The authors state in the last sentence of the book that its limited purpose is to extend the purely linear control system approach of their earlier volume by providing practical design methods for the solution of servomechanism problems. In this they have succeeded, for while the treatment is devoid of sophisticated mathematics, and studiedly eschews the fundamental aspects of advanced topics such as nonlinear and time-dependent control, it gives a sound discussion of the underlying physical phenomena, and a wealth of practical results within the extended framework of the linear control theory.

Sponsored Research Policy of Colleges and Universities. A Report of the Committee on Institutional Research Policy. 95 pp. American Council on Education, Washington, D. C., 1954. $1.50. *Reviewed by C. Süsskind, University of California.*

This thin little book is the result of an investigation that was supported by the Alfred M. Sloan Foundation through a grant to the American Council on Education. The report makes some interesting points, one of which is that "federal support of [sponsored] research . . . is not now essential to the survival of higher education in this country and should not be permitted to become so". The report goes on to cite chapter and verse in support of this contention, but this is almost the sole instance of an unequivocal stand on an important issue. The report is obviously the work of many hands, as evidenced by the style and the peculiar form: the conclusions and recommendations are presented in the first quarter of the text, and the bulk of the report is a sort of enlargement of this initial section, containing several instances of almost verbatim repetition. There is an extensive bibliography, with Lloyd V. Berkner's article on university research and government support (*Physics Today*, January 1954) among the most often quoted. But the report errs on the side of objectivity: there is too much of "on the one hand . . . on the other hand". The Committee cannot recommend more basic, more unrestricted, more institutional, more decentralized research projects without quickly mentioning the importance of applied, classified, specific-project, centralized research. As a result, an administrator will have a hard time obtaining useful guidance on policy determination from this report; objectivity here comes very close to hedging.

Einführung in die Theoretische Physik. Volume I, Mechanik and Volume II, Das Elektromagnetische Feld. By Werner Döring. 119 pp. and 120 pp. Walter de Gruyter & Co., Berlin, Germany, 1954 and 1955. Paperbound DM 2.40 each. *Reviewed by William Fuller Brown, Jr., Sun Oil Company.*

These little volumes demonstrate that a book on theoretical physics need not be too big for a student to put in his pocket, too expensive for him to have in his own library, or too long for him ever to finish reading. I

hope American authors and publishers will observe and emulate. To achieve this conciseness, the author does not omit important topics; he merely assumes that the reader is capable of working out the details of the algebra, and that he does not need to be taught everything from trigonometry to Bessel functions. For instance, theorems of vector analysis are used, but another volume of the series is cited for the proofs. A less commendable method of compression is the omission of problems; I hope they will come in supplementary volumes.

The author is well known for his research in ferromagnetism and for his collaboration with Becker in the important book *Ferromagnetismus*. His interest in that field has had an evident effect on his thinking about problems both in mechanics and in electromagnetics, and on his selection of topics.

Volume 1, *Mechanics*, has 112 pages of text. The chapter headings are: kinematics, statics, dynamics, mechanics of a rigid body, and analytical mechanics. The first four chapters cover the usual topics, in vector notation (German variety), and the fifth chapter covers the Lagrangian and Hamiltonian equations. Unusual scrutiny is directed at the angular momentum concept and equations. Döring recognizes that the standard derivation of angular momentum relations from Newton's laws is valid only for mass points, without intrinsic angular momentum, and that the particles of present-day physics are not this simple; he takes care to state his own assumptions explicitly, and to present the standard derivation with suitable qualifications.

The presentation of the mechanics of particles and rigid bodies is clear, concise, and quite complete. The discussion of the Lagrangian and Hamiltonian methods, on the other hand, is a rather meager introduction, even though the author works out the Hamiltonian of an electron in a magnetic field. The chief limitation of the book is its lack of problems and of additional illustrative examples.

Volume II, *The Electromagnetic Field*, has 117 pages of text. The chapter headings are: electrostatics, the electric current, magnetostatics, the magnetic field of stationary currents, the electric field in a variable magnetic field, and the general electromagnetic equations. There is an appendix on different concept systems (dimensions and units). Döring avoids most of the standard mistakes, such as insertion of the dielectric constant of the "medium" in the fundamental statement of Coulomb's law. He makes no metaphysical pronouncements about quantities that are "different in nature" and therefore "must" have different dimensions; in fact, his discussion of dimensions is interestingly different in approach from the usual ones. His own symbolism is nearly that of the Giorgi mks system, but he includes one extra constant in order to be able to take both electric charge and magnetic moment as basic quantities (with mass, length, and time). To pacify both factions of the Giorgi movement, he defines both "magnetization" and "magnetic polarization".

