

Book Reviews

Advances in Space Science. vol. 1, 1959. Frederick I. Orday, III, Ed. Academic Press, New York, 1959. xii + 412 pp. Illus. \$12.

This book is the first volume in a new series of the *Advances* that have proved to be extremely useful in keeping scientists and engineers abreast of research and development. In reviewing this book, perhaps it is appropriate to give first a definition of the subject, space science (or astronautics). The view that emerges from this collection of articles is that space science is an extremely broad subject encompassing selected aspects of many basic sciences. In particular, it comprises those aspects of physics, chemistry, mathematics, biology, geology, and astronomy, as well as the engineering disciplines, which are grouped together and coordinated for the purpose of the study and exploration of the universe beyond the confines of the earth's atmosphere. The scope of the subject is well illustrated by the topics covered in this volume.

The first chapter, "Interplanetary rocket trajectories" (D. F. Lawden), is concerned with the mathematical problem of determining the optimal track for sending a rocket vehicle from a launching point on the surface of one planet to a designated point on the surface of another planet. The material, treated from the sophisticated standpoint of a calculus of variations problem of the Mayer type, discusses many interesting cases in detail.

In the next chapter, "Interplanetary communications" (J. G. Pierce and C. C. Cutler), the authors discuss many well known scientific and engineering laws of communication as well as recent advances which might lead to communication systems that are needed for transmitting data over lunar, planetary, and stellar distances.

The environment of space, power requirements of space vehicles, primary

power sources, conversion techniques, and complete power systems are discussed in "Power supplies for orbital and space vehicles" (J. H. Hughes). Many of the topics touched on here are clearly in their infancy; despite the difficulty inherent in a subject that ranges over so many disciplines, the author makes admirable attempts at extrapolations.

In "Manned space cabin systems" (E. B. Colletti), the author first reviews the entire subject for both the interested nonspecialist and the specialist. Topics discussed include the human factor, flight support systems, and present and future manned systems. This review contains a very interesting commentary on the motivating forces in human beings, particularly as they are related to space exploration. This provides grounds for understanding the man-in-space programs and points clearly to the need for cooperation between design engineers and life scientists to accomplish the exploration of space.

The next chapter, "Radiation and man in space" (H. T. Shaeffer), contains an evaluation of the ionizing radiations in space in terms of the possible exposure hazards to man. Included are very detailed discussions of the primary cosmic radiation and its transition in the atmosphere, time variations of cosmic ray intensity, high-intensity radiation in fuels in space, and finally, a discussion of the avenues of radiobiological experimentation which must be followed to fill the many gaps in our present knowledge.

"Nutrition and space flight" (G. Fisher) is concerned with space feeding; this subject has many aspects, some of which are but extrapolations of air feeding techniques. Here again it is clear that an understanding of all phases of life processes is essential to the subject.

An appendix (by H. H. Koelle) contains a helpful decimal classification

system, adopted by the International Astronautical Federation, for filing references, technical papers, and other material.

Each chapter contains an extensive list of references comprised mainly of articles on space science which have been published since 1955. The advances in the subject represented by these extensive references are truly spectacular.

Because of the tremendous scope of this subject as well as the breadth of knowledge related to space science and, at the same time, the depth of knowledge required to make new contributions to the specific branches of science represented, we do not have men who can truly be called space scientists. Alas, even Leonardo da Vinci would be overwhelmed! Instead, the scientists who function in this field must be competent specialists who have a moderately complete knowledge of the subject as a whole. *Advances in Space Science* should be extremely helpful to specialists for securing information concerning recent contributions made in their specialty to astronautics as well as for obtaining a general picture of the subject as a whole.

The challenge of space exploration and study should excite the imagination of all adventurous and inquisitive men. Perhaps it will be an all-consuming outlet for the excessive energies and ambitions of the human species and, thus, serve as a substitute for war. In the last analysis, this might well be the greatest advance associated with "advances in space science" from the standpoint of mankind as a whole.

ALEX E. S. GREEN

*Physics Section, Convair,
San Diego, California*

The Study of Elementary Particles by the Photographic Method. An account of the principal techniques and discoveries illustrated by an atlas of photomicrographs. C. F. Powell, P. H. Fowler, and D. H. Perkins. Pergamon Press, New York, 1959. xvi + 669 pp. Illus. \$40.

