type-I and type-II SC—formerly called soft and hard SC respectively. This is followed by a chapter devoted to type-I SC, which is similar to that found in the books by Lynton, Rickayzen, Schrieffer and Blatt. Chapter 3 is unique in its long and clear treatment of type-II SC including a discussion of the vortex state of Abrikosov. Since 1963, tutorials on type-II SC have appeared in the literature, but this is the only book that contains a detailed discussion of them. Chapters 4 and 5 may be said to be the heart of the book. There the assumed electron condensation is analyzed in detail using the microscopic viewpoint following the BCS theory and Bogoliubov's self-consistent field method. The Landau-Ginsburg equations are discussed in chapter 6 and applied to bulk material, thin films and SC junctions in chapter 7. The last chapter is devoted to the effects of strong magnetic fields, magnetic impurities and gapless SC.

The necessary background for understanding this graduate textbook is familiarity with the contents of the third edition of Kittel's superb book on solid-state physics, a modern course in statistical physics (Reif) and quantum mechanics (Merzbacher). De Gennes eschews Feynman diagrams, Green's functions and other sophisticated techniques of the physics of the many-body problem and as the result his book will be especially attractive and intelligible to experimentalists.

The faults of this book are minor. The two-page index is practically useless and should have been expanded to at least a dozen pages to be of any value. The printing, though legible, is not a professional job. There are numerous misprints and algebraic errors, which can be rather annoying to a fastidious reader. Nevertheless, this reviewer does not hesitate to warmly recommend this book to those interested in a concise, coherent, physical and modern treatment of superconductivity.

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*This reviewer is a member of the mathematical physics department of the Stanford Research Institute.*

## Mathematical savoir faire

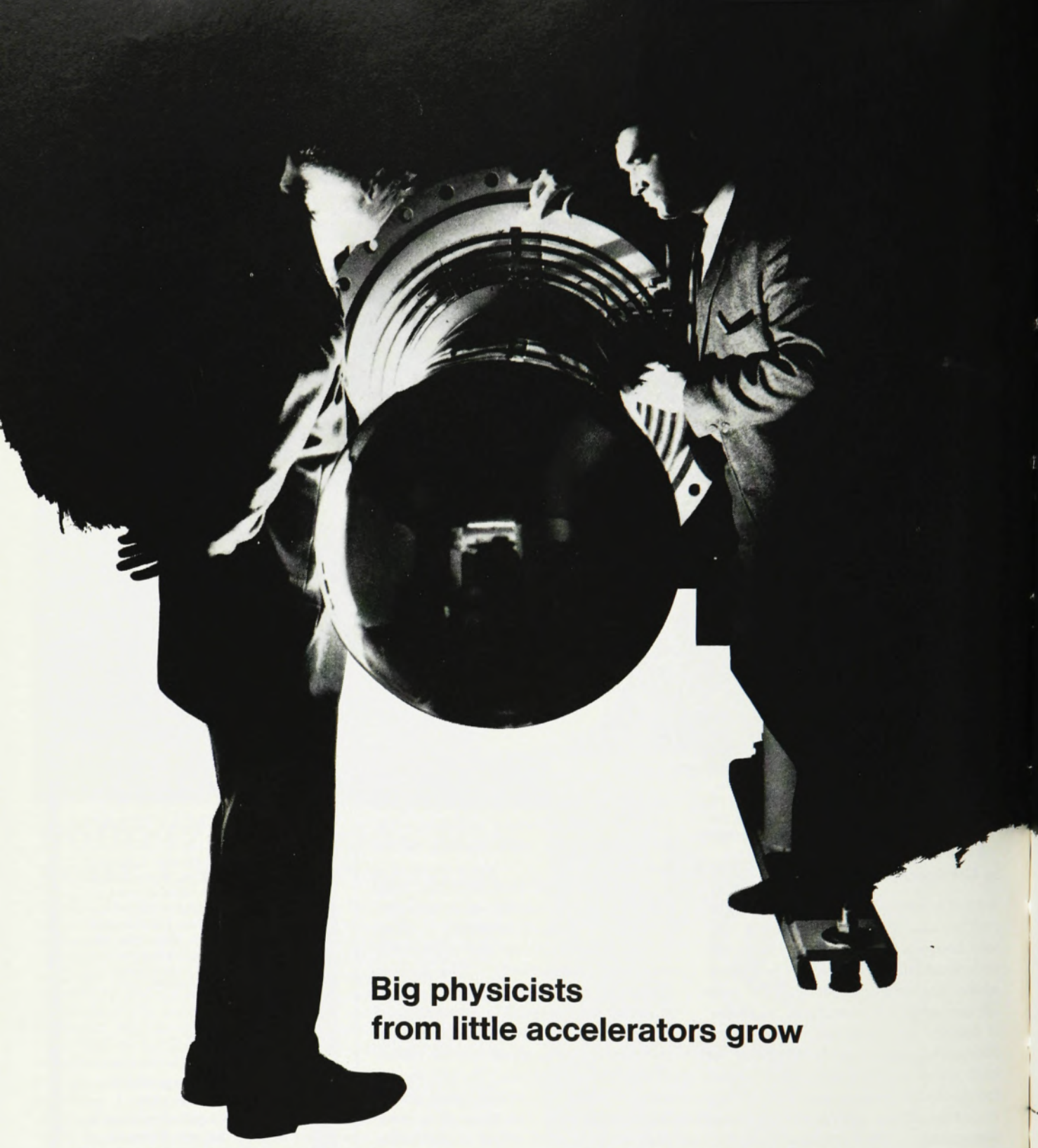
MATHEMATICS FOR PHYSICISTS. By P. Dennery, A. Krzywicki. 384 pp. Harper & Row, New York, 1967. $12.95

