by long association with others who have good taste. That does not mean, of course, that good books have not been written on the appreciation of painting and music. This book is certainly recommended reading for anyone who has a taste for that sort of thing, and while it may not make a good designer out of a poor one, it certainly will help a good designer to teach good design to others.

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Lectures in Physics

Nuclear and Particle Physics. Proceedings of an institute, Montreal, 1967. B. MARGOLIS and C. S. LAM, Eds. Benjamin, New York, 1968. viii + 552 pp., illus. $12.50.

Summer institutes (and spring, fall, and, more rarely, even winter institutes), seldom lasting beyond a month or two, have frequently had a lasting impact on the development of theoretical physics. These schools, some of which have become annual events (the subject matter shifting from year to year) are organized ostensibly to provide pedagogically accessible lectures on recent developments to (a relatively small number of) advanced graduate and fresh postgraduate students. Their most cogent justification, however, resides in the written proceedings, which often develop into the *loci classici* of their subjects, much more used and useful than the original literature. Though it is notorious that the audience may have heard only a fraction of the material that ultimately appears as proceedings, the fact that these papers were prepared, in principle, to be delivered orally often results in an attractive informality and freshness of style absent from more formally commissioned or intended review articles.

The proceedings under discussion, issuing from a one-shot affair organized with the Montreal Exposition as backdrop, have several uncommon features. Nuclear and particle physics have parted company for over two decades, though important bridges (such as nuclear forces and weak interactions) remain connecting them and at least one major bridge is being extended (in the use of high energy beams to study nuclear structure). Tempting as it is to ascribe the juxtaposition of subjects in this volume to the modest size of the institute, it is nevertheless true that four of the nine articles contain some bridge material: "Collision and decay phenomena" by K. Gottfried, "Radiative corrections to weak interactions" by G. Källén, "Muon-capture in nuclei and Migdal theory" by M. Rho, and "High energy scattering from nuclei" by C. Wilkin. Of the remaining articles, those by B. W. Lee on "Chiral algebra and dynamics" and by J. Schwinger on "Theory of sources" belong exclusively to the second part of the title, whereas those by S. Kahana on "Effective interactions in finite nuclei," by D. Kurath on "Nuclear deformations in the shell model," and by B. Margolis on "Selected topics in nuclear reactions" will be of interest to nuclear physicists only.

The range of subjects covered is thus so broad as to be beyond the gamut of practice of most physicists. The reviewer, currently a nuclear theorist, feels no disloyalty in nominating the articles on particle theory by Källén, Lee, and Schwinger as prime (and outstanding) candidates for tenure of interest. Except for the long article by Rho, which is still not long enough to be self-contained throughout, the contributions are all of exceptional clarity and can be utilized as entrées into the topics covered. From the standpoint of today's specialization, however, one must view these proceedings as almost frivolous and light-hearted (not that any of the specific contents of the volume are) compared to the monolithic volumes resulting more characteristically from such institutes.

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Radiation Biology

Radioisotopes in the Human Body. Physical and Biological Aspects. F. W. SPIERS. Academic Press, New York, 1968. xiv + 346 pp., illus. $15. American Institute of Biological Sciences and U.S. Atomic Energy Commission Monograph Series on Radiation Biology.

Radioisotopes in the Human Body is a treatise for scientists working in radiation research and protection. It describes dose calculations for ionizing radiations in the human body and succeeds in providing a unified treatment of the physical calculations, biological factors, and radiobiological effects.

Although its scope is not as wide as its title would indicate, this carefully prepared work deserves great praise. It is clearly written and well edited and provides the first comprehensive treatment of its subject by a single author. Spiers discusses the details of radioactive decay and isotope metabolism, and the mathematical models are described and applied with skill to biological events. There is an excellent review of the dosimetry of radionuclides in soft tissues. The nonuniform distribution of radiation dose in soft tissues is explored, but not as thoroughly as the distribution in bone. This reflects the state of the field. For example, the development of lung cancers in uranium miners in the western United States calls attention to the need for better information with respect to alpha particles in the lung. Chapter 4 is a most valuable and unique chapter which describes the macroscopic and microscopic structure of bone in a manner suitable for a physicist whose aim is to make radiation dose calculations. The next two subjects relate to dose calculations and measurements in bone; it is in this area that the author is most at home.

Insufficient credit seems to have been given to the pioneering work of Robley Evans in establishing the biophysical basis of radium poisoning in watch-dial painters. With this exception the book seems to be accurate in its historical account of the development of internal dose calculations.

It will be difficult for biologists without facility in calculus and some familiarity with the mathematical basis of radiation dose calculations to follow these chapters, for intermediate steps between the formulation and the solution of the problems are omitted. However, for physicists these formulations are distinctly and clearly illustrated and constitute one of the strong points of the work. In the last three chapters the author treats the effects of internal doses of radiation, natural and man-made radioisotopes in the human body, and the manner in which maximum permissible burdens of radionuclides in the body are determined. His presentations are precise and in some cases clearer than the reports of the International Commission on Radiological Protection, upon which a chapter of the book is based.

This book is suitable and valuable for the libraries of researchers. For students, it is unfortunate that the book does not contain problems. However, the suggested reading material at the

end of each chapter is well chosen. This book is generally suitable for students at the graduate level. It could be used as an introductory text only with careful supplementation by the teacher.