C. F. Powell was awarded the 1950 Nobel prize in physics for his development and application of the nuclear emulsion technique as a quantitative tool for studying nuclear processes. He now has collaborated with two of his colleagues at the University of Bristol

in the production of an exceptionally interesting, attractive, and distinguished record of this technique and its influence on an exciting period in the history of nuclear physics. This period began auspiciously in 1945 with the development of improved emulsions that permitted observation of the tracks of all cosmic ray particles, including electrons and mesons. The end of the period was reached with the production and detection of antiprotons in the laboratory. The contribution of the nuclear emulsion technique to this triumph is exemplified by the accompanying photograph, taken in 1956, showing the annihilation of an antiproton in an emulsion.

At the end of this historical period, probably all of the family of elementary particles—electrons, mesons, nucleons, and hyperons—either had been discovered, or their existence had been anticipated. Therefore, this superior book is timely, and it should play an important role for many future years as a convenient reference volume for the specialist and as an excellent introduction for the nonspecialist.

Less than one third of the book is devoted to the subject of the emulsions: preparation and composition, methods of measurement, and identification of particles. One half deals with the discovery of and data concerning specific elementary particles, a subject that serves as the central theme and integrates the discussions of technique, photographs, and history. By emphasizing this theme throughout and describing all the pertinent experimental and theoretical principles, the authors have made a complete and absorbing story of elementary particles and the part played by emulsions. In the remainder of the book, the authors consider the tracks of nuclear disintegrations produced by elementary particles at high energies as well as the tracks of the heavy nuclei of cosmic radiations. A striking example of the latter is a carbon nucleus plowing into an emulsion with an energy of 20,000 billion electron volts. This book shows how to produce and analyze such tracks, and it contains 187 photomicrographs as examples.

There are 16 separate sections, each with good references and illustrations. The subheadings of one of these sections entitled π -mesons should help describe the thoroughness and philosophy underlying the presentation: discovery of the π -meson, decay of the π -meson,

nuclear capture of negative π -mesons, production of π -mesons in nuclear collisions, the neutral π -meson, the masses of charged and neutral π -mesons, the mean lifetimes of charged and neutral π -mesons, spin and parity of the π -mesons, and the breakdown of parity in weak interactions.

Unfortunately, the enormous effort required to prepare and, indeed, to print this book almost of necessity resulted in some drawbacks, most of which are minor. For example, there are references to technical details such as Lami's theorem and the L- and σ -

mesons, which are not listed in the index, but which can be elucidated after some considerable thumbing of pages to find the place where they are described in detail. Literature references to a few technical papers are not given, although they are cited as source materials. The descriptions of emulsion processing are a little incomplete. In addition, the principal audience for which this book was intended—the physics graduate student and the more senior college students—will find it difficult to own this invaluable source book because of its unfortunate price:



An example of the annihilation of an antiproton (1956). The antiproton entered the emulsion at the upper right and disintegrated into two protons (dense tracks) and four charged π -mesons (light tracks). The total visible release of energy was 1.4 billion electron volts.

\$40. However, since physics libraries will be required to purchase copies, this book, which is the excellent combination of a cookbook, reference-record, and nuclear history-account, will, nevertheless, prove to be available and to be very readable, useful, and inviting to the neophyte physicist.

H. W. KOCH
*Radiation Physics Division,
National Bureau of Standards*

Strahlenbiologie, Strahlentherapie, Nuklearmedizin, und Krebsforschung, Ergebnisse 1952-1959. H. R. Schinz, H. Holthusen, H. Langendorff, B. Rajewsky, and G. Schubert, Eds. Thieme, Stuttgart, 1959 (order from Intercontinental Medical Book Corp., New York). 998 pp. Illus. \$65.50.

