BOOK REVIEWS

Selection of books for review is based on the editors' opinions regarding possible reader interest and on the availability of the book to the editors. Occasional selections may include books on topics somewhat peripheral to the subject matter ordinarily considered acceptable.

Title Handbook of Ocean and Underwater Engineering

Editor John J. Myers, Editor-in-Chief; Carl H. Holm, Associate Editor; Raymond F. McAllister, Contributing Editor

Publisher McGraw-Hill Book Company

Pages 1100

Price $32.50

Reviewer Donald A. Thomson

The *Handbook of Ocean and Underwater Engineering* is an encyclopedic treatise of basic and applied information that should be very useful to ocean scientists and engineers. Consisting of 12 chapters, each written by one or several specialists, this handbook accomplishes a comprehensive, authoritative coverage of ocean engineering accompanied by concise accounts of the basic principles involved in underwater technology. There are abundant illustrations, graphs, photographs, and tables that lend themselves to quick acquisition of specific information. The 29-page index is adequate for the subtopics in bold print within each chapter, but is insufficient for the more specific terminology within the subsections. Nonspecialist readers may have to shuffle several pages before finding specific information. However, compilation of a more thorough index might not be worth the considerable effort that it would take in a handbook with such voluminous data.

There is unquestionably a great need for a handbook of this sort, and this edition, which is the first of its kind, does an admirable job of reviewing past knowledge and technology as well as presenting modern advances. However, for this handbook to retain its usefulness, it must be repeatedly updated to keep up with technological improvements in the ocean sciences. Under the present multi-author format, this may prove to be an unwieldy task since subsequent editions may have to undergo extensive reorganization to accommodate technological innovations in ocean engineering.

One of the greatest services that this handbook can provide will be to the administrator, teacher, and marine scientist in evaluating types of oceanographic instrumentation and gear to be acquisitioned for research and teaching programs. Scientists and teachers are being inundated with brochures and catalogs advertising marine equipment and it is becoming more difficult for the nonspecialist to decide what instrument will be most appropriate for his specific needs. The authoritative reference material in this handbook will make this task less frustrating.

Overall, the Handbook of Ocean and Underwater Engineering is an exceptional and unique compilation of ocean technology that will benefit a wide variety of scientists, teachers, technicians, and laymen as well as engineers. It is a must on your bookshelf if you are a serious student of the oceans.

Donald A. Thomson, associate professor of biological sciences at the University of Arizona, is a marine ichthyologist with special interests in thermal pollution and poisonous fishes. Teaching courses in oceanography, marine ecology, and ichthyology at the University of Arizona, he has also served as chief scientist on an oceanographic expedition in the Gulf of California by Stanford University. He has done marine research in Hawaii and has actively participated in establishing a cooperative marine research program between the University of Arizona and Mexican institutions investigating the marine resources of the Gulf of California.

Title The Origin of Cosmic Radiation and the Expansion of the Universe

Author Erich Bagge

Publisher Richard Abel & Co., Inc., P.O. Box 4245, Portland, Oregon 97208

Pages viii + 61

Price $2.50

Reviewer Theodore Bowen

An engineer or scientist hoping this small paperback will give him a quick review of current evidence and ideas concerning the origin of cosmic radiation and the expansion of the universe will be disappointed. While

the author does briefly review the properties of high-energy cosmic radiation and some of the equations which describe the properties of an expanding universe, his main purpose is to develop a case in favor of his hypothesis that the acceleration of high-energy cosmic rays and the cosmological expansion can be attributed to the galaxies becoming electrically charged. This hypothesis is not generally accepted by astrophysicists, as there are many serious difficulties with such a model.

The author first develops the equations for an expanding universe in the Newtonian approximation, assuming that the reader is familiar with vector calculus, theory of potentials, and equations of continuity. Then, the main portion of the book discusses his model of how the galaxies become negatively charged. A weakening of the apparent gravitational force between galaxies results from the electrostatic repulsion of like charges, which, he attempts to show, would account for the expanding universe. The known characteristics of high-energy cosmic radiation are reviewed, and their acceleration is attributed, in a qualitative way, to the existence of high interstellar and intergalactic electrostatic fields.

The primary difficulty with Professor Bagge's proposal concerns the mechanism for the generation of cosmological electrostatic fields. He argues that the interstellar dust particles would acquire a negative charge in the presence of protons and electrons. Then he shows that the charged dust particles would move relatively freely through the HI clouds of neutral hydrogen and would be gravitationally accelerated toward the galactic center. The protons are supposed to be left behind because they lose too much energy to the HI clouds, thus causing the separation of charges and the charging of the galaxies. However, HI clouds, due to their low density and to the ionization caused by cosmic radiation, have an appreciable concentration of free electrons which give rise to electrical conductivity. Any electrostatic field generated by the gravitational fall of dust particles would be quickly neutralized before it could build up to cosmological proportions, in close analogy to the situation with atmospheric electricity.

There are a number of additional difficulties with the presentation in this book. The energy required to create the electrostatic field is taken to be equal to the ionization energy loss by charged dust particles in the galaxy. No explanation is given of how energy lost by ionization along the path of a charged particle can be pumped into electrostatic field energy, nor of how the dust particles replenish their supply of motional kinetic energy. The electrostatic repulsion between galaxies is only shown to be consistent with a uniformly expanding universe if initially, before the charge separation occurred, the universe was already expanding. This hardly provides an explanation of the origin of the expansion.

I would recommend this book only to the most cautious and skeptical reader.

Theodore Bowen (PhD, physics, University of Chicago, 1954) is a professor of physics at the University of Arizona. He specialized in elementary particle physics and cosmic ray physics. In 1968 he took leave from directing his research group to work for a year with the High Energy Astrophysics Group at Goddard Space Flight Center, where he was in close contact with research programs designed to learn more about cosmological and galactic structure through the detailed study of the properties of cosmic radiation.