

formations corresponding to charge and isospin conservation. Next, three chapters are devoted to electron-nucleon scattering, and in this connection the properties of the electromagnetic current of hadrons, with respect to Lorentz transformations, the discrete symmetries, P, C and T and the internal isospin symmetry, are examined. In addition a very lucid account is given of the application of dispersion theory to the electromagnetic form factors. Thereafter the main interest turns to weak interactions and the many intriguing features of weak currents are treated. The book ends with short sections on current algebra, phenomenological Lagrangians and CP violation.

The level of the book is apparently that of advanced students of elementary-particle theory, and it should prove very valuable. The presentation is not completely systematic, but the topics dealt with are treated with clarity and at considerable depth. On the debit side, one could fault the discussion of charge renormalization on pages 43-45, the arguments given on pages 136 and 128 and the treatment of isospin for nucleons on pages 31-33. In addition, there is considerable confusion with regard to the definition of the leptonic current L_μ (see equations 8.5, 9.9 and 9.10). Furthermore, the expression 14.50 for the second-order mass formula is certainly not the whole story. However, these defects and some others of a more minor nature ought not to detract from the merit of the book as a whole. The author in the preface suggests that his book may encourage someone else to write a better one, but that, I feel sure, might prove no easy task.

Ciaran Ryan is professor of mathematical physics, University College, Dublin, Ireland.

No unifying synthesis

THE ENCOUNTER BETWEEN CHRISTIANITY AND SCIENCE. Richard H. Bube, ed. 318 pp. Eerdmans, Grand Rapids, Mich., 1968. \$5.95

by Fred L. Wilson

This book, addressed to those "who fear and distrust modern science as an obstacle to Christian faith," is a collection of 10 essays by six scientists and edited by Richard Bube, professor of



materials science and electrical engineering at Stanford University. The writers, whose fields range from solid-state physics through psychology to social science, have good credentials in their specialties and are widely published writers on science and religion. Each has tried to outline briefly his discipline, discuss conflicts between his field and Christianity and explain how he personally has resolved these apparent conflicts.

Bube writes half of the essays. He opens with a brief discussion of the nature of science, emphasizing causality's downfall in modern science. He next sums up Christianity, but in a rather subjective and assertive way.

Intelligent people are repelled by a Christianity often pictured in a mythological setting, as a reward economy, or as a defender of the status quo. Bube does a good job of pointing out these favorite and false caricatures.

Walter R. Hearn's essay on biological science and F. Donald Ecklemann's essay on geology point out poignantly the tensions that often exist between scientific and Christian thought, particularly for those of a conservative, fundamentalist, Christian view. "Social Science" by David O. Moberg and "Psychology" by Stanley Lindquist could serve some real good. A case for social awareness needs to be made among conservative Christians who often seem far more interested in man's soul than in man. Among this group a widespread distrust of psychology is rampant.

For most people the vituperative debate between science and Christianity is past. Yet the tensions of incompatible attitudes, particularly for those with a fundamentalist upbringing, are still very real and probably will remain

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so for a long time. Ultimately this book fails to remove these tensions. Although the "encounter" is discussed, the scientist's and the Christian's way of seeking truth remain logically incomparable, for the book fails to provide a unifying synthesis for the two.

* * *

Fred L. Wilson is a nuclear physicist and a free-lance writer living in Houston, Texas. He is Associate Coördinator of Deaf Ministries of First Baptist Church, Houston.

Emission, absorption and scattering

RADIATION PROCESSES IN PLASMAS. By G. Bekefi. 337 pp. Wiley, New York, 1966. \$15.75

by Howard H. C. Chang

A decade ago, Project Sherwood, the US program in controlled thermonuclear fusion, was declassified and all of its findings were made public. This prudent decision has resulted in a fruitful international exchange of information and coöperation and will undoubtedly greatly hasten the joyful day when man will reach the El Dorado of controlled nuclear fusion. A by-product of declassification has been the publication of a veritable torrent of papers and books on plasma physics.

This important book deals with the emission, absorption and scattering of electromagnetic waves in gaseous plasmas. Solid-state plasmas, which are likely to be degenerate and require quantum-mechanical treatment, are not discussed at all. It is elementary in that only changes in the external motions of the constituent electrons,

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Frank S. Crawford, Jr., *University of California, Berkeley*. 488 pages, \$5.95, 1967

This book is built on concepts which present the physical properties of many types of waves. The approach is always physical and intuitive rather than mathematical, and the author never presents a formula or a result without explaining or deriving it.

