

ters, a feature missing in *A Contemporary View* . . .

Each book distinguishes between "exercises" and "problems," and both have more than enough. Most of the exercises in both are simple plug-in's, to test single ideas. The problems in *Foundations* . . . are mostly for physics and engineering students, and some are quite challenging and go beyond the level of the text. Problems in *A Contemporary View* . . . are exceedingly numerous and also challenging, but lean towards the theoretical and appear to be more imaginative, on the whole, than the problems in the other book.

In my very incomplete sampling of the two books, I turned up a few minor errors of physics as well as of history in *A Contemporary View* . . . and none in *Foundations* . . . This difference could be chance, because I read only a small fraction of each book with care. In any case, both books seem to be generally reliable, and the authors clearly know their subject and know how they want to present it.

In giving pleasure to the eye, Borowitz and Bornstein's publisher, McGraw-Hill, scores a clear victory over Van Nostrand. *A Contemporary View* . . . is done in two colors, with marginal notes, and has a roomy, uncluttered appearance. *Foundations* . . . on the other hand, despite its cramped appearance and less glossy paper, has page headings that are more useful, and its figures are more appealing than the entirely idealized figures of the other book.

Overall, what are the merits of these new additions to the recent flood of elementary textbooks? Both are good books; I would not be unhappy to teach from either one. Yet the very thing that is their strength, their all-purpose goal, is also their weakness. If you are teaching a class entirely of nonscience students, you can certainly find a text more suitable than either one. If you are teaching a class of physics majors and other science students, chances are you and the students might be happier with another choice. However, if you teach a class containing both science and nonscience students, or if you teach physics majors but want to retreat from the sophisticated approach of some recent books, you should examine both of these books and give them serious consideration.

As a theoretical physicist, I find

Borowitz and Bornstein's approach appealing, especially the way they imbued relativity into the whole fabric of the text. As a teacher, however, I would find it easier to use Michels, Correll and Patterson, for it would leave me more freedom to organize my course in my own way, and I like to mix the practical with the theoretical.

Also, I must give Michels, Correll, and Patterson a slight edge in their attention to detail.

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Kenneth Ford, professor at the University of California, Irvine, is the author of "Basic Physics," Blaisdell, Waltham, Mass., 1968.

For the nontechnical

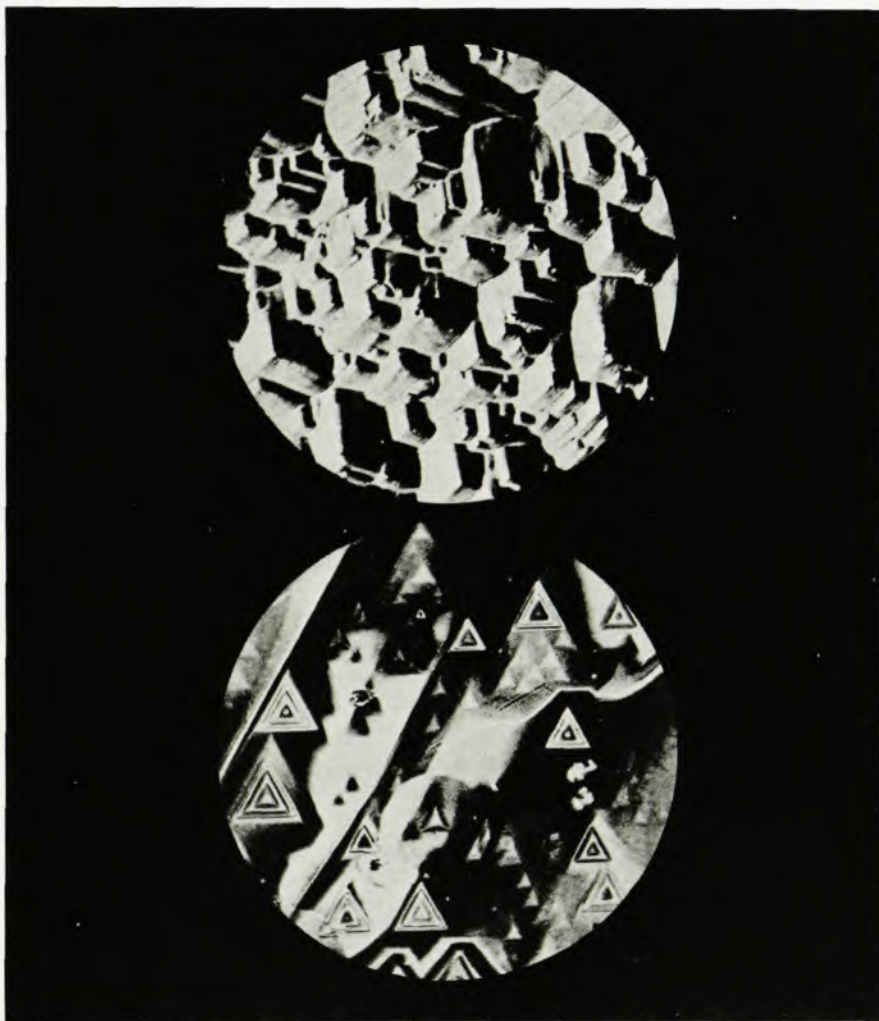
REVOLUTION IN OPTICS. By S. Tolansky. 222 pp. Penguin Books, Baltimore, Maryland, 1968. \$1.45

by ROBERT LINDSAY

In this addition to the Pelican paperback series, the author gives ample support to his assertion that there has been a revolution in optics. Samuel Tolansky is a distinguished British physicist who has written sev-

eral books and contributed much published research in atomic physics, spectroscopy and optics; first at Manchester University and then at University of London where he is now a professor. In writing this book he has brought to the layman's attention some significant discoveries and applications marking progress in optics since early in the 20th century.

