

ences to pertinent literature are appended to each chapter to stimulate them "into thinking critically". This means that its readers will not include many outside the small group interested in the mathematics of cosmogony. However, parts of the book may be read with profit by less advanced students, for in the summaries of the chapters the author explains the physical meaning of equations that otherwise might prove difficult and uninteresting to nonmathematically minded readers. The first two chapters, in nontechnical terminology, described the problem of the evolution of stellar systems and the methods of attacking it.

The term Stellar Systems embraces all aggregations or assemblies of stars, such as star clouds, open and globular star clusters, and the extragalactic nebulae, which are universes of stars. To trace their development from past to present and future states it is necessary to know at any epoch the positions and motions of their component members relative to each other or to some center of reference. These data of observation are determined by the astronomer, the practical cosmogonist, who supplies them to the theoretical cosmogonist, who, in turn, uses them to test his equations for "the behaviour of the system along the whole time axis". The task is not an easy one owing to the scanty amount of available data applicable to the problem. Therefore, he sets up model stellar systems for which certain structural properties are postulated, and for which certain simplifying assumptions can be made.

In the third and fourth chapters the methods of celestial mechanics are used to analyze model systems composed of a very large number of gravitating particles (stars). In the fifth chapter the model analyzed represents a stellar system as a material continuum in which the interaction between pairs of stars is neglected, the motion of each being "determined by a smoothed-out gravitational force due to the whole system". In the sixth and final chapter analysis by the methods of statistical mechanics is made of a model composed of stars and a continuum.

The results of these analyses, at least for the first two classes of models, describe the types of motion followed by the stellar particles; the conditions for stability of the systems; their ages; the initial configurations of systems that remain similar with the passage of time. Only limited application of the models to real systems is found.

Spheroidal Wave Functions. By Carson Flammer. 220 pp. Stanford U. Press, Stanford, Calif., 1957. \$8.50. Reviewed by M. Abramowitz, National Bureau of Standards.

The tabulation of spheroidal wave functions in a fashion similar to what has been accomplished for other special functions such as the Bessel function is well-nigh impossible. Here we must account for the oblate and prolate cases and under these classifications we have the angular and radial solutions which are de-

pendent, in addition, on the interfocal distance. Finally for each of these conditions the functions must be cataloged as to their order and degree as in the case of the Legendre functions. It is clear that under such circumstances considerable work is necessary to study methods of computation of spheroidal functions and use of large-scale computers to avoid lengthy tabulations. This requires the development of efficient computer programs which are capable of producing numerical results for any of the parameters involved. For this purpose a knowledge of the mathematical properties of spheroidal functions is basic and the present volume attempts to outline systematically such facts as are known at present. In this regard this work affords a welcome supplement to the recent volume of tables by Stratton, Morse, Chu, Little, and Corbato and the treatise by Meixner and Schafke.

The numerical tables presented are a miscellaneous collection of eigenvalues, expansion coefficients, and the spheroidal functions. The graphs of the characteristic values are very instructive and it would be very desirable if some graphs of the functions themselves had been included. Preceding the tables there is a discussion of the mathematical properties of the functions and the various representations in terms of other special functions are given. Here, some numerical examples to demonstrate the efficiency of the various types of expansions would have added much for the reader. This volume will be greatly appreciated by those engaged in the computation of spheroidal functions because of its systematic presentation and format.

The Development and Meaning of Eddington's Fundamental Theory: Including a compilation from Eddington's unpublished manuscripts. By Noel B. Slater. 299 pp. Cambridge U. Press, New York, 1957. \$7.50. Reviewed by J. C. Polkinghorne, University of Edinburgh.

Whatever the validity of the ideas with which Sir Arthur Eddington wrestled in the last twenty years of his life, there is no doubt that the magnitude and breadth of the task he set himself has fired the imaginations of many, especially of those who live in the more speculative and less pragmatic regions on the eastern side of the Atlantic. We like the picture, presented to us by Sir Edmund Whittaker, of Eddington as a latter-day Archimedes calculating π (so to speak) in face of the complaints of the professional π -measurers. However, it is because there are very grave doubts indeed about the validity of his principles, that Eddington has been less successful in firing the intellects of his readers.

Dr. Slater has had access to the considerable number of manuscripts left by Eddington at his death. These included several preliminary drafts of the text of *Fundamental Theory*. These have been collated with the final text and the greater part of this book is devoted to exhibiting the differences in presentation and argument present in these early drafts. There are also three

Ready in May!

