

Group applications

UNITARY SYMMETRIES AND THEIR APPLICATION TO HIGH ENERGY PHYSICS. By M. Gourdin. 303 pp. North-Holland, Amsterdam (Interscience, New York), 1967. \$12.75

by Don B. Lichtenberg

This book is most useful for those who already know something of group theory and unitary symmetry and who want to become better acquainted with the progress of the applications to elementary-particle physics. The different applications discussed do not all represent progress in the field, but at least they represent lines of research that have been pursued and which are worth knowing about if only to avoid pursuing them again.

I should like to regard the book as being divided into three main parts. The first part, comprising chapter 1, contains a summary of some of the main properties of the unitary group $SU(3)$. This chapter is highly condensed and is filled with many technical terms from the theory of Lie groups, Lie algebras and topology. The second part, including chapters 2 through 11, contains the main applications to particle physics of the unitary groups $U(3)$, $U(6)$ and higher dimensional groups, including noncompact groups and current algebras. The third part, containing chapters 12 through 17, is an introduction to the theory of Lie groups, Lie algebras, topology and group representations. For the uninitiated, a reading of chapters 12 through 17 is necessary to understand chapter 1.

However, even these last chapters, although of an introductory nature, are condensed and incomplete. It will be difficult to learn about the necessary group theory from them without having been previously exposed to some knowledge of group-theoretical concepts. For example, factor groups are used quite often in this part, but nowhere could I find a definition of a factor group. The entry "factor group" is not in the index. In fact, a number of undefined concepts that have been used extensively are not referred to in the inadequate index. Nevertheless, these last chapters provide the valuable function of giving the reader an acquaintance with many of the important ideas.

But the main merit of the book, in my opinion, lies in the applications. The author has shown good judgment in including applications to strong, electromagnetic and weak interactions. He has shown that unitary symmetry, including symmetry-breaking effects and the ideas of current algebras, has many applications over the whole range of elementary-particle physics. It is impressive to see so many different kinds of applications all discussed in a few chapters of one book. But this very richness of material has meant that in many cases the treatment has had to be quite sketchy and the reader has had to be referred to the original literature for further information.

Sometimes Gourdin is overly optimistic, as when he describes the $SU(6)$ prediction of the ratio of the proton to the neutron magnetic moment as being in "perfect" agreement with experiment. The actual discrepancy of

about 3% is very small when judged by the standard of the usual predictions made in elementary-particle physics, and I assume that is all Gourdin meant to imply.

This book is most useful as a summary of "the state of the art" in the applications of unitary symmetry to high-energy physics, rather than a book to teach the uninitiated about the field. As such, it is a valuable book for the young researcher who has worked in only one part of this rapidly developing area of research but who wishes to acquaint himself with a broader picture. The book will also be valuable to advanced theoretical graduate students who, however, may find it a bit rough going unless they are prepared to take much of what is said on faith.

* * *

The reviewer, a professor of physics at Indiana University, has worked for several years in unitary symmetry.

Updated and rewritten introductory textbook

FUNDAMENTAL PHYSICS. (2nd edition). By Jay Orear. 472 pp. Wiley, New York, 1967. \$8.95

by Garrison Sposito

The second edition of *Fundamental Physics* is an enlarged, updated version of its predecessor and, according to the author, represents "a serious attempt to rewrite the entire book in order to increase the amount of explanation without much increase in subject matter." This has indeed been the case, for the revision of the first ten chapters is essentially a reorganization, while that of the last six (on relativity and quantum physics) comprises primarily discussions of the laser and the advances in particle physics during the past seven years. Moreover, the book now reads more smoothly, offers more and better illustrations and problems, and enjoys the benefit of the programmed approach to self-study in the form of "test your understanding" questions (and answers) at the bottom of nearly every page.

Given that the new edition is an improvement on the first, the question left to be answered is whether *Fundamental Physics* can be used successful-

ly in a course on physics for students with little background in science. If the point of view is taken that such a course should be encyclopedic, involving many aspects of physics, and should impart a certain degree of skill in dealing with applications, then the answer to the question is essentially affirmative. Most everything in classical and quantum physics is touched upon in the book, then embellished by worked-through examples and discussions of important applications. This eclecticism is probably not seriously disadvantaged by the occasionally unintelligible prose ("This mathematical procedure, called Fourier analysis, requires an infinite number of pure sine waves using integral calculus.") or the misleading remarks concerning the visibility of the Lorentz contraction, simultaneity, and the uncertainty principle.

On the other hand, the review of elementary mathematics in the first chapter and the use of mathematics in general throughout the book are not adequate. For example, the reader is told in the review that the slope of a curve is its steepness; yet, in a later



**if you don't
fit the mold...
where should
you work?**

FOR THE LABORATORY THAT DOESN'T HAVE A MOLD!

And Avco Everett's that sort of laboratory . . . a laboratory that doesn't have a mold . . . a laboratory run by research scientists. The type of people we are looking for are Ph.D.s who like the academic life . . . its freedom, its pace, its vast research facilities and its interchanges with the foremost scientists in the country. Avco Everett is looking for the man who appreciates those benefits, but who also wants all the personal advantages of working for a private firm. That sort of man will be happy working with Avco Everett, and Avco Everett will be happy working with him.

