

no doubt that the use of the air-brush can be well learnt from this treatise. There are, however, many who would still prefer the older method of brush treatment.

P. L. M.

Applied Mathematics for Engineers. By T. Hodgson. Vol. 3: *Differential Equations with Applications.* Pp. viii + 320. (London: Chapman and Hall, Ltd., 1931.) 13s. 6d. net.

FOLLOWING the very lucid and interesting application of the calculus to dynamics, given in vol. 2, Mr. Hodgson has produced an excellent sequel in the present volume. The course has been thoroughly well planned and clearly dealt with. The subject matter embraces ordinary equations, simultaneous linear equations, partial differentiation and equations, with two good chapters on double and triple integration and spherical trigonometry.

The theoretical aspect has been well developed, though not, perhaps, with the strict rigour so dear to the pure mathematician, for this would be quite out of place in such a book. Nevertheless, just as much theory as is essential to the intelligent understanding of fundamental processes is given, so that the engineering student need no longer be a mere seeker after ready-made formulæ, but may acquire an efficient mathematical equipment by which he can be certain that his calculations are based upon a sure foundation. The chapter on partial differentiation is a striking example of the skill by which the author develops the theoretical basis. An index is unfortunately omitted from the *y* in the sixth line from the bottom of p. 80.

Not the least interesting part of the book is its manifold applications. These are carefully selected and demonstrated with great clarity. Beginning with the usual deflexion of beams, the author leads on to thermodynamic problems, harmonic analysis, and alternating currents, which are dealt with by vectors, by complex quantities, and by the Steinmetz operator. Numerous exercises for the student are also provided and these have evidently been carefully selected so that few problems of purely academic interest have been included.

- (1) *The Macmillan Table Slide Rule.* By Prof. J. P. Ballantine. Pp. 4 + 4 slides + 4 plates. (New York: The Macmillan Co., 1931.) 2s. 3d.
- (2) *Natural Trigonometric Functions to Seven Decimal Places for every Ten Seconds of Arc, together with Miscellaneous Tables.* By Howard Chapin Ives. Pp. vi + 329. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1931.) 45s. net.

(1) FOUR plates contain five figure tables of 10° , 10^{10° , arc sin 10° , arc tan 10° . The four slides consist of tables of 10° , 10^{-x} , 10^{2x} . By aligning the slides on the appropriate plate all the usual slide rule calculations which depend on log x and log log x can be performed. The alignment needs great care if a wrong reading is to be avoided.

(2) The main table gives on 270 pages natural sines, cosines, tangents and cotangents for every

10 seconds of arc, each page covering a range of 10 minutes of arc. The functions corresponding to an integral number of minutes are more boldly printed. The effect is pleasing and makes the table convenient in use. First differences and proportional parts are also given. The remainder of the book contains various subsidiary tables connecting chords, arcs, radii and central angles in a circle, adapted to the use of railway and road engineers. The book concludes with trigonometrical formulæ and an explanation. The origin of the values in the main table is not mentioned. The author states that the manuscript was twice checked and the proofs read four times and by three persons. The binding is strong and the printing is excellent.

L. M. M.-T.

Motor Benzole: its Production and Use. By W. H. Hoffert and G. Claxton. Pp. xxi + 689. (London: The National Benzole Association, 1931.) 25s.

FARADAY discovered benzene, Perkin made synthetic dyes from aniline; it was found to be an easy step by nitration and reduction from benzene to aniline. Benzene became ennobled, the world preened itself in a coat of many colours, and birth was given to the great dyestuffs controversy which, perhaps, has now found an honourable senescence amongst the acts in the Expiring Laws Continuation Bill. Now a new child has been born, motor benzole, with a more aristocratic name. After one or two false starts in 1903 and 1907, it became an established fact as a fuel in 1913, and now National Benzole pumps are to be seen every few hundred yards on our highways. The proportion of the total production used—Prof. H. E. Armstrong terms it misused—by the motorist increases each year, and considerably exceeds that required by the dye-maker, who, however, has to pay the higher price based on the fuel value of the spirit.

Benzole is extracted in gas works and coke ovens, but nothing like the total quantity possible is recovered. Some day a commercial synthesis of benzene will be achieved. It takes a book of more than 600 pages, including 120 tables, to tell us about motor benzole from every aspect of practice and theory. It is authoritative since it is prepared under the auspices of the National Benzole Association, which has established a highly competent research department.

The Problems of Evolution. By Prof. A. W. Lindsey. Pp. xiii + 236. (New York: The Macmillan Co., 1931.) 8s. 6d. net.

THE object of this essay is to show how impossible it is to separate heritage and environment in the study of evolution. This involves the author in a discussion of the inheritance of acquired characters, and references are given to much recent research. The limitation in its application to the methods of evolution lies in the difficulty of associating the responses of somatic structures with the germ cells. The book will be useful to teachers and students of biology for their lighter reading. They must be critical, and they should try some experiments for themselves.