

Grundzüge der Differential- und Integralrechnung. By G. Kowalewski. 4th ed. Leipzig and Berlin, B. G. Teubner, 1928. v+417 pp. Rm 16.

The first edition of this well known text, which appeared in 1909, was reviewed in this Bulletin, vol. 19 (1913), p. 531. The second edition (1919) and the third, which followed soon after, were reprints of the first, with misprints corrected. The same remark holds for the present fourth edition, except that there is a new appendix of eleven pages on Fredholm determinants and integral equations. Here the Fredholm determinants and minors are exhibited as the result of a limit process, their convergence is proved, and (in a page and a half) they are employed in the solution of the linear integral equation of the second kind.

This is a text for the mature student; it will be useful for reference in our courses on functions of real variables rather than in calculus classes. In his introduction the author says, "Ich habe mich bemüht überall möglichst streng zu sein." The standard of rigor is indeed high; one reviewer has complained of the dry brevity that seems to him almost "cold and heartless." Nevertheless, there is true art here.

Even in this fourth edition some annoying misprints remain, but fortunately not many have survived.

D. R. CURTISS

L'Ancienne et la Nouvelle Théorie des Quanta. (Cours de Physique Théorique de la Faculté des Sciences de Paris.) By Eugène Bloch. Paris, Hermann, 1930. 417 pp. 90 fr.

This book is essentially an account of two series of lectures, given at the Sorbonne during 1926-27 and 1928-29. It gives students of the subject an exposition of the historical development of the theory of quanta, and illustrates this by a number of typical examples. It therefore does not claim any other originality than the selection of the material, in which it has very well succeeded.

After a historical introduction comes the Planck radiation law (derived in the way of Einstein, *Physikalische Zeitschrift*, 1917) and the photoelectric effect, which leads up to the Compton effect. For this a whole chapter is reserved. Then follow the periodical system of the elements, the Bohr theory of the hydrogen atom, and the Sommerfeld quanta conditions with the fine structure. The next chapters deal with atomic magnetism, the Stern-Gerlach experiments, and Goudsmit-Uhlenbeck's theory of the spinning electron. The introductory chapters end with the Zeeman effect and take 195 pages of the book.

The last ten chapters deal with modern quantum theory. A first chapter gives some fundamental results of analytical mechanics. Then comes the Bohr correspondence principle. In Chapter 13, page 244, we find a discussion of the de Broglie waves, in which the Davisson-Germer, G. T. Thomson, Rupp, etc., experiments find their place. The next chapter deals with the Schrödinger equation. Then follow applications to rotator and hydrogen atom, and the statistical interpretation of the Schrödinger function. Chapters 17 and 18, page 321, deal with matrix mechanics. Then comes the principle of indetermination and a last chapter discusses the new statistical mechanics (Bose,

Einstein and Fermi). An appendix explains Legendre, Laplace, Hermite, and Laguerre functions.

Bloch's book seems to be eminently fit for a general introduction to the present state of things. It can be compared to Birtwistle's books (*The Quantum Theory of the Atom*, Cambridge, 1926, *The New Quantum Mechanics*, Cambridge, 1928), but is more recent and is, perhaps, more readable.

D. J. STRUIK

The Adjustment of Errors in Practical Science. By R. W. M. Gibbs. The Oxford University Press, 1929. 112 pp.

The object of this little book is to simplify and condense into a readable form the gist of the theory of errors arising in practical work. Ideas, important formulas and curves of reference basic to this phase of mathematics are presented in a concise, clear and interesting manner. The main body of the treatise is devoted to the presentation of these with diagrams, examples and tables; while the appendix is devoted to the mathematical derivation of the formulas and useful integrals. Students not interested in the mathematical side of the theory of errors will be able to read the contents and use the results without having to read technical proofs of formulas, while those interested in their derivation can turn to the appendix and find this phase presented. The chapters are short and to the point.

The first two chapters present an introduction, two examples from experience showing how distributions similar to the normal curve arise, and a short discussion of probability.

Chapters 3 and 4 present the normal curve of error for linear, area, and volume distributions, together with formulas for h , the standard deviation, and mean error. The probable errors for these three distributions are defined, discussed briefly, and given in terms of the standard deviation and mean error. The percentage error curves are introduced for these distributions with examples showing their construction and uses.

Chapter 5 is devoted to a short treatment of determining the curve of best fit and the most probable point by using the method of least squares. Exponential equations for predicting are treated linearly by using logarithms.

The following three chapters present the correlation coefficient, partial correlation, quality correlation, and the correlation ratios, together with a table exhibiting the probability of the correlation coefficient. A contingency table is explained for determining this coefficient.

The last chapter treats of the error of the last figure, the error of the interval, and the errors of functions. A power series raised to an integer is used to advantage in the discussion of the error of the interval.

The appendix follows with mathematical derivations of all formulas, equations of curves of reference, and the evaluation of certain integrals. A summary of formulas follows.

Many well constructed diagrams appear in the book and should prove helpful to the reader. Several chapters close with exercises for the student. The book is small, well bound, and easy to carry. It should prove to be very useful to those doing research work in this field. I found the treatise interesting and worthwhile.

W. D. BATEN