BOOK REVIEWS

An Introduction to Atmospheric Physics. By Robert G. Fleagle and Joost A. Businger. Vol. 5 of Internat'l Geophysics Series, edited by J. Van Mieghem. 346 pp. Academic, New York, 1963. $12.00.
Reviewed by S. Fred Singer, University of Maryland.

Atmospheric physics has traditionally been a part of a meteorology curriculum; however it is rapidly becoming a part of the undergraduate physics curriculum as well, taking its place with nuclear physics, solid-state physics, optics, acoustics, etc. But the number of suitable and up-to-date texts is small.

While the other volumes in the International Geophysics Series are monographs, the present book is a text, pure and simple. It is an elementary treatment, suitable for undergraduate students after their basic course of physics; it is simpler for example than the well-known text by John C. Johnson on *Physical Meteorology*, published in 1954.

The subject matter covers those meteorological phenomena not directly concerned with the circulation of the atmosphere: thermodynamics of atmospheric gases; growth and electrical behavior of cloud particles; radiation transfer; infrared absorption and emission in the atmosphere; and a short section on photochemical processes. Next, various energy transfer processes are described, including nonradiative ones.

There follows a very brief account of some geomagnetic phenomena, and finally a discussion of optical, radio and radar, and acoustical propagation effects in the atmosphere. Each chapter is followed by a List of Symbols, Problems, and General References. The Appendix deals with elementary vector analysis and similar topics.

It is fairly clear that the text will find its greatest appeal among undergraduate students in meteorology or engineering. Physicists may find the treatment of certain topics too brief to be satisfying. Of course, it is always a matter of individual taste what topics to include and to what depth to treat them. I would prefer to leave Maxwell's equations to a course on electricity and magnetism, to leave geomagnetic phenomena (including magnetosphere and aurorae) to a separate course on space physics, and concentrate more attention on Rayleigh and Mie scattering. On the other hand, the treatment of the topics which are peculiar to atmospheric physics, such as transfer processes, are excellently handled.

Science in the College Curriculum. Conf. Proc. (Oakland U., May 1962). Robert Hoopes, ed. 211 pp. Oakland University, Rochester, Mich., 1963.
Reviewed by Richard Schlegel, Michigan State University.

Any physicist who by inclination or committee assignment has taken the least thought about the content of the college curriculum will surely have wrestled with the problem of science education for the non-science student. In the conference which was held at Oakland, the newest of Michigan's state universities, a group of distinguished scholars and science-educators came together to discuss the problem. The report of their proceedings contains both a due amount of material on the needs for science education and on general approaches that may be taken, and also many comments that reflect earned experiences from teaching in classroom and laboratory. There is a useful appendix in which the general education requirements, in all fields, not just science, at sixty-five American colleges and universities are listed.

The conference group did come to some definite recommendations. It was felt that two year-courses are the minimum college time that should be devoted to science education, and many felt that there should be some additional course time in mathematics. The two years seem generally to divide along the lines of one of physical and one of biological science. But, with a few exceptions, the conferees felt that the traditional introductory course programs are not satisfactory, and that special courses must be devised for the non-science student. Considerable attention was given to the importance of presenting historical, philosophical, and social-economic-political aspects of science in teaching these courses. Everyone agreed, apparently, that some laboratory work, preferably not of the formal, follow-the-instruction-sheet type, is essential in teaching students something of science. There was no defense of the use of television or motion pictures in place of actual laboratory work or demonstrations.

I finished reading this report with a renewed sense of the need for the assimilation of science into our general culture, and also with a sense of the debt we owe to the too small group of able people who are devoting themselves to the task. I think, too, that we should not feel that it is only the non-science student who profits from their labors. Inevitably, the attention they give to the history of science, to its philosophical significance (and validity), and to its social effects, will come back in various ways to the science student, and he will be all the better for that.

Recent Progress in Microcalorimetry. By E. Calvet and H. Prat. Edited and Translated from French by H. A. Skinner. 177 pp. (Pergamon, Oxford) Macmillan, New York, 1963. $8.50.
Reviewed by Joseph G. Hoffman, State University of New York at Buffalo.

A more appropriate title for this survey might be: "Selected Topics In Microcalorimetry". The recent progress alluded to is that which has occurred in the authors' work. Instead of being a survey of current literature, it is a presentation of the authors' recent work with the Tian-Calvet microcalorimeter and its applications to physico-chemical and biological objects. The bibliography is limited almost exclusively to the work of the authors. There are numerous footnote references to the larger treatise by the same authors published in 1956, and to which this book is really an addendum. The new material is somewhat improved over the older treatise in that one can tell what the units are.

But the quantitative data on biological objects are not yet carefully specified. As a result, the quantitative data are only qualitative. The treatment of microcalorimetry is much too restricted to be commended for any purpose beyond a review of the authors' extensive publications.

