
Books

Physical Chemistry of High Polymers. By Maurice L. Huggins. 175 pp. John Wiley & Sons, Inc., New York, 1958. \$6.50. *Reviewed by Stuart A. Rice, Institute for the Study of Metals, University of Chicago.*

The physical chemistry of high polymers has made remarkable progress in the past fifteen years, and Dr. Huggins has been in the forefront in this development. The book being reviewed is, to some extent, a record of those aspects of the field to which the author has contributed most. As is then to be expected, the sections on solution thermodynamics and molecular structure (x-ray) are best. Other topics dealt with are synthesis and configuration of chain molecules, plastic and viscous flow, and elasticity.

It is difficult to decide for whom this book was intended. It certainly cannot serve as a graduate text nor an introductory text for chemists or physicists interested in pursuing the subject since it is too narrow in scope and superficial in treatment. In the opinion of this reviewer it will best serve as a general book for the intelligent layman or scientist in a completely different field desiring a general description without much detail. The reviewer hopes that this book will help to correct an unfortunate oversight by which Dr. Huggins is denied credit due him for his very early suggestion of helical structures in proteins (1943).

Mind and Matter. By Erwin Schrödinger. 104 pp. Cambridge U. Press, New York, 1958. \$2.75. *Reviewed by J. C. Polkinghorne, Trinity College, Cambridge, England.*

The Tarner Lectures at Trinity College, Cambridge, are delivered every three years on "the philosophy of the sciences and the relations or want of relations between the different departments of knowledge". In 1956 the lecturer was Professor Schrödinger and he discussed the strange intellectual world of science, built on the pattern of our sensual perceptions yet ultimately excluding these perceptions from its picture. The first thing that we know about a sodium flame is that it is yellow, yet when we know all about atomic spectra what has happened to this yellowness? The baby has been thrown out with the bath water. The knowledge of the intellect and the knowledge of the senses form a paradox of relation and want of relation.

Though the picture that we form of the world depends on our private perceptions we do agree about what it seems to be like. Schrödinger can only explain

this by supposing that in fact we are not many separate selves but only one Self—a point of view more congenial to the Eastern mind than to the Western. He finds satisfaction that the Upanishads and the experiences of some mystics agree with this. Yet many others, Isaiah for example, have had equally profound experiences of Otherness and there are as many religions of Transcendence as of Immanence. No doubt to explain the unanimity of our experience by supposing a "real world" behind it raises philosophical difficulties but it is surely clear that no simple solution can be found of this problem that has perplexed wise men for centuries. While one sees that Johnson did not logically refute Berkeley by vigorously kicking the table, yet one feels that the advantage was with the Doctor.

Having declared myself to be a naïve plain man I must also confess that I got much pleasure and stimulation from reading these lectures. Schrödinger has many interesting things to say: for example in his opening chapter where he wishes to have consciousness always present in the universe so that its development is never a drama played to empty stalls—and since he apparently finds the idea of God too hard or too easy a solution of this problem—he argues that consciousness is always present where there is learning and adaptation. At times his style is less easy than usual and he seems too anxious to give us the German for it, but there are also many of the felicities of style and exposition that we have come to expect from him.

