Zahlenwerte und Funktionen aus Physik, Chemie, Astronomie, Geophysik und Technik

Von Landolt-Börnstein. Sechste auflage. Herausgegeben von verschiedenen Fachgelehrten. II Band: Eigenschaften der Materie in ihren Aggregatzuständen. 4 Teil: Kalorische Zustandsgrössen. Bearbeitet von verschiedenen Fachgelehrten. Herausgegeben von K. Schäfer und E. Lax. Pp. xii + 863. (Berlin: Springer-Verlag, 1961.) Moleskin geb. 438 D.M.

THIS is the fourth of the ten parts planned for Volume 2 of the whole work, now in its sixth edition, and covers a subject area which occupied less than a hundred pages of the fifth edition and its supplements. The tables include chronological summaries of the values that have been obtained for the fundamental constants of thermochemistry, such as the mechanical equivalent of heat, the universal gas constant and Planck's constant. The majority of the book is devoted to values for molar heat, entropy and enthalpy of selected inorganic and organic substances, including their dependence on temperature. A useful summary is given of methods of calculation of undetermined thermodynamic functions of organic compounds from consideration of molecular vibrations. Included also are the Joule–Thomson and isothermal Drossel effects, the magnetocaloric effect in relation to paramagnetic salts at very low temperatures and thermodynamic functions of mixtures and solutions. The absolute joule is used throughout, in accordance with the recommendations of the ninth General Conference on Weights and Measures (1948). The copious literature references are recorded up to 1959, and are therefore more complete than in any comparable work at present in publication.

As the price of 438 D M. for this part alone suggests, purchase of the whole work will be an expensive proposition, feasible only for the larger libraries; but the part under review is self-contained, and will be of great value as a source of primary information to all users of thermodynamic data. S. P. COOPER

Volume and Integral

By Prof. Werner W. Rogosinski. Second edition. (University Mathematical Texts.) Pp. xi + 160. (Edinburgh and London: Oliver and Boyd, Ltd.; New York: Interscience Publishers, Inc., 1962.) 10*s*. 6*d*.

THE author's preface to this second edition states: "Only a few minor inaccuracies in the text have come to my notice. These, together with some misprints, have now been amended. Otherwise, apart from occasional added remarks, the new edition is unchanged".

There is consequently nothing which I can usefully add to my review of the first edition of this book (*Nature*, 173, 608; 1954). I still have the same high opinion of it as an excellent introduction to content, measure, and the Riemann and Lebesgue integrals. R. G. COOKE

Curvature and Homology

By Samuel I. Goldberg. (Pure and Applied Mathematics: A Series of Monographs and Textbooks, Vol. 11.) Pp. xvii + 315. (New York and London: Academic Press, 1962.) 68*s*.

THE study of the relations between the local and global properties of a surface, beginning with the Gauss–Bonnet theorem, widened considerably with the application of tensor analysis to generalized spaces, and received a further stimulus about 1940 by the now classical work of Hodge on harmonic forms and Betti numbers; Bochner, Yano and Lichnerowicz have been responsible for much research in this field, where the calculus of exterior forms and the theory of Lie groups are important tools. The theme of Goldberg's book is the relationship between the curvature properties of a Riemannian manifold and its homology structure; in the earlier chapters the local structure and the topology of a differentiable manifold lead to a discussion of families of Riemannian manifolds. Then complex manifolds are set up on lines suggested by Weil, and the introduction of a special type of metric defines a Kähler manifold. An appendix gives a proof of the fundamental existence theorems of de Rham, again using some of Weil's ideas and Leray's sheaf theory.

The book is one for the young specialist rather than the general mathematical reader. The author hopes that those who have had standard courses in linear algebra, real and complex variables, differential equations, and point-set topology will be able to follow his arguments. But this seems a somewhat slender basis for a fairly stiff task, and the reader would be well advised to have a reasonable knowledge of modern work on Riemann surfaces (that gleaned from G. Springer's book would suffice), and at least a nodding acquaintance with the calculus of exterior forms and some algebraic topology; granted this, he will find the book a valuable survey of recent work and of probable lines of future progress. T. A. A. BROADBENT

Boundary and Eigenvalue Problems in Mathematical Physics

By Prof. Hans Sagan. Pp. xviii + 381. (New York and London: John Wiley and Sons, Inc., 1961.) 76*s*.

THIS book has a refreshing approach to its subject-matter. Mathematical methods, as used in various branches of applied mathematics and theoretical physics, have come in recent decades to consist largely of a collection of analytical tricks and techniques, and there appears to be little unity underlying the myriad of special recipes available in certain fields. But in this book only a few basic concepts are used, such as Hamilton's principle and the calculus of variations or Bernoulli's separation method for solving certain partial differential equations. The student is expected to master these topics and then a unified background exists for the methods of solving problems in fields such as vibration, heat conduction and wave motion.

After a chapter on the calculus of variations there follows a careful account of the theory of the vibrating string and membrane and a treatment of the equations of potential and heat conduction. There is a good chapter on Fourier series, including some of the theory of the series, as well as the details of various applications, for example, the plucked string.

The next chapter is on self-adjoint boundary value problems and this is followed by one on Legendre polynomials and Bessel functions. In an important chapter on the characterization of eigen-values by a variational principle the minimum properties of eigen-values are discussed thoroughly and the Rayleigh–Ritz method is introduced. The last two chapters are on spherical harmonics and the non-homogeneous boundary value problem.

Lecturers in applied mathematics usually find it difficult to streamline their courses so that in the