*by Garrison Sposito*

A good argument can be made for the position that theoretical physics may soon be quite incomprehensible to the undergraduate scientist or engineer whose mathematical *savoir faire* does not transcend the content of traditional courses on advanced calculus and differential equations. Without at least some introductory ideas about the theory of groups and their representations, linear operators and function spaces, generalized functions, Lebesgue integration, and Green's functions, most of what has been going on recently in physical theory—in particular the numerous contributions that have been made by mathematicians—becomes an undecipherable arcanum. It follows that the mathematical content of the advanced undergraduate science curriculum, at least in the fields closely dependent upon physics, should be updated. In *Mathematics for Physicists,* Dennery and Krzywicki have attempted, with success, to do just this.

The book is divided into four long chapters on functions of a complex variable, finite-dimensional linear space, function spaces and differential equations, respectively. The authors list as the only prerequisites to understanding the material, a knowledge of the calculus and an exposure to elementary vector analysis and the theory of algebraic equations. To this the reviewer would add introductory differential equations, functions of a complex variable, and either a smattering of mathematical sophistication or a feeling for abstract analysis.

The chapter on analytic functions is long, well written, and rather complete. In particular, it contains useful sections on conformal mapping and the evaluation of integrals, including the method of steepest descent. The chapter on linear spaces is good, but not excellent. The detracting aspects



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have mostly to do with pedagogy. For example, the centered dot is employed at one time or another to represent ordinary multiplication, the scalar product, multiplication by a scalar and the product of operators. The Dirac symbol $|\ 0\ \rangle$ is introduced for the null vector, then immediately replaced by 0, the symbol just introduced as the scalar "zero." These things are likely to be confusing to an inexperienced reader. Along the same line, the authors occasionally have the bad pedagogical habit of making a new definition, then immediately generalizing it or otherwise indicating its inadequacy. The opposite extreme occurs, however, when they define the symbol *sup* to be "the upper limit." Certainly the undergraduate who has been through calculus can be told about least upper bounds. On the other hand, it should not be inferred that the chapter is hard to read. The sections on linear-operator theory, the eigenvalue problem and matrix algebra are carefully done and should be of great value to the reader with a knowledge of quantum mechanics.

The chapter on function spaces is very good. In it, along with a unique and excellent introduction to the "special functions," are to be found a tiny but heuristic section on the Lebesgue integral, a section on generalized functions (more popularly called "distributions") and one on linear operators in Hilbert space. The chapter on differential equations is also well done. Green's functions are discussed for both ordinary and partial differential equations. Included as well are four sections on the hypergeometric equation—in a sense an extension of the discussion in the third chapter on orthogonal polynomials—and the standard methods for dealing with partial differential equations.