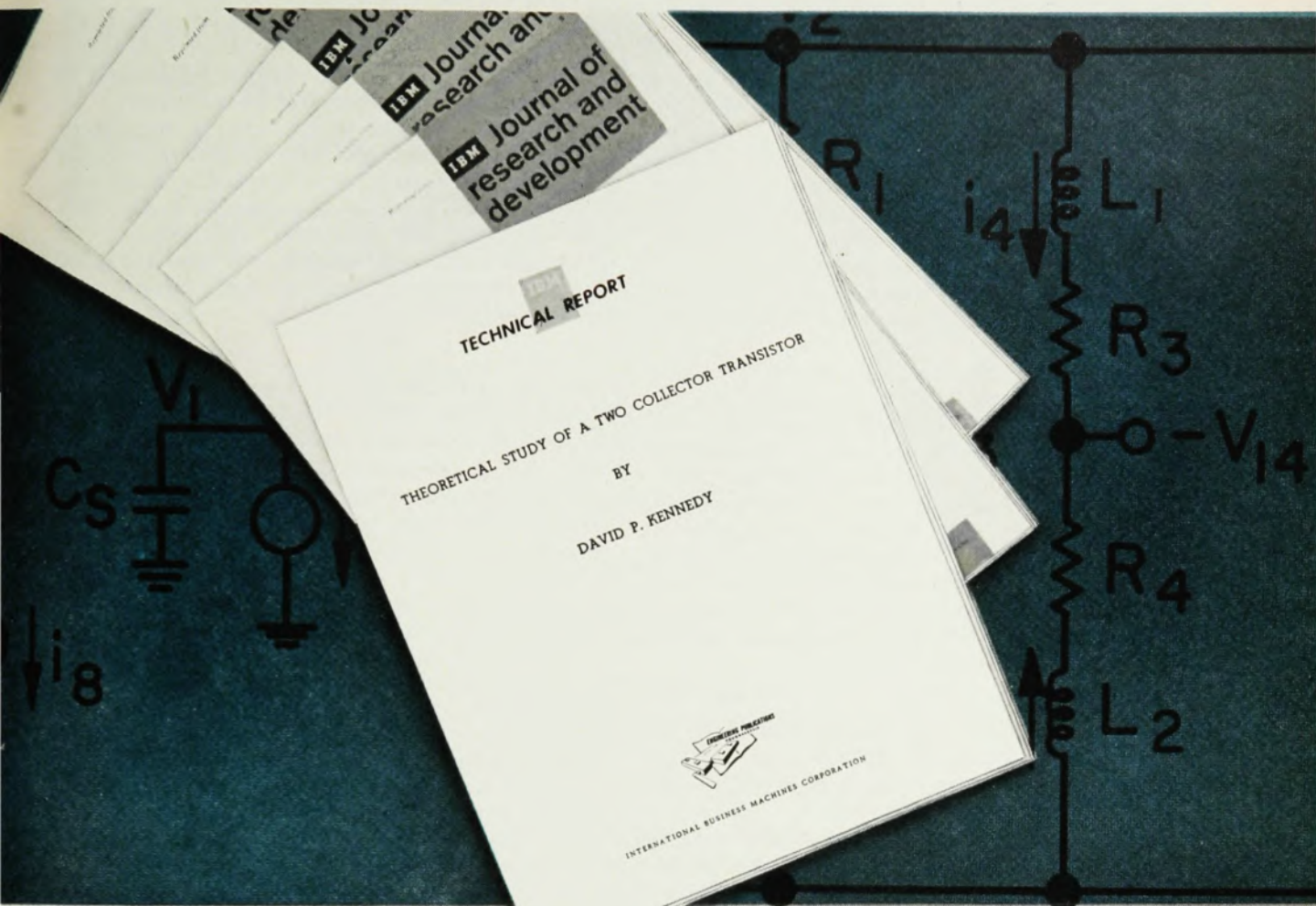
Introductory Physics: An Historical Approach. By Herbert Priestley. 515 pp. Allyn & Bacon, Inc., Boston, Mass., 1958. \$7.50. *Reviewed by Richard T. Weidner, Rutgers University.*

This general elementary textbook is intended primarily for the nonscience student taking a terminal course in physics in which the historical and cultural aspects are emphasized. (Of course, no student specializing in physics need ever study in a formal way any of the nontechnical aspects of physics.)

All of the usual topics are here, arranged in their typical sequence from units and vectors to atomic and nuclear physics. But there is a difference. In introducing each new topic, the author gives a concise, lively, and yet discerning résumé of its historical origins, often with judicious quotations from original research writings and detailed references to available sources for further reading. Certainly no student using this text can evade learning that the development of physics was often tortuous, that theory and experiment are complementary, that physics is open-ended. In addition, the reader is rewarded with fascinating anecdotal tidbits, e.g., lenses are so named because they look like lentil beans, Oersted's report on the effect named for him was probably the last scientific discovery to be written in Latin. Professor Priestley has, moreover, mercifully saved the reader from those profound depths of insight into the historical foundations of physics that are to be

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The treatment of each topic, after the historical background has been explored, is authoritative if not inspired. Considerable attention is given to the mechanics of the solar system, a subject often slighted, and to modern physics. Each chapter is followed by numerous problems, typically thirty, of which about one-third are well-chosen noncomputational questions. The typography is spanking. There is, however, too much material to be "covered" in a two-semester course, so that some choice of topics must be made; and when force, momentum, and energy (not to mention vis viva and historical asides into the disorderly gropings of early mechanics) are all introduced in a single chapter, one wonders whether a student can keep straight all these new ideas.

Purists will insist that *data* is plural. Operationalists will find the statement, "The mass of a body is the quantity of matter in it," devoid of meaning. Some readers will question whether the author's discussion of science and religion or of free will and the Uncertainty Principle is appropriate in an elementary physics textbook; but one cannot help admiring Priestley's forthright, unhedged statement of his position on these matters, or quarrel with his implicit justification for including such noncanonical topics: science does not operate in antiseptic isolation from the affairs of men and the world.

