guaranty and testimony for the fact that this book is not the work of a dilettante but of a competent and serious person who worked hard and well on both the scientific and the educational aspects of his undertaking.

In his preface, Hildesheimer claims that most of the semipopular books written by others deal either with quantum physics or with relativity but not with the whole of modern physics; moreover, those written by eminent scientists, such as Einstein, are not really comprehensible to the layman. I tend to disagree with these judgments. I distinctly recall that, as a young boy in secondary school, I read several books on relativity, among them those by Bertrand Russell and by Einstein, and that Einstein's presentation made the best sense to me. Both Gamow (in the "Mr. Tompkins" series) and Einstein (in the *Evolution of Physics,* with Infeld), have balanced their respective presentations. One thing may be said against Hildesheimer's work: like most scientists not themselves active in the field, he is overly impressed with the present accomplishments of physical theorizing. There is a great deal of discussion of controversial material of an epistemological character, although there is no mention of the Einstein-Rosen-Podolsky experiment and the ensuing discussion by Bohr and others. There is no discussion at all of quantum field theory and, more generally, of the relationship between relativistic field theory and quantum theory. But these topics should be of interest to the layman who is interested in the frontiers of science as well as its philosophic implications.

All in all, Hildesheimer's book will be of interest to those who read German fluently and who find it useful to read several semipopular books on modern physics by authors with different points of view. Such readers will find Hildesheimer's book well written and easy to understand.

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Progress in Nuclear Physics. vol. 3. Otto R. Frisch, Ed. Academic Press, New York; Pergamon Press, London, 1953. 279 pp. Illus. + plates. $9.50.

This excellent volume contains a number of articles on topics in nuclear physics. The editor has apparently made the decision to keep the area covered by each author well circumscribed, permitting a rather detailed and complete review of each subject. This makes the volumes of this series complementary to its American analog, *Annual Review of Nuclear Science,* where on the whole fairly large areas are brought into perspective by a necessarily qualitative discussion.

The present volume contains a number of articles on instruments: "The diffusion cloud chamber" by M. Snowden; "Energy measurements with proportional counters" by D. West; "Solid conduction counters" by F. C. Champion; and "The production of intense ion beams" by P. C. Thonemann. Articles that have to do with nuclear physics proper are "Oriented nuclear systems" by B. J. Blin-Stoyle, M. A. Grace, and H. Halban; "Stripping reactions" by R. Huby; and "The collision of deuterons with nucleons" by H. S. W. Massey. Two topics on electrodynamics also included are "Cerenkov radiation" by J. V. Jelley and "Annihilation of positrons" by M. Deutsch. These are, of course, not properly nuclear physics; but the first has instrumental applications, while the second is of a most fundamental importance, providing sensitive tests of quantum electrodynamics as applied to the two-body problem.

It is a pleasure to record that these articles are well written, are authoritative, and for the most part are complete. The instrumental papers include sections detailing the theory of the instruments as well as giving experiments either already performed or twinkles in the eyes of the author, in which the instrument is used. We must exclude the discussion of solid conduction counters from this description, since it is hard to make them reliable. Here the author concentrates on the information of the structure of materials revealed by these investigations. The papers on nuclear physics proper present both the theory and the experiment and are careful to point out the possible experimental and theoretical avenues where further work is indicated.

The book contains a name index as well as a short subject index. Each article contains an extensive and, in itself, an extremely useful bibliography.

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Progress in Cosmic Ray Physics. vol. II. J. G. Wilson, Ed. Interscience, New York; North-Holland, Amsterdam, 1954. xi + 322 pp. Illus. $8.50.

Like its predecessor, which was published in 1952, this volume consists of surveys or reports on several topics of current interest in cosmic-ray physics, written by experts in the fields covered. The usefulness of thoughtful reviews, expeditiously published, is quite obvious in such a turbulent subject; research workers will expect to find here many facts and references, collated with critical judgment, and in general they will not be disappointed. The book is satisfactory; if it misses the high level of some of the contributions in volume I, the differences are mainly that the subjects are less uniformly interesting, and the delay between writing and publication has stretched to well over a year.

The latter fact is most keenly apparent in the chapter on the heavy unstable particles. The editor has assigned himself this task and, in summarizing the experimental facts and their interpretation, has followed fairly closely the sense of the Copenhagen conference of 1952. The past year has seen some of that interpretation swept away, as new facts have clarified many difficult points (and of course raised others).