*Mathematics for Physicists* should be quite useable as a text for courses on applied mathematics for scientists or as a supplementary text for courses on quantum mechanics. The misprints, common to all new books, are small in number and not lethal to undergraduate understanding. However, three improvements might be suggested for future editions: the introduction of group theory into the second chapter (where it is all but done anyway), an increase in the size of the

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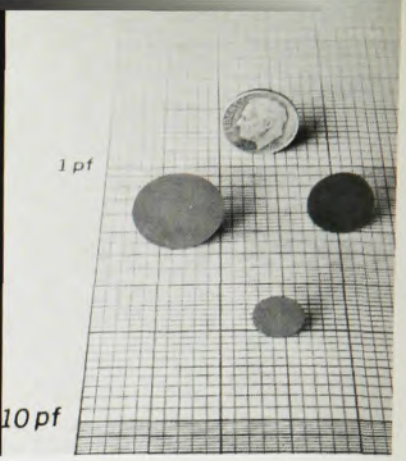


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bibliography and the inclusion of at least a few problems after each chapter.

* * *

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## Classical numerical analysis

ANALYSIS OF NUMERICAL METHODS. By Eugene Isaacson, Herbert B. Keller. 541 pp. Wiley, New York, 1966. $11.95

*by George H. Weiss*

Techniques of numerical analysis are finding their way into the solution of increasing numbers of problems of theoretical and applied physics from the solution of partial differential equations of hydrodynamics and superconductivity to the application of Padé approximant methods in nuclear physics and many-body theory. A new exposition on numerical analysis is therefore of potential interest to physicists. The text under review is, however, addressed more to the mathematician than to the physicist. My comment is not meant in any disparaging sense, since the authors would not claim to be addressing an audience of physicists.

Nevertheless, omission of such topics as rational approximations, Padé approximants and data-smoothing techniques makes the book less useful than it might otherwise be in the context of physical application. The topics which have been included (and which might by now be referred to as "classical" numerical analysis) are discussed clearly and accurately from the mathematical point of view. The discussion of solutions of linear and nonlinear equations are particularly lucid. Other topics are discussed with commendable concern for roundoff and truncation errors. This book can be highly recommended as a readable introduction to a considerable part of numerical analysis. There are important gaps, however, for potential applicants of the theory.

* * *

*The reviewer works in the division of computer research and technology at the National Institutes of Health.*

## Eigenvalue and scattering problems

VARIATIONAL PRINCIPLES. By B. L. Moiseiwitsch. 310 pp. Interscience, New York, 1966. $14.00

*by Joseph Gillis*

The main purpose of this text is to demonstrate the application of variational methods to two types of quantum mechanical problems: steady-state problems where the variational techniques are used to obtain eigenvalues, and scattering problems where they are applied to the evaluation of scattering amplitudes and phase shifts.

The book opens with a careful and methodical formulation of the basic ideas of the subject and of their application to both classical and relativistic mechanics. The chapter on eigenvalue probelms includes the first textbook treatment so far available of recent work on two-electron atoms. And the chapter on scattering theory includes, of course, an account of the Schwinger variational principle as well as of some of the many other such principles that have come in its wake.

The subject is a difficult one and, in spite of the high quality of the exposition, the book is not easy reading. There are not many books that cover this sort of ground and the reviewer knows none that do it as well as this.

* * *

*The reviewer is professor of applied mathematics and former dean of the graduate school at the Weizmann Institute of Science, Rehovoth, Israel.*

## Introduction to quanta

WAVE MECHANICS FOR CHEMISTS. By C. W. N. Cumper. 382 pp. Academic Press, New York, 1966. $11.50

*by Donald A. McQuarrie*

This book is apparently meant as an introduction to quantum mechanics for students at the undergraduate level. Its use as a first introduction would be utterly disastrous, though, since it presents quantum mechanics as an esoteric, mysterious subject, bristling with difficult mathematics, from which the student must be spared. Such an introduction could lead to