Listening in the Dark: The Acoustic Orientation of Bats and Men. By Donald R. Griffin. 413 pp. Yale U. Press, New Haven, Conn., 1958. \$7.50. *Reviewed by R. Bruce Lindsay, Brown University.*

If anyone still entertains the notion that natural history is the more or less unsystematic study of the large-scale behavior of animals and other living things, reading of this book will surprise and enlighten him greatly. This is the fascinating story of the experimental naturalist using the elaborate resources of present-day physics for the ingenious and decisive solution of a puzzling problem in animal activity, namely the ability of bats to navigate in the dark and indeed to avoid in their flight obstacles of relatively small size.

For the past twenty years the author, with colleagues and students, has been carrying on intensive research to test the suggestion of H. Hartridge (1920) that bats use high-frequency sound in the avoidance of obstacles during flight. The book under review summarizes in masterly fashion the results of these investigations. Thanks to the work of Griffin it is now known conclusively that many bats have the ability to emit ultrasonic radiation up to 150 kilocycles/sec in frequency, and that their ears are also capable of detecting sounds in this range. The navigation of such bats is by the process of echo-location, analogous to sonar as employed in underwater detection.

The author reviews in detail experiments performed

to measure the acoustic output of bats as well as the acuity of their hearing. He describes clearly the tests which have proved beyond the shadow of a doubt that bats use sonar not only in navigation, but also for the pursuit of insect prey. He has used his equipment both in the field and in the laboratory, providing beautiful illustrations of the effective employment of physical apparatus for zoological investigations.

An interesting feature of the work is the author's keen interest in animal orientation in general, including that of man. His book is full of illuminating suggestions bearing on human echo-location and its acuity. This opens up a wide field for further investigation.

The style is clear and graceful and there are many attractive illustrations. The book should have a wide appeal among physicists.

Principles of Noise. By J. J. Freeman. 299 pp. John Wiley & Sons, Inc., New York, 1958. \$9.25. *Reviewed by Joseph G. Hoffman, University of Buffalo.*

The physical origins of noise are only briefly touched upon since this is a text for engineers. For example, the two classic derivations of Nyquist's law for electrical noise are given in terms of the kinetics of electrons in the Drude model, and in terms of modes of oscillation of a transmission line coupling two resistors. These form the fundamentals of the origins of thermal noise for the author's purpose. He has made an excellent compilation of methods of handling noise problems. Four chapters give the engineering mathematics of Fourier analysis, probability theory, stationary random processes, and the Gaussian random process. The other six chapters deal with physical source of noise, equivalent noise generators, noise factor, measurement of a direct voltage, detection of alternating waveforms, and target noise. The format of the substantially mathematical text is attractive and makes for easy reading. The exposition of random processes reflects teaching experience and is highly commendable. There is one appendix: it deals with the current induced by an electron. The table of contents is usually explicit and, along with the adequate index, helps the reader readily find his way among the numerous practical aspects of electrical noise.

Mathematical Theory of Compressible Fluid Flow. By Richard von Mises, completed by Hilda Geiringer, G. S. S. Ludford. 514 pp. Academic Press Inc., New York, 1958. \$15.00. *Reviewed by T. Teichmann, Lockheed Missile Systems Division.*

Though the unfortunate death of Richard von Mises in 1953 prevented him from completing a comprehensive book on compressible flow, his collaborators have combined a skillful elaboration of his lecture notes with his own completed initial chapters, to provide a reasonably homogeneous and embracing work, which can be read with profit by any serious student of theoretical aerodynamics. The book combines, to a remarkable de-

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A number of subsidiary points of interest, somewhat in the nature of footnotes, follow the text, but do not interrupt the main flow of the argument. The general format and typography are good, and familiar notations are used almost throughout the book.

While the latter portion of the book is of necessity not light reading, the first three chapters provide an excellent treatment of the underlying laws and methods of theoretical aerodynamics, and can be recommended even to those who are not concerned with the more complex problem of ducts or transonic flow.

Missile Engineering Handbook. By C. W. Besserer. 600 pp. D. Van Nostrand Co., Inc., Princeton, N. J., 1958. \$14.50. Reviewed by Robert E. Street, University of Washington.

This is the first "handbook" in a new and rapidly growing engineering field. It is not intended to replace the usual engineering or scientific handbooks. Instead it is supplementary to these, as well as being a compendium of information contained in the other volumes of the series "Principles of Guided Missile Design" of which it is the fourth volume.