Interested? Our investigations range from high temperature gas dynamics, plasma dynamics, aerophysics, atomic physics, reentry physics, magnetohydrodynamics to low temperature physics including superconductivity. If you're in any one of these fields, write Mr. Louis Rudzinsky, Industrial Relations Director. He'll be glad to send you bibliographies and abstracts of our recent publications. Then you'll have a better basis to judge us. We think you'll see what we mean.



2385 REVERE BEACH PARKWAY
EVERETT, MASSACHUSETTS 02149

An Equal Opportunity Employer

discussion of the photoelectric effect, he is expected to realize, without further comment, that the slope of a plot of photoelectron energy against incident light frequency yields the Planck constant. In another place it is stated that the binomial theorem may be used to reduce the expression for the time difference in the analysis of the Michelson-Morley experiment. Fifteen pages later the theorem is described for the first time. Finally, it must be added that the problem is not eased any by the infrequent but unabashed use of exponentials and derivatives.

The second edition of *Fundamental Physics* should prove useful as a textbook for any course on "liberal-arts physics" that adheres strongly to the encyclopedic approach and devotes sufficient lecture time to a review of mathematics. However, the book will be of small value in those courses on basic physics whose paramount ambition is to reveal the fundamental concepts and principles that hold the science together.

* * *

The reviewer, an assistant professor of physics at Sonoma State College in Rohnert Park, Calif., has research interest in quantum statistical mechanics and mathematical physics.

Well loved model

HIGH ENERGY NUCLEAR REACTIONS. By A. B. Clegg. 130 pp. Clarendon, Press, Oxford, 1966. Paper \$2.90

by Walter Benenson

High Energy Nuclear Reactions is a recent addition to the series of monographs that is called the Oxford Library of the Physical Sciences. The subject matter is nuclear reactions produced by nucleons of energy 100 MeV or more. Experimental data presented are mainly of nuclear reactions produced by protons from 150–200 MeV synchrocyclotrons. Nuclei investigated are for the most part light, with C^{12} and O^{16} receiving a great deal of the attention. The author, Arthur B. Clegg of the University of Oxford, is a leading contributor to this field of research.

Most of his attention is to experi-

mental results that can be well understood theoretically. These are nuclear reactions in which a relatively simple change is made in the target nucleus. The author refers to these in his preface as "nuclear reactions I have known and loved." Elastic and inelastic scattering as well as nucleon-knockout and cluster-knockout reactions are discussed. The theoretical model for the reaction mechanism is a collision between the incident nucleon and a single nucleon in the target nucleus. Although the author makes clear why the model should work, its main justification is that it works well. The success of the model for the nuclear reactions is an optimistic prediction for the productivity of the next generation of isochronous cyclotrons of 100 MeV and more. These machines are being actively sought or designed at many laboratories throughout the world. One can be sure that Clegg's book will be a reference well used by those proposing to build these machines. Indeed the only addition one would desire is a chapter about future expectations such as what would be done with higher energy, resolution and beam current.

High Energy Nuclear Reactions can be recommended as physics literature. It is not a compendium of data, references, or reprints but an attempt to set forth intelligibly the progress of a productive field of physics. It is well written and well organized throughout and makes unusually good reading.

* * *

The reviewer works in nuclear physics and elementary particles at the Michigan State cyclotron laboratory.

Engineering probability

ELEMENTS OF PROBABILITY THEORY. By J. Bass. Trans. from French by W. McKay. 249 pp. Academic Press, New York, 1966. \$9.75

by Thomas Kailath

In the last few years there has been a sudden increase in the number of textbooks on probability theory, most of them directed towards engineering and physics students. The present book, a translation of a French text, is probably one of the best, especially for

ASTRODYNAMICS ROCKETS SATELLITES AND SPACE TRAVEL

by John A. Eisele

Develops Newton's and Kepler's laws with many mnemonic devices to aid the young physicist and space scientist. With over 1500 equations and drawings, it represents an unique approach to celestial mechanics with emphasis on potential-well diagrams as an analytical tool.

6" × 9" XVIII + 545 pp. cloth.

\$10.00 post paid on prepaid orders.

ADVANCED QUANTUM MECHANICS AND PARTICLE PHYSICS 2ND ED.

by John A. Eisele

Topics include: Schroedinger Equation; Klein Gordon Equation; Dirac Equation; Feynman Techniques; Beta Decay; Non-Conservation of Parity; Foldy-Wouthuysen Transformation; Isotopic Spin; Pi Meson Scattering; Transformation Theory; Integral Equations.

5 1/2" × 8" XVIII + 656 pp. cloth.

\$8.00 post paid on prepaid orders.

THE NATIONAL BOOK CO. OF AMERICA

P.O. Box 18036, Washington, D.C. 20021

A Corcoran Brief:

How to select a personnel consultant

Select one who recognizes that the ultimate decision is yours. And one who—knowledgeably, personally, and with intellectual integrity—focuses your attention on situations compatible with your professional and personal objectives.

Select one who can see beyond the obvious and can perhaps suggest objectives you've not considered.

Last, select one, only one.

Here at Corcoran, we serve the BS, MS and PhD degree-holders individually. Nationwide, we work with large and small industrial and research clients on a fee-paid basis. Your call or correspondence is invited.

JOSEPH P. CORCORAN
Personnel Consultants

505E Germantown Pike
Lafayette Hill, Pa. 19444
(215) 825-0848