

cesses, such as 'breaking the code' of DNA but . . . the basic phenomena of life . . . we still do not understand." Further on, talking about biology he says: ". . . we have hardly scratched the surface of its central problems. . . ."

The very first paper, on electronic structures by J. I. Fernandez-Alonso, is a remarkable summary of methods for computing molecular energy levels and properties. As far as I know it is the only concise description of the various initialled methods such as SCF, MO, LCAO, HLSP, and VB. The 80 pages provide a cursory review of the difficulties attending the approximations of quantum theory in molecular orbitals (MO's). On page 23 it is stated that a diagram of procedure in MO theory is presented "to make it more readily understood by chemists and biologists." A wide variety of biomolecules is described and discussed competently.

The editors have made a broadly representative selection of experimental methods applied to getting information about living systems. These include, for example, electron spin resonance in plants, paramagnetic species in seeds, photo-protection from ultraviolet, nuclear magnetic resonance in specific molecular reactions, infrared spectra of nucleic acids, and thermal effects on proteins, etc.

The format includes heavy paper, large print, good mathematical notation, numerous tables and figures, subject and name indices, and a table of contents. It is a highly commendable, durable, and timely book for students in basic life sciences.

Group Theoretical Concepts and Methods in Elementary Particle Physics. Summer School Lectures (Istanbul, July-Aug. 1962) Feza Gürsey, ed. 425 pp. Gordon & Breach, New York, 1964. Regular edition \$19.50; professional edition \$12.50.

Reviewed by John G. Taylor, Rutgers University.

Group theory plays a basic role in elementary-particle physics, and there have been important advances very recently, based on certain symmetries which the strongly interacting particles are found to possess. The book under review is a collection of lectures on the various aspects of group

theory which are concerned with these and other symmetries of the elementary particles.

Let me first describe the area covered by the lectures. They may be roughly separated into two classes: the first class discussed certain mathematical problems in group theory of physical interest, and the second class discussed more directly physical problems using standard group-theoretic tools. The first class of lectures consisted of a discussion of the Hopf method for the global consideration of compact Lie groups (both classification and representation theory) and some applications (D. Speiser); the local classification and representation of Lie groups (G. Racah); a survey of the inhomogeneous Lorentz group and its unitary representations, including space and time reversal (E. Wigner); group invariance in quantum mechanics and the group extension problem (L. Michel); contraction of Lie groups and their representations (E. İnönü). The second class consisted of derivation of the *PCT* theorem and the relation between spin and statistics (N. Burgoyne); topics in high energy scattering theory (O. Greenberg); the unitary symmetry model, and generalized gauge invariance (S. Glashow); chiral symmetries in strong and weak interactions (Y. Nambu); broken symmetries (A. Salam); introduction to the de Sitter group (F. Gürsey); axiomatization of parastatistics (dell'Antonio, Greenberg, Sudarshan); and a review of the renormalization group (E. Caianello).

The articles vary greatly in length. Taken as a whole they will be of great value to the graduate or other nonexpert student wishing to gain familiarity with the way groups are being used in elementary-particle physics. Most of the articles are readable and have good bibliographies. Further, they cover a broad range. The reviewer thought two of the articles to be too condensed to be really helpful, but eleven out of thirteen is a good percentage. The book contains few minor errors and is very clearly printed. Evidently great care has been taken in publishing. This care may be the reason for the long delay (over two years) between the summer school and the appearance of the

book. This delay means that most of the physical lectures of class two have lost some of their topicality or are out of date. Indeed the later successes of SU_3 and SU_6 should have meant much more emphasis on these groups than allowed in a single lecture by Glashow. Even so, the book should be a very valuable introduction to students trying to learn something about groups and elementary particles.

Direct Use of the Sun's Energy. By Farington Daniels. 374 pp. Yale University Press, New Haven, Conn., 1964. Cloth \$7.50, paper \$2.45.

Reviewed by Robert L. Weber, The Pennsylvania State University.

In this attractively styled book (in sunbeam-yellow binding), Professor Daniels alerts his readers to the rapid depletion of the earth's conventional sources of energy and to the promise that direct use of sunlight holds in supplying the energy of primary importance to man's continued survival on earth.

This felicitous account is popular science at its best. The unsolved problem concerns us all. The account of efforts to solve the problem can be skimmed by a reader chiefly attracted by the historical sketches, illustrations, anecdotes, and foreign ventures. But for the reader who wants to know the cost of solar heat compared with oil heat for a home in Princeton, engineering data are there. And for the serious student who may want to embark on his own research, many tables summarize findings to date, and there is a good bibliography of work in a field in which surprisingly little was published before 1940.

Professor Daniels' humanitarian interest in securing improved water, food, and energy supplies for peoples in areas with very limited resources is apparent throughout this book. So also is the scientist's disciplined imagination and an engineer's willingness to plan beneficial projects feasible with use of local materials.

Solar heating and the distillation of water receive major attention. But there is also discussion of selective radiation surfaces; refrigeration; heat engines; and thermoelectric, thermionic, photovoltaic, and photochemical