Introduction to the Transfer of Heat and Mass

By E. R. G. Eckert; with an Appendix on Property Values, by Robert M. Drake, Jr. Pp. xiii+284. (London: McGraw-Hill Publishing Co., Ltd., 1950.) 34*s*.

THE American edition of Dr. E. R. G. Eckert's excellent German text, enriched as it is by new sections and some fine interference photographs, is most welcome. The literature of the subject is so vast that there is need for a work such as this, which presents basic theory and established data but is chiefly concerned with depth of understanding.

The largest part of the book deals with heat transfer by convection. The starting-point is the flat plate in longitudinal flow, so that the student is immediately introduced to velocity and thermal boundary layers and acquainted with the factors which govern them. Extensive use is made of the approximate methods associated with the names of von Kármán, Pohlhausen and Kroujiline, which are simple and sufficiently accurate and which have the great advantage for the student of using physical, rather than exclusively mathematical, reasoning. Flow in ducts is treated later, as a case where the stream is all boundary layer. There is a good account of recent work on the analogy between heat transfer and friction.

Mass transfer is given less attention than heat transfer. The only case considered in detail is the transfer of water vapour between an air stream and a flat plate. A few pages devoted to generalizing the results so obtained would be a worth-while addition, contributing to the student's confidence in tackling other cases.

The treatment of radiation and radiative heat-exchange is concise and benefits from the fact that the author's own research has made important contributions to our knowledge of this aspect of heat transfer. D. B. SPALDING

Tables of the Error Function and of its First Twenty Derivatives

By the Staff of the Computation Laboratory. (Annals of the Computation Laboratory of Harvard University, Vol. 23.) Pp. xxviii+276. (Cambridge, Mass.: Harvard University Press; London: Oxford University Press, 1952.) 8 dollars.

IN various forms, at various intervals, and with various degrees of accuracy, integrals of the 'normal' (Gaussian) distribution function have been tabulated, mainly on account of its fundamental importance in statistical calculations. Nothing like the same attention has been given to the derivatives, although the demand for them has been increasing. They also enter into statistical calculations (for example, the Gram-Charlier series). They provide solutions of the equation of heat conduction or diffusion, are closely associated with the Hermite polynomials, and possess valuable orthogonal properties. After requests from various quarters these tables were prepared in the Harvard Computational Laboratory, under contract with the United States Air Force. It is claimed that, at any point, they give more derivatives or more decimals, or use a smaller interval, than other published tables.

Table 1 gives $\varphi_0(x) = \sqrt{(1/2\pi)}\exp(-\frac{1}{2}x^2)$, its integral (for completeness) and its first four derivatives. Table 2 gives derivatives from the fifth to the tenth. In these tables six decimals are given, at intervals of 0·004 in x, and tabulation proceeds until the values cease to be significant in the sixth decimal. Tables 3 and 4 give the succeeding derivatives, up to the twentieth. Here the larger values which occur for the smaller values of x are given to seven significant figures, but later values stop, as before, at the sixth decimal; the interval in these tables is 0·002. No reason is given for the rather unusual choice of intervals, and no special provision is made for interpolation, since the Taylor series is appropriate and not inconvenient.

An introduction gives an account of the main properties of the functions tabulated, an outline of the method of calculation, and an account of problems in which these functions have found application. Seven-decimal values of their zeros are also given.

W. G. BICKLEY

Copolymerization

By Turner Alfrey, Jr., John J. Bohrer and H. Mark. (High Polymers, Vol. 8.) Pp. x+269. (New York and London: Interscience Publishers, Inc., 1952.) 6.80 dollars.

COPOLYMERIZATION is the phenomenon of the synthesis of a macromolecule from two monomeric components, each of which is capable of polymerizing. Not all monomers exhibit this phenomenon, and in addition it is occasionally possible for copolymers to be formed when one of the components does not itself polymerize. Very occasionally it may happen that two molecules will form a copolymer and neither will polymerize separately. Copolymers are of great interest industrially—nearly all synthetic rubbers are copolymers because the necessary properties cannot be obtained with a homogeneous polymer made from one component only. But this volume is concerned almost wholly with the purely academic problems which arise in such processes. Most of the work on copolymerization has been induced by the addition of free radicals in the monomers, and the ionic mechanism of copolymerization has only been studied to a very limited extent.

The book presupposes some knowledge of polymerization mechanism, since this is dealt with in detail in other volumes in the series. The authors are so well known for their contribution to high-polymer chemistry that this whole book is a thoroughly critical and authoritative discussion of the reaction mechanism of copolymerization, the structures and reactivity of copolymers. The immense number of systems studied has added a very important chapter to our knowledge of relative reactivity radicals and thrown a new light on radical reactions. In spite of the specialist nature of the subject, the book will be of great interest to anyone interested in the mechanism of organic reactions. It is well produced, illustrated, printed and bound.

H. W. MELVILLE

Geometry and the Imagination

By D. Hilbert and S. Cohn-Vossen. Translated by P. Nemenyi. Pp. ix+357. (New York: Chelsea Publishing Co., 1952.) 5 dollars.

THE original German edition of this book, "Anschauliche Geometrie", was reviewed in these columns in 1933 (see *Nature*, 132, 369; 1933). This English translation, by P. Nemenyi, retains the fascination and enthusiasm of the original work, and should provide stimulus and inspiration to every student and teacher of geometry.