

plication beyond the first chapter. The difference lies in the physical problem of particular interest. *Radiative Transfer* is primarily concerned with the conservative (nonabsorbing) medium and attention is focused on the scattering kernel and its possible forms; in *Neutron Transport Theory* the basic scattering process is simple and well defined, the attention here is on the nonconservative case in which the probability of a neutron emerging from a collision may be less, or (in the presence of fissionable material) greater, than unity.

The material in the book is divided into four parts. The first discusses the general formulation of the equations and develops general theorems concerning eigenvalues, eigenfunctions, orthogonality, and completeness. The next three sections concentrate on the important cases of constant cross section, energy dependent diffusion problems with and without spectral regeneration, and the neutron distribution at large distances from the source.

This impressive volume is the first really complete coverage of neutron transport theory to appear. It is surprising that this is so, for almost all of the material has existed in the unpublished literature of the atomic energy programs of the United States, Canada, and the United Kingdom for five to ten years. The commercial prospects of nuclear energy have apparently driven many physicists away from the field. Davison has shown that there is still some physics left in the classical neutron and his book should serve as a needed stimulus to workers in the field by indicating the broad problems and the methods available for their solution, as well as those still unanswered questions which require further investigation.

Basic Physics. Vols. 1 & 2. By Alexander Efron. 692 pp. John F. Rider Publisher, Inc., New York, 1957. \$8.95. *Reviewed by Ira M. Freeman, Rutgers University.*

In yielding to the compulsion to include every detailed item that any teacher or supervisor might look for, the authors of many current high-school physics textbooks appear to have lost sight of an important fact: In order to succeed in this highly competitive field, a new book must do more than wedge in a sentence or two about the latest technological achievement. It should offer something novel in method, attitude, or approach.

It was a truly refreshing experience for this reviewer to examine the book written by the chairman of the physics department at Stuyvesant High School, for here we find an original, effective, psychologically sound method of attack—the “spiral approach” to physics. The student is first offered an overview of some of the simpler aspects of physics. Here, in a treatment which is largely descriptive, he gains a perspective of a substantial part of the whole field, at the same time acquiring confidence and losing some of his inborn antipathy to the subject. Then the student returns to a more penetrating and analytical consideration of the

material which builds on and enhances the earlier and more descriptive treatment.

The two levels correspond in general to the two volumes into which the work is divided, but short-range “spiraling” is accomplished in adjacent chapters as well. Each volume, complete in itself, cuts across the conventional subject-matter divisions. For example, electrical charge at rest and in motion is treated in Book 1, while circuits, electromagnetic induction, ac theory, and electronics are deferred to Book 2. The treatment of alternating current is admirable and includes the use of the vector representation.

Applications are by no means slighted, but they are presented only after the appropriate principles have been developed. The items are well chosen and include many matters of current interest and importance. Magnetic domains, health physics, cryogenics, ferrites, scintillation counters are all here. And, prophetically, the jacket ornament is none other than “Sputnik” itself!

Other features of the presentation are noteworthy. A generous set of “Questions and Problems” of graduated difficulty follows the text of each chapter. These exercises for the most part are qualitative and descriptive in the earlier sections of the book, more quantitative and analytical in the later portions. The mathematical methods used include algebra, geometry, simple trigonometric functions, logarithms, and the denary notation. Teachers will welcome the numerous suggestions for demonstrations that can be done with modest equipment.