The Mathematical Foundations of Quantum Mechanics. A Lecture-Note Volume. By George W. Mackey, 137 pp. W. A. Benjamin, New York, 1963. Cloth $7.00, paper $3.95.
Reviewed by Michael Danos, National Bureau of Standards.

At some time during his schooling, every student of physics (at least of theoretical physics) should take out time and indulge in the luxury of exposing himself to the beauty of mathematical thought, to the Olympian remoteness of mathematical problems, to the exquisitely precise filigree structure of mathematical concepts. In addition to the aesthetic pleasure, this digression from the straight path to the PhD can be thought of as a long-term investment that will give the future physicist a new and deeper understanding of the theoretical structure of physics, widen his outlook, and enlarge his horizons.

Mackey's book, an improved version of lecture notes written with élan and lucidity, is eminently suited as an introductory guide into the world of mathematics, as distinguished from mathematical technology, which is usually the only twig of mathematics presented to physics students. In explaining the mathematical structure of classical and quantum mechanics to pure mathematicians having "little or no knowledge of physics", Mackey brings to life what a physicist generally would consider to be abstract and not really useful topics of pure mathematics. The influence of great mathematicians of the past (Poincaré, Hilbert, Weyl, von Neumann) is evident, and the book could be characterized as being a less formal, but more searching, stimulating, and demanding version of von Neumann's 1932 book of the same title. It is aimed at advanced graduate students in pure mathematics. However, a bright advanced graduate student in physics with some knowledge of higher mathematics beyond the college level should be able to gain an understanding of the material presented by the time of the second reading of the book. In the interval between the first and the second reading (since a fault of the book is the paucity of its bibliography) he will have clandestinely approached a trusted member of the mathematics department for help and for advice on the literature, unless he has already done some studying on his own. After this he will return with renewed vigor to the evaluation of his graphs. In the meantime he will not have learned much physics, but he will have learned something about physics.

It may not be pragmatic, but if you are a graduate student, read this book! Perhaps, even you, a mature physicist, should read it!

Solar Flares. By Henry J. Smith and Elske v.P. Smith. (Collier-Macmillan, London) Macmillan, New York, 1963. $12.95.
Reviewed by Bruce W. Shore, Harvard College Observatory.

As a result of the IGY, many physicists discovered the variegated activity on the sun that has fascinated solar astronomers for the last century. Topics that belonged to a few astronomical specialists ten years ago find an audience today throughout the vast new aerospace community. One of the best illustrations is the appearance of this monograph on solar flares—those mysterious unaccountable brightenings of line emission over a small area of the solar disc. Could such an event have any practical consequence? Indeed, yes; major changes of the geomagnetic field often follow disturbances, impairing telegraph and telephone communication. Ionospheric disturbances linked to solar outbursts disrupt radio communication. And as this country prepares to send astronauts on space journeys, these formerly obscure events take on new significance: outbursts of hazardous radiation from the sun appear to be a consequence of major flare activity. Thus, a book on solar flares and related solar-terrestrial relations will attract a sizable and heterogeneous audience, ranging from amateur telescope makers to corporate vice presidents, from hydrodynamicists to statisticians. Each will indeed find this book a readable and interesting treatise. Though an alert freshman may discover possibilities here for a brief research project, theoreticians at the most advanced level will find observations a real challenge, for the basic nature of solar activity is still very much an enigma.

Following an introductory chapter neatly summarizing present knowledge of "the sun's surprising and puzzling behavior," the authors discuss at length the observations of flare phenomena: first the flares themselves, as observed for example through filters; then the spectra of flares and active regions; next radio-frequency observations; and finally corpuscular radiation. The final chapter summarizes the tasks for any model of flare phenomena, and reviews several current models. Readers unfamiliar with stellar atmospheres, observational spectroscopy, or magnetoionic theory will find good introductions to these subjects in the appropriate chapters. The authors carefully define the descriptive nomenclature introduced over the years. An excellent 31-page bibliography and a discussion of the several periodicals devoted to solar data further enhance the value of the book as a reference source.

Henry and Elske Smith have observed and studied flares for several years at the Sacramento Peak Observatory, and this monograph reflects their patient work. I recommend it both for the wealth of data on solar activity and for the well-written detailed description of solar phenomena; it belongs in any well-stocked library of physical science.

The World Of Elementary Particles. By Kenneth W. Ford. 246 pp. Blaisdell, New York, 1963. Paper $2.95., Cloth $4.50.
Reviewed by W. G. Holladay, Vanderbilt University.

The particles of physics have appeared on the scene in such profusion and usually in such provocative forms that unprecedented effort is being directed toward the attainment of some understanding of their properties. This effort frequently engulfs those involved in it, and since it is at the boundary of our most profound knowledge and deepest ignorance, re-