This treatise is a succinct summary of the internal radiation dose questions of the past and a commentary on present dosimetry. One can only hope that, in this field where the literature contains many reports and conference proceedings edited by one or two investigators but consisting of the diverse reports of many, more books of this caliber will be forthcoming.

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Geo- and Cosmochemistry

Origin and Distribution of the Elements. An international symposium, Paris, 1967. L. H. AHRENS, Ed. Pergamon, New York, 1968. xviii + 1178 pp. + plates. $48. International Series of Monographs in Earth Sciences, vol. 30.

This book should have been issued as two volumes. The first half deals with the sun, stars, meteorites, and planets, whose composition was governed by nuclear and cosmochemical processes. The second half deals with the earth, whose surface composition is determined largely by geochemical processes. There is little contact or interaction between these two areas, as is shown by the author index: most authors are cited either in the first or in the second half of the book, not in both.

Of the 90 papers in this volume, 16 are in French and one in German. The remainder, including seven papers from the U.S.S.R., are in English. Much of this material has been published elsewhere, before or after the symposium, and so the total amount of new information is disappointingly small for a volume of this size. Nonetheless, there are more first-rate papers in this book than can be mentioned in this brief review.

Sections 1 and 2, Theories of Origin (11 papers) and Solar, Stellar, and Interstellar Abundances (10 papers) contain a fair cross section of recent work in the field. Fowler, Gibbons and Macklin, and Bernas *et al.* review some of the laboratory data on which theories of nucleosynthesis are based. Cameron presents a new table of the abundances of the elements in the solar system, based largely on Type I carbonaceous chondrites. This paper, and a review of abundances in the solar photosphere by Müller, are likely to be widely cited. Pottasch discusses abundances in the solar corona, which sometimes differ greatly from those in the photosphere. Bidelman, Warner, and Pagel give authoritative surveys of magnetic, late-type peculiar, and old stars, respectively.

Section 3, Meteorites (21 papers) ranges farther afield than the title of the book suggests. In addition to a number of straightforward papers on the abundances of individual elements, by Ahrens, Schmitt, Ehmann, Reed, and Smales and their respective coworkers, it also contains discussions of meteorite ages (Reynolds, Turner, and Burnett *et al.*), orbits (Wänke, Wetherill, and Yokoyama *et al.*), classification (Fredriksson *et al.*), mineralogy (Jedwab), and atmospheric ablation (Cantelaube and Pellas).

Section 4, Planets, Asteroids, Comets, Tektites (5 papers) is a catchall. It contains an interesting review of planetary atmospheres (Owen), two papers on tektites (Taylor, Mills), one on radiation effects (Zeller), and one on zodiacal dust (Rhee).

Part 5, Terrestrial Abundances (43 papers), is divided into three sections. The first contains several papers on abundances in major rock types (Turekian, Taylor, Barth, and Schroll), along with a number of more highly specialized ones on granitoids and ultramafic rocks. The second and third sections are devoted to individual elements, gases, sedimentary rocks, water, and other topics. Some of the more interesting papers deal with composition of the earth's interior as inferred from the abundances of potassium, uranium, and thorium (Shaw), potassium and rubidium (Erlank), or rare earths (Philpotts and Schnetzler); distribution of transition-metal ions in silicates in terms of crystal field theory (Allègre *et al.*, Burns); and sediments (Wedepohl, Bienner *et al.*). Spencer, Degens, and Kulbicki demonstrate how factor analysis can simplify the interpretation of large quantities of geochemical data. Goni and Guillemin show that many trace elements are not uniformly distributed throughout the host crystal, but are concentrated along grain boundaries and crystal defects.

Typography and proofreading are both excellent. Regrettably, the publishers have used paper of high wood pulp content, perhaps in view of the ephemeral nature of some of the papers in this volume. The price has nonetheless been set at a steep $48. Since so much of the material in this volume is available elsewhere, highly specialized, or far removed from any one reader's field of interest, only ardent bibliophiles will want to acquire this volume. Most geochemists, cosmochemists, and astrophysicists will probably be content to consult it in their institutional libraries.

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Enzyme Kinetics

Behavior of Enzyme Systems. JOHN M. REINER. Second edition. Van Nostrand Reinhold, New York, 1969. xviii + 350 pp., illus. $14.50.

This reviewer was first stimulated to enter the field of enzyme kinetics by figuring out why in the previous edition of this book the author could not show consistency between the product inhibition data for creatine kinase and the equations he had derived for a two-substrate ordered mechanism. It was thus a shock to find the same error still present (pp. 144–45) after ten years in this new edition, but this incident really characterizes the entire book. Enzyme kinetics has come of age in the last ten years, but the author has remained stationary and seemingly unaware of what has been going on. Few references are more recent than 1960, and no mention is made of the growing body of literature in which analyses of initial velocity and inhibition patterns are used to deduce the order of addition and release of reactants in complex mechanisms. No mention is made of the prediction of kinetic patterns by inspection. In short, one searches in vain for any of modern enzyme kinetics, either theory or practice. The author writes with a breezy style that is fun to read, but what one is reading is all ten years old. New sections have been added on allosteric kinetics and on enzyme mechanisms, but the author does not really come to grips with these subjects, either, and one does not get a clear picture of the present state of our knowledge of these important fields. A good book on enzyme kinetics is badly needed, but this is not it.

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