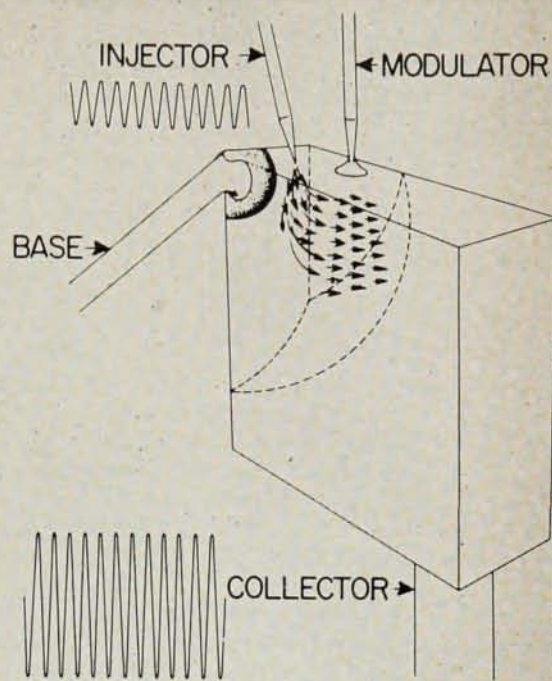
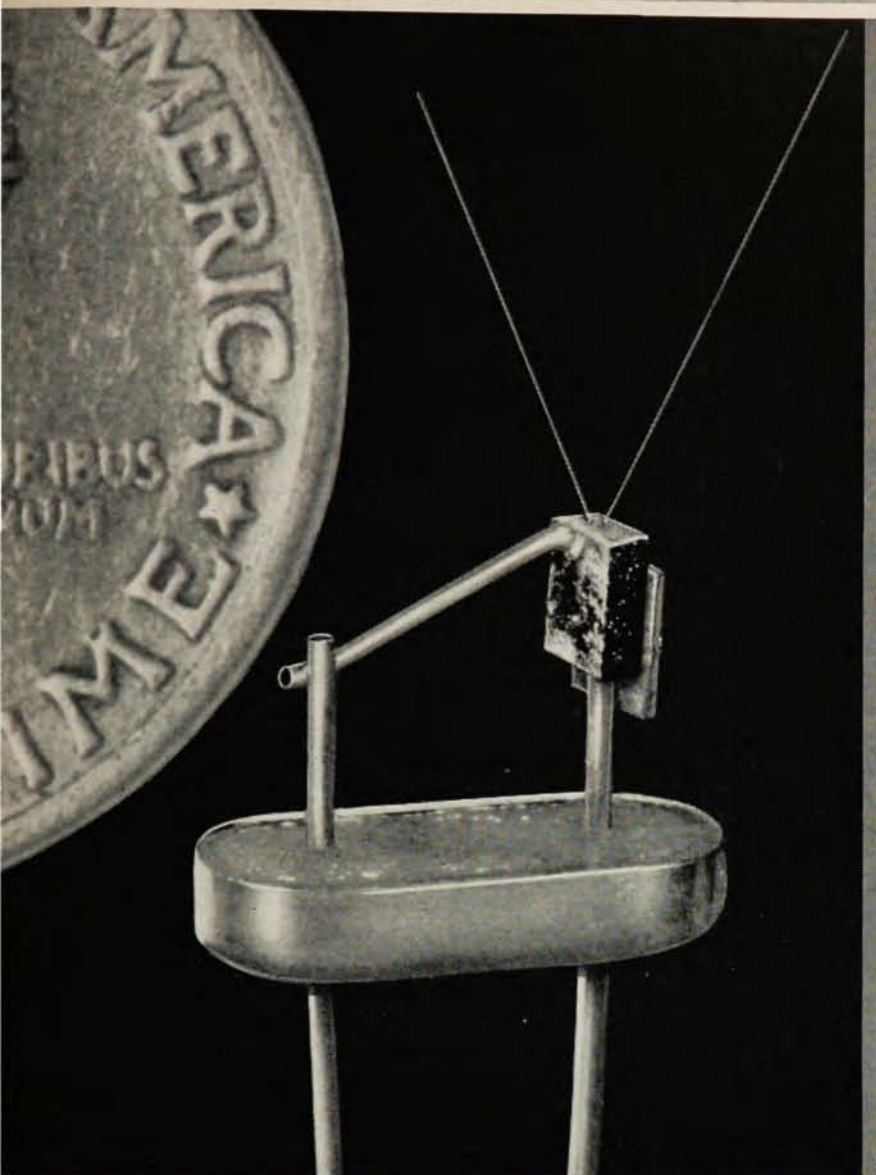
The physical make-up of the book is attractive without being ostentatious. The numerous line cuts are crisp and bold, and halftones of the purely ornamental or “gee-whiz” variety are not in evidence.

Dr. Efron has tested his approach to the teaching of high-school physics for over a decade, and the results have been markedly successful. The spiral seems to carry students to an intermediate level from which at least the better ones will wish to continue work in science. It seems certain that the groundwork laid here will make it significantly easier for both student and teacher in college. The content of *Basic Physics* satisfies the requirements of all College Boards, as well as all local, regional, and state syllabi.

Every teacher and administrator of secondary-school physics would profit by examining and reflecting on this stimulating and soundly conceived textbook.

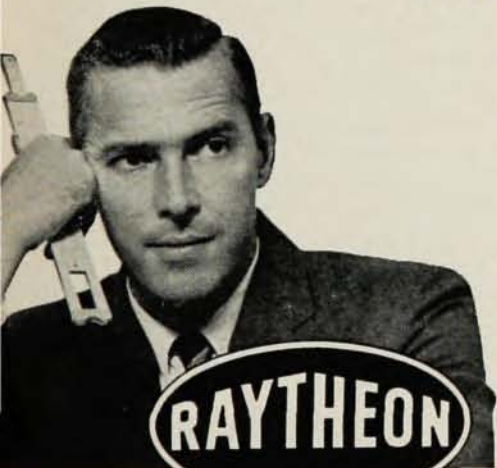
College Physics. By Robert T. Beyer and A. O. Williams, Jr. 656 pp. Prentice-Hall, Inc., Englewood Cliffs, N. J., 1957. \$7.50. *Reviewed by Peter Lindenfeld, Rutgers University.*

What, another book on “College Physics”? Aren’t there dozens of these already, all of them teaching Newton’s laws, Hooke’s law, Ohm’s law? Is this another volume stating these and the other rules which when manipulated in the approved way lead to the required answers on examinations? Do we need more books of this sort?



