

conjunction with one of the standard texts because so many of the necessary mathematical tools are given. It is also useful as a handy reference for the large number of problems which are worked out and for the problems which are given at the end of each chapter with which the student can test his proficiency and mastery over the subject material.

Grain Boundaries in Metals. By D. McLean. 346 pp. Oxford U. Press, New York, 1957. \$8.00. *Reviewed by A. Maradudin, University of Maryland.*

Dr. McLean's book, one of the Monographs on the Physics and Chemistry of Materials published by the Oxford University Press, is a substantial addition to the literature of metallurgical science. It is the first book to be devoted exclusively to the subject of grain boundaries, and this fact alone, in the absence of its many other attractive features, would make it a book worth having.

Considering the amount of material contained in this book it is difficult in a short review to do much more than just describe the various topics it discusses. After a historical introduction which summarizes the various theories as to the structure of grain boundaries, a discussion of modern (i.e., post 1948) theories is given, chief among these being the dislocation theory of grain boundaries. In his discussion of these theories McLean emphasizes their ad hoc nature pointing out that "Each was put forward to explain particular properties and, while having some quantitative success with the properties which it was put forward to explain, has not explained other properties." This is followed by a discussion of the interfacial energies and tension of grain boundaries both from a theoretical and an experimental point of view, and the effect of these energies and tensions on the shape of grains in polycrystalline materials. Other topics considered in this book include a discussion of the equilibrium segregation of solute concentration at grain boundaries; the influence of grain boundaries on strain hardening during deformation and on the yield point; sub-boundaries, their formation, movement under stress, and effect on mechanical properties; movement of grain boundaries during annealing; sliding of crystals past each other at grain boundaries; and intergranular brittleness, where the discussion is divided into low-temperature brittleness and intercrystalline fracture at high temperatures.

The emphasis throughout the book is on what is actually known about grain boundaries, although a substantial portion of the discussion is devoted to theoretical interpretation of the experimental results. In all cases, however, the author is careful to point out the region of agreement between theory and experiment; that there is as yet imperfect agreement between theory and experiment in many areas should serve to stimulate the search for more successful theories.

The presentation of this vast amount of material is carried out with a liberal use of figures, diagrams, and

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By **C. C. GOTLIEB** and **J. N. P. HUME**, both of the University of Toronto. *McGraw-Hill Series in Information Processing and Computers.* 338 pages, \$9.50

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tables of numerical results. There are references to over six hundred publications in the literature. The price of the book is reasonable, and it is perhaps not too much to say that it will rapidly become a must for all workers in this field.

Les Méthodes nouvelles de la Mécanique céleste (Reprint). By H. Poincaré. Vol. 1, 382 pp.; Vol. 2, 476 pp.; Vol. 3, 414 pp.; published in 1892, 1893, 1899 respectively; paperbound \$2.75 each. **An Introduction to the Study of Stellar Structure** (Reprint). By S. Chandrasekhar. 509 pp.; original edition 1939; paperbound \$2.75. Dover Publications, Inc., New York, 1957. Reviewed by George Weiss, University of Maryland.

The first and still most outstanding success of Newtonian mechanics was in the description of celestial motion. Celestial mechanics is not a fashionable subject in contemporary physics. Hence we tend to forget the very substantial and very elegant contributions made to this field in the eighteenth and nineteenth centuries. The genesis of Hamilton-Jacobi theory, the theory of adiabatic invariants, perturbation theory, and other tools which are commonplace in physics today, were first found in the study of the three-body problem and other investigations related to celestial motions. The current output of books on celestial mechanics is a slender one and few of the modern books are likely to reach the level of Henri Poincaré's monumental three-volume set, *Les Méthodes nouvelles de la Mécanique céleste*.

Among the material included in this set are a discussion of the Hamilton-Jacobi theory especially as it applies to the three-body problem, an account of perturbation theory including the treatment of differential equations with periodic coefficients (with a discussion of the elimination of spurious secular terms), and an introduction to the topological theory of nonlinear differential equations.

Poincaré wrote at a leisurely pace that makes for easy reading without obliging the reader to fill in many steps. In this respect Poincaré's treatise is to be preferred to the more businesslike *Celestial Mechanics* by Moulton and can be recommended for physicists, applied mathematicians, and readers who are interested in browsing among the more delightful investigations of the eighteenth and nineteenth centuries.