QUANTUM PHYSICS, Volume IV

Eyvind H. Wichmann, *University of California, Berkeley*. Approx. \$5.50, available April

The aim of this textbook is to introduce students to quantum mechanical thinking; to acquaint them with some characteristic phenomena in microphysics; and to familiarize them with the orders of magnitude of physical quantities in this particular domain of physics.

MECHANICS, Volume I

Charles Kittel, Walter D. Knight, both of the *University of California, Berkeley*, and Malvin A. Ruderman, *New York University*. 512 pages, \$5.50, 1965

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Edward M. Purcell, *Harvard University*. 480 pages, \$5.50, 1965

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F. Reif, *University of California, Berkeley*. 432 pages, \$5.50, 1967

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Alan M. Portis, *University of California, Berkeley*. Each 128 pages, \$2.25

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Hugh D. Young, *Carnegie-Mellon University*. 656 pages, \$8.95, 1964

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An introductory course in classical electricity and magnetic theory. It is intended to fill the need for a text which covers with some rigor the basic ideas as they have developed and which shows clearly the connection between experimental facts and the theoretical framework that accommodates them.

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In this edition, the first half treats physics, and the second half chemistry. Important features include a major reorganization of topics and the addition of interest-stimulating essays on various subjects.

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Paul W. Hodge, *University of Washington*. Approx. 160 pages, \$4.95 clothbound, \$2.95 soft-cover (tent.), available March

Provides a simple and graphic guide to the universe as a whole and describes some of the concepts which astronomers use to understand it. Brief and informal, the book is designed for use by those with no background in astronomy, physics, or college mathematics.

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Ira M. Freeman, *Rutgers, The State University*. 744 pages, \$10.75, 1968

A CONTEMPORARY VIEW OF ELEMENTARY PHYSICS

Sidney Borowitz and Lawrence A. Bornstein, both of *New York University*. 912 pages, \$12.00, 1968

McGraw-Hill Book Company, 330 West 42nd Street, New York, New York 10036

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Frederick Bueche, *University of Dayton*. 645 pages, \$10.50, 1965

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Frederick Bueche. 768 pages, \$12.50 (tent.), available April

This introductory text is intended for the calculus-level university physics course. Although the text is moderately rigorous and sophisticated, care is taken at every step to make the results physically reasonable and intuitive. A self-testing study supplement will be available with the text.

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J. Gordon Stipe, *Boston University*. 675 pages, \$10.50, 1967

BASIC PHYSICS

Marsh W. White, Kenneth V. Manning, and Robert L. Weber, all of *The Pennsylvania State University*. 608 pages, \$9.95, 1968

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William C. Elmore and Mark A. Heald, both of *Swarthmore College*. 464 pages, \$13.50 (tent.), available May

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INTRODUCTION TO MODERN PHYSICS,

Sixth Edition

F. K. Richtmyer, E. H. Kennard, and John N. Cooper, *U.S. Naval Postgraduate School*. International Series in Pure and Applied Physics. 752 pages, \$13.00 (tent.), available April

This text maintains the classic, historical features of the earlier editions while updating the material on solid state physics and nuclear physics. New features include much shorter and more teachable chapters, added problem sets, new material on solid state physics, quantum statistics, four-vectors in relativity, and elementary wave mechanics.

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BASIC ELECTRONICS FOR SCIENTISTS

James J. Brophy, *Illinois Institute of Technology*. 512 pages, \$10.50, 1966

The scope of the book is especially broad, taking into account all topics of interest to engineers and scientists. The material on electronic devices and circuits is specifically oriented to appeal to scientists.

EXPERIMENTAL ELECTRONICS

Richard J. Higgins, *University of Oregon*. 186 pages, \$4.50, 1968

This laboratory manual is especially designed to accompany **BASIC ELECTRONICS FOR SCIENTISTS** by James J. Brophy. It provides a set of stimulating experiments which give students of physics and allied sciences the basic knowledge of electronic instrumentation needed for laboratory work.

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ions and atoms are considered. This amounts to treating them as points, and transitions associated with the changes in the internal structure of the ions and atoms are omitted entirely.

An intermediate course in electromagnetic theory and a course in advanced calculus are sufficient background for understanding this book. Familiarity with the material in Lyman Spitzer's little classic, *Physics of Fully Ionized Gases*, while not imperative, would be very helpful. No knowledge of quantum mechanics is necessary because only classical plasmas are studied. In fact, the principal model is that of an electron gas moving through a uniform, smeared-out positive background, assumed immobile.

