and enthusiastic observer of nature, describes an astounding variety of optical phenomena and gives their explanation. Reading the book is a pure delight because the author manages to impart his enthusiasm to the reader so well that one is tempted to run outdoors immediately to start observing. This unique volume will probably be of the greatest direct value to those who teach physics, to physical meteorologists, to astronomers, and all who have a practical interest in the problem of visibility.

A History of the Theories of Aether and Electricity. The Modern Theories, 1900–1926. By Sir Edmund Whittaker. 319 pp. Philosophical Library, Inc., New York, 1954. $8.75. *Reviewed by William Fuller Brown, Jr., Sun Oil Company.*

This is the second volume of a three-volume work. The first volume, subtitled *The Classical Theory*, is a 1951 revision of a book first published in 1910; it was reviewed in this journal and in the *American Journal of Physics* in 1952. The third volume is to cover the period from 1926 to 1950.

The purpose of this volume is "to describe the revolution in physics which took place in the first quarter of the twentieth century". The book begins with the discovery of radioactivity and ends with the fusion of matrix- and wave-mechanics. It devotes a chapter to each of nine topics; the order is chronological within each chapter. Radioactivity gets one chapter, topics in electromagnetism and relativity get three, and topics in quantum theory get five.

This is a history of published papers rather than of the men who published them. Journal references are plentiful; dates of birth and death are given, and some details of academic history; but there are no anecdotes, no descriptions of social gatherings, no eye-witness reports of how somebody stumbled upon a new theory. If you are wondering under what conditions great ideas are born, you will not find the answer here; but what you do find will all be objective and verifiable.

The book includes a number of fairly complete and complex mathematical derivations; few readers will have time to read it with complete understanding at every step. Fortunately that is not necessary, for one can get a good general impression by reading the text and skimming the mathematics. At the same time, the detailed derivations will help the reader who wishes to study some particular subject more thoroughly.

Whittaker attributes several important discoveries to persons other than those usually cited. For instance, he traces special relativity to publications of Poincaré in 1901–1904; he describes Einstein's 1905 paper as having "set forth the relativity theory of Poincaré and Lorentz with some amplifications". (Despite this adjustment of credits, Einstein occupies more lines in the index than does any other entry.) I have not verified Whittaker's documentation in the particular cases he discusses, but in other fields I have noticed errors like those he corrects. A trivial but revealing example is the misspelling *Mosotti* for *Mossotti;* its persistence since 1932 suggests that physicists seldom consult the original sources unless those sources are very recent. Once an error becomes embodied in the folklore of physics, its permanence is practically assured, for attempts to correct it go unnoticed.

There are occasional references to "the true explanation" of some phenomenon. Does this mean merely the explanation accepted today, or is there some other connotation? The term, used without definition, seems incongruous in a book about the revolution in physics—a revolution that surely had epistemological implications.

It is clear that the author has made a careful and exhaustive study of all relevant research papers and has used no second-hand information. The impression I get is that the revolution in physics was a clumsier process, with more frequent blundering into blind alleys, than one might suppose from the usual glib accounts; and that more persons had a hand in the process than are usually mentioned. The impression you get may be different; but in any case I think you will find the book illuminating, and will get from it a better appreciation of the process of scientific discovery.

Applied Electronics. A First Course in Electronics, Electron Tubes, and Associated Circuits (Second Edition). By Truman S. Gray. 881 pp. The Technology Press, MIT, and John Wiley and Sons, Inc., New York, 1954. $9.00. *Reviewed by Louis Weinberg, Hughes Research and Development Laboratories.*

The present volume *Applied Electronics* represents a second edition of a book that has achieved wide recognition as one of a series put out by the MIT Electrical Engineering staff. Like its predecessor, the new edition is intended as a textbook for a first course in electronics and as a reference volume for independent study and use.

The over-all plan of the book is the same as that of the first edition; the three parts treat successively the physics of electronic conduction, the characteristics of typical electron tubes, and the analysis of active circuits. A final chapter on transistors has been added and the chapter of the first edition on polyphase rectifiers has been eliminated.

All of the virtues of the first edition have been retained: the stress is still on basic concepts and methods rather than on the presentation of a wide variety of electronic circuits, and the same scrupulous regard is paid to the definition and meaning of reference polarities so that the old bugaboo of the student—the minus sign—doesn't rise like an apparition to haunt him but always appears as an old and well understood friend.

Instructors and students alike will appreciate the expanded and improved discussion of feedback in tube circuits, the fuller treatment of direct-coupled amplifiers, and the rewritten version of thyratron control. Some other changes worthy of note are the addition of two articles on the analysis, both graphical and ana-

lytical, of tubes with cathode bias and an article on the shift of the dynamic load line with changes in average plate current. Finally, one appendix that has been added will be particularly welcomed by the student—it contains answers to representative problems in the text.