A few steps I object to. In treating the field of a

continuous dipole distribution, Döring avoids semi-convergent integrals by carefully not differentiating his original formula for the potential; this is hardly fair to the reader, for it makes things seem simpler and safer than they really are. He passes without adequate discussion from the total-energy integral to the concept of energy density; the reader should be told that this is an act of faith, and that furthermore it is unnecessary for the derivation of any physically meaningful result.

He gives attention, though, to some matters usually slighted. He recognizes the necessity for accepting magnetic moment as a fundamental concept, at least in the present state of knowledge of fundamental particles, and he bases his treatment of magnetostatics on it; thus he resists the lure of the electric-magnetic analogies that one can get by using poles or Amperian currents. He mentions a seldom recognized fact, that the separation of the force on part of a body into a "magnetic" and a "mechanical" part is nonunique.

In these volumes the author has not merely handed on a compilation of orthodox notions; he has subjected the old notions to a critical inspection, with attention to more recent experimental knowledge. It is unusual and refreshing to find a book this original in a field this old.

Flow, Fracture, and Fatigue

Knowledge of the mechanical behavior of metals, outside the elastic range, is still mainly empirical; some help in applying the empirical facts is afforded by formal theories of plastic flow and failure, and some help in understanding them has lately come from physical theories about dislocations, flaws, etc. *Strength and Resistance of Metals,* by John M. Lessells (450 pp.; John Wiley & Sons, Inc., New York, 1954; $10.00), is written from the point of view of a mechanical engineer; it is therefore devoted mainly to the empirical facts, though it does present the more elementary equations of the formal theories and mention some concepts of the physical theories. The topic that is discussed in greatest detail, and with greatest attention to physical processes, is fatigue; this is a field in which the author has been active. Other topics included are tensile properties, hardness, impact, fracture, strain hysteresis, and wear. A physicist will find this book useful if, in designing apparatus, he finds himself temporarily in the role of mechanical engineer; or if, in studying the physical processes involved in flow and fracture, he needs information about the complicated empirical facts that physical theory must try to explain.

Dielectrics

The Conference on Electrical Insulation is a unit of the Division of Engineering and Industrial Research of the National Academy of Sciences-National Research Council. Established in 1920, it continues the original plan of having a yearly meeting to present papers and exchange information on research activities in dielectrics and insulation. The conference publishes each year a *Digest of Literature on Dielectrics;* the recent issue, Vol. XVII, edited by A. E. Middleton and H. M. Philofsky, covers primarily the literature published in 1953. The Digest is divided into three major sections: Part I covers dielectric measuring techniques and fundamental and structural aspects of dielectrics, including ferromagnetic phenomena; Part II covers specific applications of all types of insulating materials in the electrical industry; Part III deals with structural, electrical and physical aspects of semiconductors and other fundamental subjects of interest to both the advancement of dielectric and semiconductor technology. (177 pp., National Academy of Sciences—National Research Council, Washington, D. C., 1954; paperbound.)

Electronics

Advances in Electronics and Electron Physics, edited by L. Marton, is Volume VI of the series originally titled *Advances in Electronics.* As in previous years, the contents consist of comprehensive reviews of recent advances in the field. The articles and authors are: Metallic Conduction at High Frequencies and Low Temperatures, A. B. Pippard; Relaxation Processes in Ferromagnetism, Elihu Abrahams; Physical Properties of Ferrites, J. Smit and H. P. J. Wijn; Space Charge Limited Currents, Henry F. Ivey; A Comparison of Analogous Semiconductor and Gaseous Electronics Devices, W. M. Webster; The Electron Microscope—A Review, M. E. Haine; Traveling-Wave Tubes, Rudolf G. E. Hutter; Paramagnetism, J. Van Den Handel. The titles of the articles indicate the scope of the work, as well as the basis for the new title of the series. The articles, both in coverage and readability, provide excellent introductions to the various subjects included. (538 pp.; Academic Press Inc., New York, 1954; $11.80.)

Electricity and Magnetism

Electricity and Magnetism, by Ralph P. Winch (with a chapter Oscillating Circuits and Maxwell's Theory by David A. Park), is intended for the average sophomore course in this subject. The text departs from conventional practice by introducing circuit analysis ahead of field theory in an effort to exploit the students' background of elementary physics. The author states that the recommendations of the Coulomb's Law Committee of the American Association of Physics Teachers were followed in the preparation of the text. (755 pp.; Prentice Hall, Inc., New York, 1955; $7.75.)

Textbook

The expanded and much revised *University Physics,* by F. W. Sears and M. W. Zemansky, features 157 more pages than the first edition. Most of these come from additional problems. Others come from expanded electricity and optics section. Many topics have been thoroughly reworked and illustrations are excellent. The book's usefulness as an undergraduate text has been demonstrated. (1031 pp.; Addison-Wesley Publishing Co., Inc., Cambridge, Mass., 1955; $10.00.)