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one has only 387 pages of what is usually considered to be the proper content of handbooks, data of various kinds, equations, and similar information. The remaining one third of the book is a very comprehensive glossary of terms used in the whole field of missiles, including such slang expressions as "beeper" and technical terms such as "Schuler pendulum". The glossary could be interesting reading to a specialist in part of the field who wishes to learn the use of terms in other specialties. This reviewer, being an aerodynamicist, found most aerodynamic terms pretty well defined, but in a few cases there is vagueness, such as in the definition of "dynamic pressure", or omissions, such as "Bernoulli's theorem", which is defined as the theorem of probability but not of fluid dynamics.

The book is a difficult one to evaluate; it has excellent tables and charts such as those on the atmosphere, shock and vibration of airborne equipment, reliability of missiles, properties of materials of especial interest to the missile designer, vibration design, and structural formulae. Yet the sections on aerodynamics, electronics, propulsion, and space-flight data are too brief to cover anything more than the obvious and most elementary information. Some of the tables are self-explanatory but others are not. (For example, the one for apparent gravity, a term which is nowhere defined.) The limitations and reliability of the data is not mentioned. This paucity of explanation and lack of discussion will limit the use of this handbook to those in the know, who are apparently familiar with the special lingo of missile engineers. However, it is only for such people that the book is intended anyway.

Le Volcanisme Lunaire et Terrestre: Origine des Continents, des Océans et des Atmosphères, l'Energie géothermique. By Alexandre Dauvillier. 300 pp. Editions Albin Michel, Paris, France, 1958. Paperbound 1.200 fr. *Reviewed by S. A. Korff, New York University.*

In this book, Alexandre Dauvillier, professor at the College de France, discusses the volcanic history of the earth and moon. He starts out with a description of the fission of the earth-moon system, which resulted in a moon with no iron core but made of the material of the earth's mantle and crust. He then discusses the formation of craters on the moon, the vast majority of which he states to be volcanic rather than meteoric in origin. Owing to the absence of erosion agents, the present surface of the moon is that to which it cooled very long ago. He discusses the differences between the forms of the craters on the moon and that formed by a meteor in Arizona. The depression of the crater floor he attributes to subsidence.

Dauvillier discusses at some length the problems of geochemistry and the role played by what he calls the "salt cycle" and the cycle of superheated water. He believes that water is necessary for the development of volcanic action, and points out that virtually all continental volcanos are now extinct. He devotes paragraphs

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The book is well written, and brings out many interesting points. It should certainly be read by all persons interested in the subject. Needless to say, it contains many controversial ideas, and many professional geophysicists will disagree with various interpretations. His point of view differs quite radically, for example, with that developed by Urey both about the origin and also about the subsequent physical-chemical history of the moon. Likewise his analysis of geomagnetic effects differs from that of Chapman. But his arguments are stimulating and interesting to follow, and this is a subject which is very new so that there does not exist a great body of data whose interpretation has met with widespread agreement.

1958 Heat Transfer and Fluid Mechanics Institute: Preprints of papers (U. of California, Berkeley, June 1958). 264 pp. Stanford U. Press, Stanford, Calif. \$8.50. *Reviewed by C. M. Ablow, Stanford Research Institute.*

As is pointed out in the preface, this group of preprints is only to be considered a basis for discussion with final versions of the papers appearing in appropriate journals. However, the quality of the individual papers is uniformly high and their reproduction, by a photographic process, is clean and legible so that the volume presents an attractive collection of the latest work in its field.

Two of the papers are listed as survey articles. That of R. K. Landshoff gives a short but comprehensive coverage of the subject matter, theoretical and experimental tools, and fields of application of magnetohydrodynamics. The article serves best as an index to its extensive but well-selected bibliography.

The paper on the "Drag of a Sphere Moving in a Conducting Fluid in the Presence of a Magnetic Field" by K. P. Chopra and S. F. Singer exemplifies the use of dimensional analysis in magnetohydrodynamics, for various cases of conducting or magnetized spheres moving in a plasma are tractable when the equations can be simplified because some nondimensional groupings may be very large or small.

The partial differential equations of motion in a magnetic laminar boundary layer are shown to be reducible to ordinary equations in a similarity parameter in the paper by P. S. Lykoudis under rather severe assumptions on the nature of the fluid and its flow. The three magnetohydrodynamic papers do show the analytic side of the subject to be very difficult with

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by Samuel Glasstone and Milton C. Edlund, *Physicist at Oak Ridge National Laboratory.*

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few positive results in spite of its well-explored foundation in ordinary hydrodynamics.