This review has not yet exhausted superlatives for there are still some reserved for the reprinted edition of *An Introduction to the Study of Stellar Structure* by S. Chandrasekhar, which, broadly speaking, contains an account of classical mechanics and thermodynamics as they overlap in the construction of models for stellar interiors. Of particular interest are two chapters which lay the foundation for more detailed calculations. The first deals with the axiomatic development of classical thermodynamics by the method of Carathéodory, and the second is on relativistic quantum statistics. Both of these chapters are almost unequalled for lucidity of exposition. A large part of this volume is devoted to the

study of the equilibrium of polytropic and isothermal gas spheres. These results are then extensively applied to the study of models for stellar interiors which yield information on the relation between the mass dimensions and the luminosity of a star. The final chapter on stellar energy is by now outdated, but the rest of this volume is likely to remain the outstanding classic in this field for a long time to come.

The Dover Publishers will certainly prosper if they continue to offer such excellent reprints in inexpensive editions.

Correction

In the review of *The Spectrum of Atomic Hydrogen* (see *Physics Today*, April 1958, p. 32) the word "positron" should be read instead of "proton" in line 10 from the bottom.

Books Received

PHYSICS OF NUCLEAR FISSION: Supplement No. 1 of the Soviet Journal *Atomnaya Energiya*. Translated from Russian by J. E. S. Bradley. 182 pp. Pergamon Press, London & New York, 1958. \$9.00.

ZUM WELTBILD DER PHYSIK (7th Revised Edition). By Carl Friedrich von Weizsäcker. 378 pp. S. Hirzel Verlag, Stuttgart, Germany, 1958. DM 14.70.

DOVER REPRINTS. *Gaseous Conductors: Theory and Engineering Applications*, by James Dillon Cobine, 606 pp., paperbound \$2.75. *Thermodynamics*, by Enrico Fermi, 160 pp., paperbound \$1.75. *Foundations of Physics*, by R. Bruce Lindsay and Henry Margenau, 542 pp., paperbound \$2.45. *The Theory of Functions of a Real Variable and the Theory of Fourier's Series*, by E. W. Hobson. Vol. 1, 736 pp. Vol. 2, 780 pp., paperbound \$3.00 each. Dover Publications, Inc., New York, 1958.

THE STORY OF ALBERT EINSTEIN. By Mae Blacker Freeman. 178 pp. Random House, New York, 1958. \$2.95.

PROCEEDINGS OF 12TH INTERNATIONAL SCIENTIFIC RADIO UNION GENERAL ASSEMBLY (Boulder, Colo., Aug.-Sept. 1957). Vol. 11, Part 1, Commission 1: On Radio Measurements & Standards. 78 pp. URSI, Brussels, Belgium, 1958. Paperbound \$2.00.

SURFACE ACTIVITY: Proceedings of 2nd Internat'l Congress (London, Apr. 1957). Edited by J. H. Schulman. Vol. 1, *Gas/Liquid & Liquid/Liquid Interface*; 521 pp.; \$15.00. Vol. 2, *Solid/Gas Interface*; 348 pp.; \$12.60. Vol. 3, *Electrical Phenomena & Solid/Liquid Interface*; 621 pp.; \$16.80. Vol. 4, *Solid/Liquid Interface & Cell/Water Interface*; 352 pp.; \$12.60. (Butterworths, England) Academic Press Inc., New York, 1958. \$50.00 for complete set.

THEORETICAL ASTROPHYSICS. Edited by V. A. Ambartsumyan. Translated from Russian by J. B. Sykes. 645 pp. Pergamon Press, London & New York, 1958. \$22.50.

PROCEEDINGS OF THE SIXTH INTERNATIONAL CONFERENCE ON SPECTROSCOPY (Amsterdam, May 1956). Edited by W. van Tongeren, F. Freese, E. H. S. van Someren. 663 pp. Pergamon Press, London & New York, 1957. \$25.00.

ANALYTICAL MECHANICS FOR ENGINEERS (5th Revised Edition). By Fred B. Seely, Newton E. Ensign, Paul G. Jones. 475 pp. John Wiley & Sons, Inc., New York, 1958. \$7.25.