Plasma physics has been derisively called the discipline rich in theoretical concepts of dubious applicability. The author has admirably attempted to overcome this stigma by frequent comparisons between experimental results and the theory. The ten chapters are devoted to transport of radiation, Kirchhoff's radiation law, emission and absorption from binary encounters, fluctuations, collective emission phenomena, cyclotron emission waves from density fluctuations, microinstabilities and experimental methods. A useful list of references and an author and subject index are provided.

Other reviewers have given very high grades to this book. (See for instance the rhapsodic review by T. Boyd that appeared in the 1 July 1967 issue of *Nature*, page 104.) The book is reasonably well written and will undoubtedly be widely used in the second semester of courses in plasma physics. In spite of its rather high price, it can be recommended as a good buy with the following caveats:

Readers who prefer a more advanced mathematical treatment using Green's functions will like *Electromagnetic Fluctuations in a Plasma* by A. Sitenko, Academic Press, New York, 1967. Sitenko also treats an electron-ion plasma, and his chapters on fluctuations are much more complete and detailed.

A more readable account of the transport of radiation and Kirchhoff's radiation law is given in *Physics of Shock Waves* by Ya. Zel'dovich and Yu. Raizer, Academic Press, New York, 1966, or in *Theoretical Astrophysics* by V. Ambartsumian, Pergamon Press, Oxford, 1958.

Formulas are frequently simply

written down, with the reader being referred to a book where the details are given. However, Bekefi does not give the exact page, and he sometimes propagates the errors of the authors he quotes.

Bekefi, who is at MIT, often attributes results to MIT physicists when, in fact, the results were obtained much earlier by others. This is sloppy scholarship and inexcusable parochialism.

There are no problems. With problems, the scope of the book could have been considerably widened and the value of the book greatly enhanced.

These grumbles are further proof of the truisms that life is short and that an author never finishes a book, he merely abandons it.

* * *

Howard H. C. Chang is senior mathematical physicist at Stanford Research Institute.

On continental drifts

DEBATE ABOUT THE EARTH: APPROACH TO GEOPHYSICS THROUGH ANALYSIS OF CONTINENTAL DRIFT. By H. Takeuchi, S. Uyeda, H. Kanamori. Trans. from Japanese. 253 pp. Freeman, Cooper, San Francisco, 1967. \$4.50

by Owen W. Williams

An extremely well translated version of a Japanese book published in 1964, this book is a timely addition to the continuing debate on the subject of continental drift. Although the authors attempt to convey a neutral position and objective approach as to the existence of continental drift, they appear in reality to be firm proponents of such a position.

The book is written in an exciting, lively and most readable style. It is prepared with sufficient detail to satisfy the scientist and with balance in pertinent generalizations desirable to the layman. If supplemented in some places, it would make a desirable text for an introductory survey course in geophysics. The authors use an ideal set of attractive and meaningful figures and hand-lettered drawings to complement their book.

The first portion of the book offers a clear account of the continental-drift controversy historically from Wegener to the special 1928 American Association of Petroleum Geologists

Symposium on the subject, to Du Toits's movement theory, to the hibernation and almost the demise of the drift theorem during the 1940's and thence to its rekindling by paleomagnetic specialists. Every avenue of each theory and concept is covered; however, an occasional tie-in to the drift theory demands some unsubstantiated imagination from the reader. It is one of the few books in which one can find resumés of the evolution of both continental-drift theory and paleomagnetic theory. The second part of the book deals with contributions of the earth's magnetism and terrestrial heat flow while the final section deals with contributions of marine geophysics and geology.

Although the book is not perfectly balanced, and although it obviously reflects the personal interests of the authors, its validity is still sound. A drawback of any such book is that it becomes dated in a rapidly moving field. For example, no mention is made of evidence supporting the Vine-Matthews sea-floor-spreading hypothesis, advances in recognizing and dating geomagnetic field reversals, recent support of J. T. Wilson's theory and plans for space scientists (geodesists) to use artificial earth satellites to detect continental drift directly over a decade in time.

Internationalism of science is stressed with personalities such as P. M. S. Blackett, Sir Edward Bullard, Jeffries, Louis, Neel, Walter Elsasser and Stanley Runcorn. The need to communicate in science plus the appreciation of having to advance new ideas is recognized by the authors throughout this fine book. This well written book should attract considerable attention among earth scientists.

* * *

Owen W. Williams is director of the terrestrial sciences laboratory at Air Force Cambridge Research Laboratories.

A consensus of experts

PROGRESS IN LOW TEMPERATURE PHYSICS, Vol. 5. C. J. Gorter, ed. 332 pp. North-Holland, Amsterdam (Interscience, New York), 1967. \$15.50

by Garrison Sposito

The fifth volume of this celebrated series is in keeping with the trend of its more recent predecessors to-