The other survey article, by H. K. Emmons, entitled "Theoretical Aerothermodynamics", lists the general equations for flow, reaction, and transfer processes in fluids together with an indication of methods of solution. It is shown that present techniques permit the analytic solution of combustion problems in which only the chemical kinetics are simplified, by neglecting the temperature dependence of reaction parameters, for example. It goes without saying that a collection of such solutions would greatly enhance our understanding of combustion processes.

Solutions to some combustion problems along the above lines are exhibited in the study of combustion in a laminar boundary layer by J. P. Hartnett and E. R. G. Eckert and in the similar work on the flow of a reactive gas along a decomposing wall by E. K. Knuth.

More general studies almost without simplifying assumptions are that giving "Criteria for Thermodynamic Equilibrium in Gas Flow" by M. Rudin and that on "Wave Propagation in a Reacting Mixture" by B. T. Chu. In the latter it is shown that a wave front proceeds into undisturbed gas at a fixed sound speed even though, since the wave initiates a reaction, its amplitude decays so that only the passage of the variable speed reaction front is measurable.

The section on reactive fluids also includes a demonstration by M. Gerstein and A. E. Potter that even the use of greatly simplified reaction kinetics permits prediction of flame quenching distances in fair agreement with experiment.

Of the three papers in the fluid dynamics section, one by R. G. Deissler and M. Perlmutter contains a systematic analysis of compressible laminar and turbulent vortex flows which may be considered not oversimplified models for flows in a Ranque-Hilsch tube. These tubes have received a good deal of attention in the last few years providing as they do a separation of a gas flow into hot and cold streams without the use of machinery. The other two fluid dynamics papers by R. R. Mills and S. Corrsin and by S. W. Yuan and A. Barazotti report on experiments with turbulent flow in the presence of a contraction or of injection at the wall.

The studies in the heat transfer section of the collection all report on experiments approximately verifying earlier theoretical or empirical results. That of R. Hartunian, A. Russo, and P. Marrone concerns shock tubes and that of S. Globe and D. Dropkin natural convection heating. The paper by F. Kreith and D. Margolis investigates the effect of swirl in a pipe on heat transfer and gives a qualitative explanation for the observations.

The paper by P. H. Rose, M. C. Adams, and R. F. Probst reports on the heat transfer at the nose of blunt bodies moving through partially dissociated air and includes a correlation of experimental evidence with their semiempirical theoretical explanation. The

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concept of rigor. He introduces concepts one at a time and develops each with examples before the next is introduced. The modern atomic viewpoint is employed throughout. These and other important features make the work highly useful for reference and for a new, fresh viewpoint on a standard subject. *Ready in February. Approx. 600 pages. Illus. Prob. \$8.50.*

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TOPICS in ELECTROMAGNETIC THEORY.

By D. A. Watkins, *Stanford University*. Provides a logical, unified treatment of topics of interest to students and workers in the field of electromagnetic theory and microwave electron tubes. 1958. 118 pages. \$6.50.

ADVANCED MECHANICS of FLUIDS.

Edited by H. Rouse, *State University of Iowa*. A sequel to Rouse's *Elementary Mechanics of Fluids*, this book presents a rigorous and coherent approach to the analytical techniques of research, and incorporates the most recent developments in the field. 1958. 444 pages. Prob. \$9.75.

PHYSICAL LAWS and EFFECTS.

By C. F. Hix and R. P. Alley, *both of General Electric Co.* Provides a convenient compilation of both familiar and unfamiliar laws and effects. One of a series written by General Electric authors for the advancement of engineering practice. 1958. 291 pages. \$7.95.

The SCIENCE of PHOTOGRAPHY.

By H. Baines, *Kodak Ltd., London*. An authoritative and comprehensive survey of both processes and methods used in modern photography. 1958. 319 pages. \$7.50.

PROGRESS in SEMICONDUCTORS.

Volume III. Edited by A. F. Gibson, *Radar Research Establishment, Malvern, U.K.*; R. E. Burgess, *University of British Columbia*; and P. Aigrain, *Université de Paris*. With 8 contributors. The third volume of a yearly international review of the semiconductor field. 1958. 210 pages. \$8.50.

SEMICONDUCTOR ABSTRACTS.