R. D. Sard and M. F. Crouch, writing on nuclear

interactions of stopped μ mesons, have presented an admirable survey of the experimental facts and have emphasized the crucial role of nuclear structure theory in obtaining quantitative results from the interpretation. (Again, the past year has seen the completion of an experiment that ingeniously avoids most of the uncertainties that nuclear theory introduces.) The late E. G. Dymond contributed an authoritative chapter on the penetrating component of cosmic radiation in the upper atmosphere and succeeded in bringing some order and rational interpretation into a nearly chaotic experimental situation.

The long chapter by H. Messel on the development of a nucleon cascade is a progress report rather than a true review. Messel's principal results are collected here and compared with experiment in a rather offhand way. One hopes that some method may be found in the future to reduce his formidable mathematical structure to a more convenient size.

The final chapter, "Particle identification with photographic emulsions, and related problems," by L. Voyvodic, presents a detailed exposition of the *expertise* of nuclear emulsions. Its inclusion is eloquent testimony to the importance of this tool in cosmic-ray research and helps to make the book a reference work of permanent value for physicists working in the field of cosmic rays and elementary particles.

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Flow Properties of Disperse Systems. J. J. Hermans, Ed. vol. V of *Deformation and Flow.* Interscience, New York; North-Holland, Amsterdam, 1953. vi + 445 pp. Illus. + plates. $9.90.

The term *disperse system* is used in this volume to cover not only suspensions and emulsions but also colloidal solutions, even though, in the latter case, many protein and polymer solutions are now known to behave like the solutions of small molecules. There are 10 chapters contributed by seven authors—five are from England, the others from France and Holland.

The editor shows that there is no thermodynamic necessity for dividing suspensions and solutions. A distinction is one of convenience. Hence, here are to be found the flow properties of dilute solutions of rigid particles, concentrated polymer solutions and gels as well as the coarser dispersions that include such a variety of systems as suspensions, emulsions, liquid sprays, smoke, and powders. The pertinence of the treatment to everyday technical experience can be illustrated by a brief selection of topics included in the volume: thixotropy, false-body, xerogels, rubber elasticity, viscosity with and without Brownian motion, non-Newtonian flow, drop size in liquid sprays, flow of a swirling liquid through an orifice, shattering of liquid drops by air blast, foams, coagulation of smokes, fluidized powders, free flowing and sticky. The volume is excellently produced, with legible type, equations and charts, and attractive reproductions of photographs. The reader has here in a single volume an authoritative summary of the rapidly developing science of rheology in these increasingly important systems of technology.

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Modulation Theory. Harold S. Black. Van Nostrand, New York–London, 1953. 363 pp. Illus. + plates. $8.75.

The Bell Telephone laboratories have, of necessity, been vitally concerned with the systems approach to communication problems for many years because of its important economic bearing on the business of the Bell System companies. It is thus no accident that much of the pioneering work in this field by Nyquist, Shannon, and others, originated in that organization.

This recent volume in the Bell Laboratories series continues in the best of this tradition and is a valuable contribution to the science of communications. Heretofore, modulation theory has been treated in most textbooks and many articles from the point of view of apparatus design. This book is unique in that it considers modulation in the light of modern information theory, thus giving primary emphasis to the systems aspects of modulation.

The first third of the book is concerned with the generalized theory of modulation, particularly as it influences systems design. The latter two-thirds covers specific applications in the amplitude, frequency, and pulse modulation cases. The author avoids the distraction of excessive circuit minutia but includes practical illustrations, where required, in the form of simplified diagrams.

There is an excellent treatment of the various forms of pulse modulation, almost one-third of the text being devoted to this material. Although pulse circuitry and its associated techniques generally have become quite familiar to communications engineers because of the widespread use of radar, this broad discussion of all forms of pulse modulation will be found extremely useful and worth while to have in one place.

The material contained in *Modulation Theory* has been used in the communications development training program of the Bell Telephone Laboratories and makes an excellent textbook as well as a reference book. One of its most valuable parts is the list of references, numbering more than 300 in all, given at the end of each chapter. A number of problems are also included, which may be used by the student to check his understanding of the text. Although devoted entirely to modulation theory, the text is not excessively mathematical in nature, since the author wisely concentrates on the results of the mathematical processes and not on the details of the mathematical manipulations.

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