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We do not need another book that hands down the laws for the student to swallow, we do not need another technological cookbook. But we do need a "Beyer and Williams". Before discussing this book I would like to describe some of the characteristics which I consider essential for an introductory text if it is to give a glimpse of physics as the physicist knows it.

It must stress the limits and limitations of its description of each subject. From gravitation to radioactive decay there is very little room for the absolute statement without qualification. The student who is learning to solve problems without being fully aware of the restricted region in which his solutions apply is not learning physics.

This leads to a second characteristic of physics as opposed to that which is often taught under the name of *College Physics*. It is an open subject. The answers are not all known. Otherwise there would be no need for physicists. Even in the classical subjects there are many opportunities to demonstrate the limits of our knowledge. When we discuss kinetic theory, magnetism, even Ohm's law, we can point to the near frontier.

Finally an introduction to physics must stress the structure of the subject. It is not easy to describe the role of physical theory and its relation to the results of experiments, but without some attempt in this direction we can only have a cookbook. The student who has been led to believe that Newton's laws are self-evident is not only ill prepared for the transition to non-Newtonian physics, he has missed the most important lesson of the structure of mechanics.

Beyer and Williams must have had these characteristics in mind as they wrote their book. Perhaps the most striking feature of the book is its emphasis on the limits of validity of its statements. This sets the whole tone of the book and shows by example the caution of science and the dangers of extrapolation to the unknown. The spirit of physics as a continuing human achievement comes through very well, although specific examples of the limits of our knowledge and the subjects of current research are not often discussed.

Considerable effort has gone into the description of the structure of physical theory. There are several general sections at the beginning and again later in the book. Newton's laws are very carefully discussed, in a way that we do not expect in an elementary textbook. In the discussions of kinetic theory, geometrical optics, atomic structure, the authors again stress the way in which physics attempts to describe and correlate natural phenomena.

The structure of physics is often obscured in elementary books by a diffuse choice of topics. Here Beyer and Williams make one of their most significant contributions. They stick to the fundamentals of the subject and stay away from many of the peripheral topics which have caused traditional elementary physics to grow by formless accretion. Surface tension is not mentioned, friction is barely touched. Technological applications stay in the background and are never allowed to cloud the main development. Atomic bombs,

for example, are discussed in a chapter called "Applications of Nuclear Physics" together with radiation therapy and radiocarbon dating. Nor are there any gimmicks in the book; no pictures of power stations, or lightning, or exploding bombs.

Approximately one quarter of the book deals with "modern" physics. The careful explanations of the earlier chapters make the transition from classical physics more natural and less traumatic than is usually the case. As always the limitations are given as much weight as the successes.

Beyer and Williams' program and intentions are admirable. In some cases the execution of the program does not meet the high standards which they have set for themselves. In leaning over backwards to avoid a cut and dried presentation they sometimes obscure a lucid statement by the subsequent discussion. Is it necessary to talk of "those who accept the principle of conservation of momentum somewhat grudgingly"? (This sentence is given an ironic twist by the fact that their statement of the principle is questionable.) The introduction to work and mechanical energy is excellent. A section called "discussion of potential energy" destroys some of the clarity which the previous sections achieved. Similarly the description of simple harmonic motion is very clear, but in talking about simple harmonic motion the basic definition gets lost.

In view of the emphasis in most of the book it is surprising to see Coulomb's law stated with equal emphasis for vacuum and for a dielectric medium. Did the 1950 report of the American Association of Physics Teachers not discredit this practice sufficiently?

The virtues of this book are far more important than its defects. Beyer and Williams have written a text with individuality and fresh ideas. Their book is one of the best on its level and will undoubtedly have great influence on introductory courses and on future textbooks.

Numerical Methods. By R. A. Buckingham. 597 pp. Pitman Publishing Corp., New York, 1957. \$15.00. Reviewed by Robert T. Beyer, Brown University.

The theme of a great work of literature is very often established in the first sentence or paragraph of the book. It has therefore been this reviewer's practice to take special notice of this opening gambit. To be sure, the first words in scientific texts are not often of much interest and are quickly passed over. The opening of the text under review, however, is so striking, and so sets the theme of the book, that it bears repeating.

"What is the art of computation? This question may for the moment be answered as follows. Most calculations are carried out with numbers which are to some extent approximate, by methods which are often inexact, and their results, expressed in numerical form, are also approximate; yet there is normally only one answer which is correct to a specified degree of accuracy. The art of computation therefore lies in obtaining this correct answer with reasonable certainty, and with the least unnecessary labour."