Volume IV — 1956 Issue: Abstracts of the Literature on Semiconducting and Luminescent Materials and Their Applications. Prepared jointly by members of the Solid State Devices Division and the Physical Chemistry Division of Battelle Memorial Institute. Edited by C. S. Peet, *Battelle Memorial Institute*. A publication in the Electrochemical Society Abstract Series. *In press.*

PLANNING of EXPERIMENTS.

By D. R. Cox, *University of London*. Examines the ideas underlying modern work on the statistical aspects of experimental designs. One of the Wiley Publications in Statistics, Walter A. Shewhart and S. S. Wilks, Editors. 1958. 308 pages. \$7.50.

HANDBOOK of CHEMICAL MICROSCOPY

—Volume I, Third Edition: Principles and Use of Microscopes and Accessories; Physical Methods for the Study of Chemical Problems. By the late E. M. Chamot and C. W. Mason, *both of Cornell University*. 1958. 502 pages. \$14.00.

INTRODUCTION to FUNCTIONAL ANALYSIS.

By A. E. Taylor, *University of California, L. A.* 1958. 423 pages. \$12.50.

NOISE in ELECTRON DEVICES.

Edited by L. D. Smullen, and H. A. Haus, *both of M.I.T.* With 6 contributors. A Technology Press book, M.I.T. 1958. Approx. 432 pages. Prob. \$12.00.

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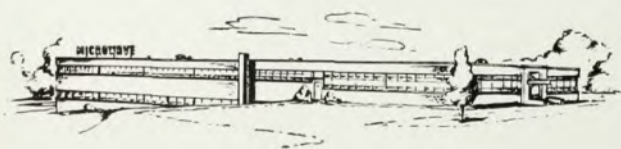
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report by A. J. Vitale, E. M. Kaegi, N. S. Diaconis, and W. R. Warren covers a similar experimental investigation. In contrast, S. M. Bogdonoff and I. E. Vas have conjectured that great reductions in heat transfer to a blunt body in hypersonic flow are possible if the flow is separated by a spike extending ahead of the body. Their experiments verify this provided the flow remains laminar. The problem of finding materials able to serve as practical spike tips is still open.

A. J. Hanawalt, A. H. Blessing, and C. M. Schmidt compute the temperatures of leading edges in very high-speed long continued flight and point out the practicality of insulated surfaces so that it is radiation that balances the aerodynamic heating. For short periods surface melting can be a useful heat sink as is pointed out by the calculations of S. M. Scala and G. W. Sutton.

The van Karman-Polhausen approximate integral method of boundary layer analysis is shown by P. A. Libby to give satisfactory agreement with more exact and exacting theoretical computation schemes for laminary hypersonic flow.

In summary, if this collection is a fair sample of the latest research it is evidence of an orderly advance, for all the papers can be readily subsumed under a few headings: combustion, dissociated gas dynamics, flow of real fluids. This means either that most investigators have recognized and attacked the few major problems of our time or perhaps that there is a more centralized control of basic research in this country than we should like to admit.

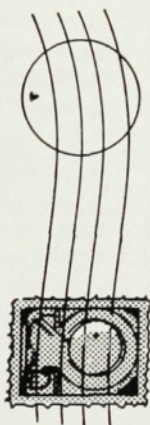
The Exploration of Space by Radio. By R. Hanbury Brown and A. C. B. Lovell. 207 pp. John Wiley & Sons, Inc., New York, 1958. \$6.50. *Reviewed by H. Mendlowitz, National Bureau of Standards.*

In a field which started just about a quarter of a century ago, a well-written book of an introductory character is quite welcome. Actually, although the field of radio-astronomy is about twenty-five years old, the major advances in techniques and accumulation of data took place in the last decade. The authors themselves have made important original contributions in this field. It is not very often that those people who make significant advances in research in a scientific field can also be effective in presenting their work to those not acquainted with the field. Hanbury Brown and Lovell have been able to put together a rather nice book to serve as an introduction to the uninitiated without giving him the feeling that he is being "talked down" to.

The authors start with a short chapter to give the reader some background material in astronomy and then continue with an introduction of the subject by discussing properties of radio waves and the techniques of radio astronomy. After this the meaty part of the subject is discussed. This includes such topics as galactic and extragalactic radio emissions, the importance of the hydrogen 21-cm emission line in the study of interstellar space, and solar radio waves. One of the

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Vol. II, MESONS. "... of value to anyone who has any connection with π -meson physics. Nowhere else can so much useful and important information on this subject be found . . ." By Geoffrey Chew, University of California, in *Nucleonics*.