The presentation is carefully or-



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ganized into three parts. The first part establishes a working background by reviewing classical optics, the quantum theory and astrophysics. The second part is the vital portion with its eight chapters containing well over half the text. Its material is a rich collection that treats in considerable detail the developments in optical and electron microscopy, multiple-beam interferometry, luminescence, optical glasses and plastics and fiber optics.

Tolansky is particularly successful in showing how some of these developments have spawned various industrial and commercial applications, which touch on aspects of everyday life, and yet how others have played key roles in fundamental scientific research. In some instances he speaks from firsthand experience and conveys the lively sense of enthusiasm and excitement with which a research scientist attacks a problem. Moreover the debts to the past have not been overlooked and a nice historical perspective has been provided for certain subjects by mentioning the important beginning steps by individuals in earlier centuries. The relatively recent and publicly prominent topics of lasers and holography are taken up in the third part, where concise physical explanations are given and backed by both actual and speculative examples of applications.

* * *

A professor at Trinity College, Robert Lindsay has been teaching undergraduate physics for 13 years.

Singular perturbations

PERTURBATION METHODS IN APPLIED MATHEMATICS. By Julian D. Cole. 260 pp. Blaisdell, Waltham, Mass., 1968. \$9.50

by GEORGE I. BELL

The term "perturbation method" may suggest to most physicists the Rayleigh-Schrödinger theory and related methods of obtaining energy eigenvalues. This book has nothing to do with such perturbation methods, but is rather about problems in singular-perturbation theory, boundary layers and the like.

These problems arise in differential equations containing a small parameter, ϵ , where the solution of the differ-

ential equation for any finite value of ϵ is qualitatively different from the solution for $\epsilon = 0$. Consider, for example, an ordinary differential equation for $x(t)$

$$\epsilon \frac{d^2x}{dt^2} + \frac{dx}{dt} + x = 0$$

For $\epsilon = 0$, the differential equation is first order and $x(t)$ is uniquely determined by $x(0)$; for any finite ϵ , the equation is second order, and both $x(0)$ and $(dx/dt)(0)$ are required to determine the solution that is, in general, qualitatively different from that for $\epsilon = 0$. This book is about solutions to similar and more complicated differential equations using asymptotic expansions in ϵ .

The first half treats ordinary differential equations. Singular-perturbation theory is developed for equations in which ϵ multiplies the highest order derivative, and explanations are provided for matched asymptotic expansions and uniformly valid solutions. Julian Cole also describes methods for treating harmonic oscillators subject to perturbations affecting the period and amplitude, including the "two-time" method. The Van der Pol relaxation oscillator is studied at length. Differential equations with slowly varying coefficients are also examined and contacts are made with adiabatic invariants and the Wentzel-Kramers-Brillouin-Jeffreys method.

In the second half, partial-differential equations (of second order) are considered in which ϵ multiplies the highest-order derivatives. The solutions are examined for elliptic and hyperbolic equations and are applied to a number of hydrodynamic problems, including boundary-layer theory and magnetohydrodynamic pipe flow.

Cole, professor of applied mathematics at California Institute of Technology, is well qualified to write on these topics; he and his colleagues have contributed significantly to the development of these perturbation methods. His book could be read profitably by a graduate student familiar with ordinary and partial-differential equations, but a knowledge of hydrodynamics would help in appreciating some of the examples. Cole employs physical intuition and simple arguments throughout, rather than mathematical rigor, and methods are explained through examples. It could also profit theoretically inclined workers in many fields, for although these perturbation methods have been

largely developed in hydrodynamics, they are applicable in many other fields.

* * *

George Bell, with the theoretical division at Los Alamos Scientific Laboratory, has had an interest in "singular-perturbation theory" since discovering that he had used it (inadvertently) in a transport-theory problem.

Concentration on the nucleus

NUCLEAR PHYSICS: AN INTRODUCTION. By Haro von Buttlar. 547 pp. Academic Press, New York, 1968. \$14.50

by NORMAN A. BAILY

I examined this book from the point of view of using it as a text for the first quarter of an advanced radiation-dosimetry course. What was desired was a comprehensive review of nuclear-physics fundamentals to serve as a base in developing the specialized topics of the course.

The book provides excellent coverage of many topics and treats neutron interactions extensively, but gives very little coverage to charged-particle interactions or the interactions of photons with matter. Rather than the usual broad topical spread found in many texts with similar titles, the book concentrates, and probably rightly so, on the nucleus. It should, therefore, adequately prepare the physics undergraduate student for more advanced treatments of the same topics, in addition to providing the groundwork for advanced concepts not treated.

The approach is quite sound, starting with a review of collision theory and the central-force problem. Part A continues with such subjects as nuclear-binding energies, kinematics and decays. The liquid-drop model is described together with its limitations, and neutron physics concludes this section. Part B introduces the student to applicable quantum-mechanical concepts, and the third section then treats selected topics, which are nuclear spin, nuclear moments, the shell model, the two-nucleon problem, reaction cross sections, alpha- and beta-decay theory, and summaries of the various nuclear models.

Haro Von Buttlar is a professor at the Institut Für Experimentalphysik, Ruhr-Universität Bochum, Germany. He wrote this text to bridge the gap