Foundations of modern physical science

by GERALD HOLTON, *Harvard University*, and
DUANE H. D. ROLLER, *University of Oklahoma*
under the editorship of
DUANE ROLLER, *The Ramo-Wooldridge Corporation*

This new textbook, based on the cumulative teaching experience of both authors and of the editor in physics, physical science, and the history of science, is intended for an introductory college course in physics or in physical science. It does not assume a previous scientific background, or mathematics beyond high-school algebra. Each topic discussed is complete and does not presuppose that the student will necessarily continue studies in physical science. The level of the mathematical and conceptual content of the book has been carefully chosen to come within reach of the average student without special background; at the same time, the presentation provides stimulation for the best intellectual effort of each student.

The book is based on the same pattern as Professor Holton's widely praised *Introduction to Concepts and Theories in Physical Science*, which, of course, continues to be available. Like its distinguished model, *Foundations of Modern Physical Science* approaches the subject from the historical, philosophical, and logical points of view. The *historical approach* brings to life the evolution of physical science through occasional well-chosen quotations from the original writings of the great scientists. The *philosophical approach* explores the methods of science in actual problem situations. The *logical structure* of the examples studied shows the student that feature of science which has made it the proverbial model for clear and effective thinking. However, the main strength of the book is intended to lie in its scientific subject matter content; the historical and philosophical aspects are used as pedagogic aids for the clear presentation of scientific fundamentals.

Foundations of Modern Physical Science likewise draws largely from physics for its subject matter, with important related topics in chemistry and astronomy. However, it gives more space than its predecessor to optics, electricity and magnetism, and nuclear physics, so that this new book may be used by itself in a general physics course, without the need for assigning a supplementary text. Another important difference is the less demanding mathematical presentation, as indicated above. *Foundations of Modern Physical Science* thus maintains the fresh, vital approach of Professor Holton's other book, while directing itself to the student with no special preparation. It is the hope of the publisher that, by having both books available, anyone who wishes to offer such a course may select the text appropriate to his needs.

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chapters summarizing the three main sections of *Fundamental Theory*, and many useful footnotes.

Dr. Slater has performed this enormous task with great care and competence. He is able to tell us much about the development of *Fundamental Theory*. Here is the raw material for the writing one day of one of the most fascinating stories in the history of science, though whether it will be a triumph or a tragedy that will be written we do not know. It will take a great deal of study to assess how much he has been able to help us to understand the meaning of *Fundamental Theory*. No miraculous clarification could be expected and all the old uses of the familiar in contexts that are unfamiliar, inappropriate, or contradictory remain.

Eddington expected that his theory would be judged mainly by its success in predicting the pure numbers of Nature. Our picture of the physical world today is much more complicated than it was in 1944. There are many new particles whose masses Eddington did not predict. Perhaps he would reply that these are not fundamental particles but compounds and that his theory only dealt with the fundamental particles. The most striking discrepancy is between his calculated value of the fine structure constant and its measured value. If he were alive today he would no doubt be able to find some more factors of 136/137 which had been forgotten and which made it right, but would this be a refinement of the theory or a numerical "fudge"? It is with this curious mixture of distrust and admiration that we still approach *Fundamental Theory*.

Science and Human Life. By J. A. V. Butler. 162 pp. Basic Books, Inc., New York, 1957. \$3.95. *Reviewed by R. Bruce Lindsay, Brown University.*

It is by no means a new thing that the success of physical science has stimulated the application of the scientific point of view to all aspects of human life. Yet it must be admitted the process is accelerating rapidly in the present age and confidence in science as a method of description of experience in every sphere is growing apace. The writer of the present book, a well-known physical chemist and biophysicist, has attempted an assessment of the success of the program; this should be of interest to all physicists who can take the time to look for a moment beyond their specialized research.

The author carries the reader on a very considerable excursion, from the method of science in the study of the inanimate world, through the application of physics and chemistry to living organisms including man, and finally to the study of man in society. It is presumably inevitable that such a broad canvas should betray a certain superficiality of treatment and the work has not escaped this drawback. However there are some very shrewd judgments clearly expressed, particularly with respect to the difficulty of attacking the problem of mind in terms of the concepts of physical science and the role of science in ethics and religion. It is indeed unfortunate that the writer does not provide at the beginning of his book a more adequate elucidation of the