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parts of the book which I found most interesting was the discussion of the discovery of discrete sources or radio stars. There are discussions of the tracking of meteors by radar, lunar probes, and radio echoes from earth satellites. New techniques and equipment are also described and, of course, the authors' own important facility, the 250-ft Jodrell Bank steerable telescope is discussed.

Except for a few slips by the authors the book is well written. For example "parsec", a unit of distance, is utilized right at the beginning and it is only defined on page 10. Also, a search through the index did not list this word. Another case which may cause some irritation to the reader is the discussion in the body of the text (page 59) of certain reference points in a diagram (44b). These points do not appear in the diagram.

I am sure that these kinds of errors can be repaired in later printings or editions of this book and that the over-all quality will outweigh these blemishes. In this important scientific International Geophysical Year and because of the current news of earth satellites and lunar probes, this book will surely help serve to introduce those unacquainted with radio astronomy to a very fascinating and important field.

Crystal Physics II. Vol. 7, Part 2 of *Handbuch der Physik*. Edited by S. Flügge. 273 pp. Springer-Verlag, Berlin, Germany, 1958. DM 76.00 (subscription price DM 60.80). Reviewed by R. Smoluchowski, *Carnegie Institute of Technology*.

In continuation of the new *Handbuch der Physik* series there appeared the second part of the volume dealing with crystal physics. While the first part concerns several subjects such as lattice defects, crystallography, elastic and thermal properties, and specific heats, the second is devoted only to plasticity and to transformations and precipitation in solids. Seeger's article, of over 200 pages, is a very thorough survey of the phenomenological and of the theoretical side of plasticity in crystalline materials. Inasmuch as dislocations, the basic concept of plasticity, have been treated at length by the same author in the first part of this volume, the present article uses them as a tool without going into a detailed theoretical and experimental discussion of their properties. Similarly the mathematical plasticity of a continuum is omitted since it is treated elsewhere. The first item to be treated in detail is the estimate of the so-called theoretical shear strength and its comparison with experiment. This is the crucial argument which underlies nearly all concepts of the defect structure of solids. This introduction is followed by an excellent and long (nearly half of the whole article) description of the fundamental facts and notion of plasticity: crystallography of deformation, geometry, creep curves, yield point, critical shear strength, influence of temperature, influence of composition, etc. The chapter covers both metals and many nonmetals such as germanium and



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alkali halides. A separate chapter deals with the important phenomenon of strain hardening in various metal alloys and in nonmetals. Another very well-illustrated chapter deals with slip lines and other surface phenomena as related to the internal processes. Theory of plasticity is discussed in the next chapter which covers nearly 60 pages. Here the various models of critical shear strength, of strain hardening, etc., are discussed. In particular, the role of the Lomer-Cottrell dislocations is stressed. The reviewer found this section particularly valuable since it introduces order into the maze of various semiquantitative models and theories recently proposed. A discussion of plastic properties of alloys and of recovery, polygonization, and recrystallization, as well as creep, closes the article. There are numerous and up-to-date references.

A short article by Dehlinger, only slightly over 40 pages, is devoted to phase transformations in solids. It is a pity that a summary of this rich and interesting field had to be compressed that much. For instance, very little space is devoted to the extremely basic preprecipitation phenomena; similarly the order-disorder transformations and other transformations, which may not be simple phase changes, are disposed of on one page only. On the other hand, the classical first-order phase transitions are treated in more detail. The first chapter deals with the mechanism of nucleation, describing the usual models of Volmer, Becker, and others, and discusses the resulting kinetics. In the next chapter are covered the kinetics of various special reactions such as precipitation and age hardening, x-ray and microscopic evidence, associated magnetic phenomena, thermodynamics of precipitation, and the mechanism and rates of age hardening. In the final chapters are discussed the diffusionless transformations such as the polymorphism of cobalt, the martensitic reaction, the resulting orientation relationships, the strain energy, and the rate of the martensitic transformation. An inclusion of an up-to-date table of the observed orientation relationships in the various diffusionless transformations is most valuable. A rather complete reference list helps to guide the reader into those fields which are only briefly treated.

While the present volume is written in German, the excellent English subject index and the richness of illustrations and diagrams should make the book of value even to those who are shaky in reading foreign languages.

Books Received

THE EARTH AND ITS GRAVITY FIELD. By W. A. Heiskanen and F. A. Vening Meinesz. 470 pp. McGraw-Hill Book Co., Inc., New York, 1958. \$12.50.

FLUID DYNAMICS AND HEAT TRANSFER. By James G. Knudsen and Donald L. Katz. 576 pp. McGraw-Hill Book Co., Inc., New York, 1958. \$12.50.

