. 118). The others are relatively minor. The explanations are generally clear (an exception is the section on the running and unification of the gauge couplings in unified theories).

Altogether, the book is a welcome addition to the literature in this field, by a real expert, and will repay the closest study. It is especially an excellent book for graduate students in physics.

STEPHEN M. BARR
Brookhaven National Laboratory, Brookhaven, NY 11973

Ices

Ices in the Solar System. JÜRGEN KLINGER, DANIEL BENEST, AUDOUIN DOLLFUS, and ROMAN SMOLUCHOWSKI, Eds. Reidel, Dordrecht, 1985 (U.S. distributor, Kluwer, Hingham, MA). xviii, 954 pp., illus. $99. NATO Advanced Science Institutes, Series C, vol. 156. From a workshop, Nice, Jan. 1984.

The significance of ices in terrestrial and planetary systems amply justifies the size of this large volume. Ice, in the mineralogically correct sense of frozen water, is the basic component of permafrost, which covers as much as a quarter of Earth's land surface, and the phase relationships of the water-ice system and the rheology of ice are basic parameters of the behavior of the glaciers and ice sheets that have dominated much of the higher-latitude regions.

Ices in the more general sense, including frozen volatiles such as H_2O, CO_2, CH_4, NH_3, and various hydrates of these and less abundant ices, play central roles in the evolutionary history, present state, engineering properties, and even economic potential of terrestrial systems. The recent discovery of extensive natural gas clathrates (solid methane hydrates) in the permafrost regions of Siberia, Alaska, and northern Canada and in marine sediments is potentially of major economic importance. In the solar system beyond the orbit of Earth, ices also play a major role. In the satellites of the outer solar system they are often more abundant than the silicates and metals that constitute the bulk of the terrestrial planets. A knowledge of the special properties of these ices is thus important in understanding the history and current state of the majority of solar system bodies.

This book is the proceedings of a workshop that brought together many of the leading authorities on the subject. It is composed of five major sections: Physics and Remote Sensing of Ices (physical properties, pressure-temperature phase behavior, optical and spectral properties, the nature of clathrates); Cosmochemistry of Ices and Interplanetary Particles (nature of interstellar and interplanetary grains, modifications of ices by charged particle bombardment); The Icy Nuclei of Comets; Ices on Mars; and Rings, Icy Satellites, and Pluto. Each section consists of six to 16 papers that range from detailed descriptions of well-characterized physical and chemical systems to the most current interpretations and theories of the nature and processes of these icy planetary bodies. In content and readability they range from acceptable to outstanding.

The scope of the book goes much beyond ices to include aspects of the formation of the solar system and the evolution of a number of planetary bodies. The reader is introduced to some fascinating worlds: Titan and its hydrocarbon ocean, Mars and its alternating polar caps, the vagaries of cometary behavior, Uranus and its coal black rings, and many others. Future work may well disprove some or all of the models presented. But past experience in planetary exploration suggests that we underestimate the complexity and strangeness of bodies in the solar system at least as often as we overestimate them. The reader gets a good flavor of this complexity in these papers.

The book was completed before the recent Voyager 2 Uranus encounter and the flyby of Comet Halley by the European, Soviet, and Japanese spacecraft. Thus the discussions of the rings and satellites of Uranus and of cometary nuclei are of necessity less than complete. With the present hiatus in U.S. missions there is not likely to be any equivalent increment in our knowledge of the solar system for nearly a decade. This book will thus remain a good summary of the state of the art for a number of years.

The text was reproduced from camera-ready copy supplied by the authors and varies significantly in type face and proofreading quality. The transposition of the text on pp. 68 and 69 is the only significant production flaw I noted.

MICHAEL J. GAFFEY
Department of Geology, Rensselaer Polytechnic Institute, Troy, NY 12180

Reprints of Books Previously Reviewed

Ice Ages. Solving the Mystery. John Imbrie and Katherine Palmer Imbrie. Harvard University Press, Cambridge, MA, 1986. Paper, $7.95. *Reviewed* **204**, 751 (1979).

Laboratory Life. The Construction of Scientific Facts. Bruno Latour and Steve Woolgar. Princeton University Press, Princeton, NJ, 1986. Paper, $12.50. With new postscript and subtitle. *Reviewed* **206**, 824 (1979).

Occult and Scientific Mentalities in the Renaissance. Brian Vickers, Ed. Cambridge University Press, New York, 1986. Paper, $15.95. *Reviewed* **226**, 1185 (1984).

Books Received

Acid Deposition. Environmental, Economic, and Policy Issues. Donald D. Adams and Walter P. Page, Eds. Plenum, New York, 1986. xii, 560 pp., illus. $79.50. Based on a conference, Plattsburgh, NY, June 1983.

Adaptational Biology. Molecules to Organisms. C. Ladd Prosser. Wiley-Interscience, New York, 1986. xii, 784 pp., illus. $99.50; paper, $49.50.

Adaptive and Learning Systems. Theory and Applications. Kumpati S. Narendra, Ed. Plenum, New York, 1986. viii, 418 pp., illus. $65. From a workshop, New Haven, CT, May 1985.

The Adrenal Gland and Hypertension. F. Mantero *et al.*, Eds. Raven, New York, 1986. xviii, 465 pp., illus. $63.50. Serono Symposia Publications, vol. 27.

Advances in Forensic Haemogenetics 1. B. Brink-