In the 16 chapters of this volume, 19 experts present and discuss the progress made between 1952 and 1958 in the fields mentioned in the book title. The first chapter (by H. Sommermeyer), on the historical development of the target theory, emphasizes the applications made since 1946. This is followed by four chapters on radiation genetics in bacteriophages (by W. Harm), microorganisms (by R. W. Kaplan), *Drosophila* (by H. Fritz-Niggli), and mammals (by H. Nachtsheim). Dosage problems and megavolt irradiation techniques are discussed in two chapters (by W. Pohlitz and R. Wideröe, respectively). Three chapters are devoted to clinical-therapeutical applications, experiences, and results obtained when different equipment and methods are used in different situations. Of special interest is the chapter on rotation therapy and grid therapy, as well as the chapter (by Hug) on the acute general reactions to total-body and partial-body irradiations. Progress in the application and use of isotopes is analyzed in two chapters: a critical review of treatments with radioisotopes and a report on I^{131} diagnostic procedures in thyroid diseases. A chapter on the effects of drugs on the radiation damaged organism and a chapter on radiomimetic substances complete the collection.

The book is stimulating reading for every one working in the mentioned fields and is of special interest insofar as it reflects, in the broadest sense, the European approaches and attitudes

towards radiation biology and radiation medicine. Written by German and Swiss scientists, it shows their way of analyzing and interpreting data, with the goal of giving stimulation and presenting conclusions which may inspire and promote future experiments and research.

The simplest way to give an idea of the level, value, and importance of the volume is to compare it with the well known Annual Review Series covering such fields as nuclear medicine, physiology, and biochemistry. In doing this, it becomes evident that the book compares favorably with these volumes. This is all the more remarkable since the authors had to cover in a limited space nearly 7 years of progress. Much more impressive are the well written presentation and the clever and experienced selection of the numerous references. For a long time this book will be an important reference work for study, lecture, and research.

A. T. KREBS
*Biology Department,
University of Louisville*

General Climatology. Howard J. Critchfield. Prentice-Hall, Englewood Cliffs, N.J., 1960. xiii + 465 pp. Illus. \$7.95.

Breadth rather than depth characterizes this book. This is intentional because it is evident that the book is aimed at the nonspecialist student. As the text for an elementary course, it will fulfill its purpose.

The book deals with weather and climate. One part is devoted to a description of the climates of the world. The use of meteorological and climatological knowledge in human activities is related. Also included in its wide range are weather forecasting and the influences of weather on vegetation and soils.

In some respects one could call this an anthology; it contains nothing original, and it is evident that the author has not gone much beyond secondary sources. About two-thirds of the nearly 200 illustrations are from other works. Many came from other texts: volumes of *The Yearbook of Agriculture* and other government publications.

Critchfield has an easy style, and the well-produced book is completely free

of technical jargon. But I hope no one will be misled by this smooth approach and conclude that answers in the fields of atmospheric sciences are easy to come by.

H. E. LANDSBERG
*Office of Climatology,
U.S. Weather Bureau*

Progress in Inorganic Chemistry. vol. 1. F. A. Cotton, Ed. Interscience, New York, 1959. ix + 566 pp. \$14.50.

According to the preface statement by the editor, this volume initiates a new series of publications on modern inorganic chemistry; it is intended that the volumes appear annually, that the articles be written by leading researchers in the particular field, and that they be comprehensible, but not necessarily readily so, to a competent research worker at the Ph.D. level in some branch of inorganic chemistry, not necessarily the one under discussion.

It is further intended that the author be given the responsibility and the privilege of presenting a scholarly and accurate account of his subject without feeling that he needs to oversimplify and that he be regarded as best qualified to determine the style, length, and general nature of the treatment of his subject. Articles are to be published in English, German, and French.

The first volume contains seven articles: "Cyclopentadienyl and arene metal compounds" (G. Wilkinson and F. A. Cotton); "Interstitial compounds of graphite" (G. R. Henning); "Über Schwefel-Stickstoff-Verbindungen" (Margot Becke-Goehring); "Metal-ammonia solutions" (W. L. Jolly); "Isocyanide complexes of metals" (L. Malatesta); "The effects of inner orbital splitting on the thermodynamic properties of transition metal compounds and coordination complexes" (P. George and D. S. McClure); and "The structure and properties of mixed metal oxides" (R. Ward).

This new series on the progress in inorganic chemistry appears to have gotten off to a good start, and forthcoming volumes, if they maintain the high ideals that have been set, should prove to be extremely valuable in presenting the rapidly developing mass of information in this branch of chemistry.

RALEIGH GILCHRIST
*Division of Chemistry,
National Bureau of Standards*