HANDBOOK OF PHYSICS. Edited by E. U. Condon and Hugh Odishaw. 1504 pp. McGraw-Hill Book Co., Inc., New York, 1958. \$25.00.

INDUSTRIAL NUCLEAR DEVELOPMENT: A Challenge to the States. Proceedings of Nat'l Assoc. of Manufacturers & Nat'l Industrial Council Conf. (NYC, May 1958). 64 pp. Nat'l Assoc. of Manufacturers, New York, 1958. Paper-bound \$2.00.

INDUSTRIAL CARBON AND GRAPHITE: Soc. of Chemical Industry Symp. (London, Sept. 1957). 630 pp. The Macmillan Co., New York, 1958. \$25.75.

TECHNOLOGY OF COLUMBIUM (NIOBIUM): Electrochemical Soc. Symp. (Washington, D. C., May 1958). Edited by B. W. Gonser & E. M. Sherwood. 120 pp. John Wiley & Sons, Inc., New York, 1958. \$7.00.

NUCLEAR ROCKET PROPULSION. By R. W. Bussard and R. D. DeLauer. 370 pp. McGraw-Hill Book Co., Inc., New York, 1958. \$10.00.

METALLURGICAL THERMOCHEMISTRY (3rd Revised Edition). Vol. 1 of Internat'l Series of Monographs on Metal Physics & Physical Metallurgy. By O. Kubaschewski and E. L. Evans. 426 pp. Pergamon Press, London & New York, 1958. \$10.00.

THE PHYSICS OF RUBBER ELASTICITY (2nd Revised Edition). By L. R. G. Treloar. 342 pp. Oxford U. Press, New York, 1958. \$6.40.

THE PHYSICIST'S CONCEPTION OF NATURE. By Werner Heisenberg. Translated from German by Arnold J. Pomerans. 192 pp. Harcourt, Brace & Co., New York, 1958. \$3.75.

ELECTRONICS OF MICROWAVE TUBES. By W. J. Kleen. Translated from German by P. A. Lindsay, A. Reddish, C. R. Russell. 349 pp. Academic Press Inc., New York, 1958. \$9.00.

IONOGRAPHIE: les émulsions nucléaires, principes et applications. By Pierre Demers. 834 pp. Les Presses Universitaires de Montréal, Canada, 1958. \$20.00 (Canadian).

GRUNDRISSE DER PHOTOGRAPHIE UND IHRER ANWENDUNGEN, BESONDERS IN DER ATOMPHYSIK. By Georg Joos and Erwin Schopper. 408 pp. Akademische Verlagsgesellschaft m.b.H., Frankfurt, Germany, 1958. DM 48.00.

MIND AND MATTER. By Erwin Schrödinger. 104 pp. Cambridge U. Press, New York, 1958. \$2.75.

HANDBOOK OF AUTOMATION, COMPUTATION, AND CONTROL. Vol. 1, Control Fundamentals. Edited by Eugene M. Grabbe, Simon Ramo, Dean E. Wooldridge. 5 sections, 26 chapters. John Wiley & Sons, Inc., New York, 1958. \$17.00.

ANNUAL REVIEW OF PHYSICAL CHEMISTRY, Vol. 9. Edited by H. Eyring, C. J. Christensen, H. S. Johnston. 511 pp. Annual Reviews, Inc., Palo Alto, Calif., 1958. \$7.00 in US; \$7.50 elsewhere.

BRIGHTER THAN A THOUSAND SUNS: A Personal History of the Atomic Scientists. By Robert Jungk. Translated from German by James Cleugh. 369 pp. Harcourt, Brace & Co., New York, 1958. \$5.00.

PRODUCTIVE USES OF NUCLEAR ENERGY: Report on Nuclear Energy and World Fuel Prices. By Cornelius J. Dwyer. 74 pp. Nat'l Planning Assoc., Washington, D. C., 1958. Paper-bound \$1.25.

NAVAL HYDRODYNAMICS: Symp. Proceedings (Washington, D. C., Sept. 1956). Edited by F. S. Sherman, 444 pp. NAS-NRC Publication 515. Nat'l Academy of Sciences—Nat'l Research Council, Washington, D. C., 1957. \$5.00.

INTRODUCTION TO MODERN PHYSICS. By C. H. Blanchard, C. R. Burnett, R. G. Stoner, R. L. Weber. 414 pp. Prentice-Hall, Inc., Englewood Cliffs, N. J., 1958. \$10.00.