

has therefore written this text to supply a course that will equip the student for work in calculus and engineering, without burdening him with a mass of detail useful only to the student of mathematics for its own sake. The result is a very attractive little book. The author has picked out the easy and fruitful bits of his subject without concerning himself greatly whether the topics chosen are conventionally elementary or advanced. He gives us a book very different from the stock "analytical conics," for the conic falls into its place among other curves, and is not studied under a microscope. For example, we have nothing about the equation of the tangent to a conic; presumably the author would take tangents after dy/dx . On the other hand, we have sections on periodic functions, empirical equations, parametric representation, co-ordinates in space, surfaces. The book is one that might very well be used with a class of intelligent non-specialists in their last two years at an English public school, at a stage when the function of mathematics is to broaden their outlook. It would serve equally well as an introductory course for a specialist.

The book is full of pleasing practical touches—e.g. "But on other problems, notably in work with alternating currents, an interpretation can be given to the process of extracting the square root of a negative number, and then such results are entirely real."

(2) Most English text-books on the calculus are fairly well provided with exercises, but anyone who wants more will find a good collection here. The sets on maxima and minima are especially practical. Students of foreign fashions in notation will note the absence of \sin^{-1} ; arc sin is used instead. The hyperbolic functions have not found admission, which seems a pity. The sets of exercises are prefaced by brief directions and plain warnings; the directions however are, from an educational point of view, too much in the way of rules—e.g. "To find d^2y/dx^2 (when x and y are given as functions of t) use the somewhat cumbersome formula

$$\frac{d^2y}{dx^2} = \left(\frac{dx}{dt} \cdot \frac{d^2y}{dt^2} - \frac{dy}{dt} \cdot \frac{d^2x}{dt^2} \right) / \left(\frac{dx}{dt} \right)^3,$$

etc." (p. 29). On p. 81 the precise meaning of "in general" is not clear in the sentence: "Expansion into series is, in general, useful in calculations only when the series is convergent."

(3) This book contains many more tables than are commonly used in British class-rooms—e.g. cubes and cube roots, tables of n^2 , n^3 , n^4 , n^5 , n^6 , n^7 , n^8 , n^9 , areas and circumferences of circles, volumes of spheres, circular segments, chords, etc., together with five pages of weights and measures (from which it appears that the American yard differs from the British yard, being defined as 3600/3937 metres). On the other hand, there is no full table of secs and cosecs. Sine and cosine share a table, as do tan and cot. The "arguments" are given to three significant figures, or for every ten minutes in the trigonometrical tables. There are no difference columns, and to obtain a fourth

significant figure, or the intermediate degrees, it is necessary to interpolate. Some of the functions are given to four significant figures, some to five; the principle underlying the choice of four or five is not mentioned. The author has broken with the curious tradition (the origin of which we should like to know) that ten should be added to the log of a circular function.

For British schools this book will probably be considered to contain too much in one way and too little in another (e.g. difference columns). The type is too small for young eyes.

(4) This book contains chapters on household accounts, commercial arithmetic, business letters, soils, manures, crops, live-stock, foodstuffs, dairying, mensuration, levelling, brickwork and building construction, water supply, work and power, measurement in the field. The explanations of arithmetical processes are undistinguished and sometimes old-fashioned (e.g. inverting the multiplier in contracted multiplication). But we imagine that this is not the part of the book in which the author is most interested. The description of all practical matters concerning farms and farmers is well written, and the numerous examples have a most realistic and practical appearance. How much more interesting it must be to find the volume of a "mangel pie" than of a mere prism!

C. G.

OUR BOOKSHELF.

Aids to Bacteriology. By C. G. Moor and William Partridge. Third edition. Pp. viii + 278. (London: Baillière, Tindall and Cox, 1916.) Price 3s. 6d. net.

THIS well-known little book, now in its third edition, contains an extraordinary amount of information within a small compass, though necessarily in a condensed form; in fact, the whole range of subjects included under the term "Bacteriology" is covered by it. Migula's classification of the Bacteria now replaces that of Heuppe, and as regards bacterial mutability, the authors remark that this is largely of academic interest, and that in practice species tend to crop up fairly true to type. Antibodies, apparatus, culture media and methods of examination are surveyed, and all the principal pathogenic bacteria and protozoa are described. In addition, the moulds, yeasts, fermentation, and enzymes are dealt with as well as the bacteriology of water, milk and other foods, air, soil and sewage, and disinfection and disinfectants; little seems to have been missed and few errors occur. It is a pity that *B. perfringens* as a synonym for *B. Welchii* is not mentioned, for it is so commonly used now. Agricultural bacteriology has two or three pages devoted to it, including nitrogen fixation, nitrification and sterilisation of soil. The filterable viruses are dealt with, and some recent work on the meningococcus and other topics is referred to in a brief appendix. Altogether we may congratulate the authors upon having compiled an exceedingly comprehensive and useful little book.