The subject of transistors makes its influence felt even in the discussion on tube circuits, for *explicit* treatments of the grounded-grid and grounded-plate amplifiers have been added; thus, a source of confusion for the beginning student is anticipated and disposed of, namely, his feeling that the three basic transistor connections somehow do not have their correspondences in tube circuits. The final chapter on transistors serves as an introduction to the field; however, because of the less than fifty pages available the problem of transistor bias is not treated and some advantages peculiar to transistors like complementary symmetry are not even mentioned. Also, the common-base connection is used as the standard circuit and all voltages are referred to the base, whereas this reviewer believes the choice of the common-emitter circuit would have been preferable. A minor criticism, too, is that black marks useful throughout the rest of the book for indicating emphasis are not used in the transistor chapter. The linear incremental analysis of the transistor is presented in detail and graphical analysis, including the transfer of load lines from one voltage-current plane to another, is lucidly treated.

It is felt that the book makes a worthwhile addition to the reference library of anyone interested in electronics, and that it will gain increased acceptance as a textbook for introductory (and intermediate) courses in electronics.

Progress in Nuclear Physics. Volume 3. Edited by O. R. Frisch. 279 pp. Academic Press Inc., New York, 1954. $9.50. *Reviewed by Evans Hayward and Irwin Oppenheim, National Bureau of Standards.*

Volume 3 of *Progress in Nuclear Physics* contains nine articles covering a wide range of interests. Three are devoted to the ionizing-particle detectors, diffusion-cloud chambers, proportional counters, and solid-conduction counters by M. Snowden, D. West, and F. C. Champion, respectively. The first two are of interest because of the tremendous strides in the development of these instruments since the war and their subsequent application to many problems in nuclear physics. The paper by Champion describes the solid state physics of the crystal counter, a very interesting device which is not yet widely used because of the difficulties in its operation. An article on the Cerenkov Effect by J. V. Jelley gives a history of the experiments as well as the theoretical development concerning this phenomenon; the last section describes various counters that make use of the Cerenkov Effect for detecting radiation. The paper on the Production of Intense Ion Beams by P. C. Thonemann discusses the properties and the production of plasmas and will appeal chiefly to the accelerator physicist. The article by Blin-Stoyle, Grace, and Halban on Oriented Nuclear Systems describes methods for obtaining polarization and alignment of nuclei and the information available from systems of oriented nuclei and oriented particle beams. Deutsch's article on annihilation of positrons gives special emphasis to theoretical and experimental results for positronium. The importance of the study of the deuteron in the determination of spins and parities of nuclei and nuclear forces is emphasized by Huby in his article on Stripping Reactions and by Massey in Collisions of Deuterons with Nucleons.

The articles are all of high caliber and make profitable reading for the general reader as well as for the specialist.

Nuclear Science Glossary

A Glossary of Terms in Nuclear Science and Technology is just what it claims to be—a comprehensive listing of terms and definitions in the general field of nuclear engineering. The *Glossary* is made up of nine sections dealing with physics, reactor theory, reactor engineering, chemistry, chemical engineering, biophysics and radiobiology, instrumentation, isotope separation, and metallurgy, with the sections available separately at prices ranging from $.60 to $2.50 each and the whole series selling for $7.00. Compiled under the direction of the National Research Council, the *Glossary* was produced by the Nuclear Energy Glossary Committee of the American Society of Mechanical Engineers and may be obtained from the latter at 29 West 39th Street, New York 18, New York. According to the foreword, "the aim has been to limit the inclusion of terms in each section of the Glossary to the following categories: (1) peculiar to the field of nuclear energy; (2) used in this field in a different sense or with different emphasis from what is most commonly understood in other connections; and (3) used elsewhere in the same way, but so infrequently as to be unfamiliar."

Books Received

TRANSACTIONS OF THE SYMPOSIUM ON FLUID MECHANICS AND COMPUTING (New York University, 1953). Edited by Garrett Birkhoff, K. O. Friedrichs, and T. E. Sterne. 243 pp. Interscience Publishers, Inc., New York, 1954. $5.00.

A BRIEF TEXT IN ASTRONOMY. By William T. Skilling and Robert S. Richardson. 327 pp. Henry Holt and Co., New York, 1954. $4.00.

SYMPOSIUM ON FLUORESCENT X-RAY SPECTROGRAPHIC ANALYSIS. American Society for Testing Materials Special Technical Publication No. 157. 68 pp. ASTM, 1916 Race St., Philadelphia 3, Pennsylvania, 1954. Paperbound $1.75.

INDEX TO THE LITERATURE ON SPECTROCHEMICAL ANALYSIS (Part III, 1946–1950). By Bourdon F. Scribner and William F. Meggers. American Society for Testing Materials Special Technical Publication No. 41–C. 226 pp. ASTM, 1916 Race St., Philadelphia 3, Pennsylvania, 1954. Paperbound $4.50.