Review

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REVIEWS.

Elliptic Integrals. By HARRIS HANCOCK. Pp. 104. Price \$1.25 or 6s. net. 1917. (New York: John Wiley and Sons; London: Chapman and Hall, Ltd.)

This is No. 18 of the "Mathematical Monographs" edited by Merriman and Woodward, and will be found an exceedingly useful introduction to what is a rather attractive subject to a student who is interested in the technical work of integration. The volume relates almost entirely to the three well-known elliptic integrals, with tables and examples showing practical applications, and, to keep the work within limits desired by the editors, the subject is what is known as the Legendre-Jacobi theory, and the discussion is almost entirely confined to the elliptic integrals of the first and second kinds (p. 5). There is a short account of the elliptic functions which emphasises their doubly periodic properties, but there is no account of the derivation of the addition-theorem for elliptic integrals. "The underlying theory, the philosophy of the subject, I have attempted to give in my larger work on elliptic functions, vol. i." (p. 6).

PHILIP E. B. JOURDAIN.

Functions of a Complex Variable. By T. M. MACROBERT. Pp. xiv + 298. 12s. net. 1917. (Macmillan.)

The theory of functions of a complex variable embraces so large a field that it is not surprising to find great diversity in the text-books and treatises that deal with it. Durège, Forsyth, and Kowalewski, for example, present very different treatments of the same topic, the emphasis of the author's preference for a particular aspect of the subject being more marked in the smaller works. Mr. MacRobert's aim is to cover a wide range in a book of very moderate dimensions; he thus meets an obvious need, but inevitably sacrifices the interest that would attach to a study from some specially selected standpoint. The book will be very useful to the student who has to be economical in the apportionment of his time to various claims; but it is not likely, of itself, to grip the imagination and kindle enthusiasm.

It may arise merely from personal predilection that one feels disappointment at the brief treatment of the geometrical representation of functions. Apart from the importance of its applications, there is strong appeal to the imagination in the theory of conformal transformation; and for some there is fascination in the Riemann representation of multiform functions. Yet the Riemann surface is not mentioned throughout the work.

But if there had been more geometry there would not have been room for the theory of analytic functions, the convergence and uniform convergence of series, the gamma functions, elliptic functions, linear differential equations, hypergeometric, Legendre and Bessel functions, all of which meet with adequate clear and well arranged treatment. In preferring analysis to geometry the author is not out of the fashion.

Generally the exposition is lucid and succinct. Perhaps one may be allowed to cavil at the treatment of infinity. When, after distinguishing between the value of $f(z)$ at a point z_1 and the limit of $f(z)$ for $z \rightarrow z_1$, an illustration of discontinuity is introduced by the words "if $f(z_1)$ is infinite," one feels that there is confusion, what is meant being "if $f(z)$ becomes infinite as $z \rightarrow z_1$ "; but few writers handle infinity with the precision of language that is desirable in the interests of the student. This instance is given, not as a type of Mr. MacRobert's style, but as an exception to the general carefulness of his phraseology.

The book contains a large number of illustrative examples, some fully worked out, others left to be worked by the reader. These are well selected, and will be valuable to both teacher and student. Indeed, general utility is the outstanding feature of the work. By careful arrangement and by adapting his exposition to the needs of the beginner in the subject, the author enables such a reader with the minimum of difficulty to become acquainted with the outstanding features of a wide region of new and interesting mathe-

mathematical thought. Mr. MacRobert is particularly to be congratulated on his success in combining comprehensiveness and brevity without sacrifice of clearness.

J. G. LEATHEM.

Elementary Science for Engineering Apprentices. By W. M^BRETNEY. Pp. v+74. 1s. 1917. (Longmans, Green.)

This covers the Science syllabus usually followed in the Second Year Preliminary Technical Course, and is designed to help (a) the secondary or elementary school teachers who are employed to take apprentices in evening classes, and who may be unfamiliar with the practical applications; (b) the engineering draughtsman who has undertaken the same work but is not a teacher by experience and training; and (c) the apprentices. To contrive this triple debt to pay is not an easy task, but it seems to us that the author's effort is quite creditable, and that this little book probably gives just what is needed for the purpose.

The Art of Teaching Arithmetic. By J. B. THOMSON. Pp. viii+295. 4s. 6d. (Longmans, Green.)

Miss Thomson lives in a land where "teachers" are yet to be found who conceive it their duty to cane a child who produces a wrong answer to a sum. To pass from the stifling atmosphere, connoted by such an attitude towards the child mind, to the fresh breezes that make their influence felt in most pages of her book is to cross a gulf of ignorance and prejudice, a gulf of terror and of tears. The book is clearly the outcome of patient thought, of experience, and of psychological insight. It brims with sympathy for the budding mind ever brought face to face with new problems, and for the teacher—often temporarily helpless in the simultaneous task of dealing with flesh and blood, of devising ways and means of explaining difficulties, of creating and sustaining interest, and always subject to the descent from "above" of authority that is not always discriminating or even always intelligent. The book, says Miss Thomson, is not for the mathematical specialist. With all respect we venture to say that it is distinctly a book for the mathematical specialist who has to deal with the infant mind. He may wish to, or indeed may have to, teach his own children, and at any rate he will desire to know if they are being taught upon wise and well-thought out principles. He may blush when he sees Miss Thomson asking for decimals like £3.48527. He may wonder why (p. 161) in finding the H.C.F. of 96 and 128 she has not taken her class on a game of hide and seek for the factors that are ever so cunningly concealed in these numbers and also in 128—96, *i.e.* in 32 (the "still there" game); or if in 57 and 15, these "still there" in $4 \times 15 = 57$, *i.e.* in 60—37, *i.e.* in 3, and surely when you know your prisoner is in 3, you can round him up swiftly and deftly. He may shudder at the old-fashioned methods for L.C.M. as well as H.C.F., methods that (*v.* top of p. 163 and foot of p. 164) most surely mask what is really being done in the processes. But apart from such blemishes he will find many things of which he has never thought, and of which he could not be expected to think unless circumstances had brought him face to face with them.

We may not agree on all points with the author, but our differences are not differences of principle. The right spirit informs her work, and the wider spread of such volumes as these must lead to the healthy differences of opinion which ensure progress in the one direction we care about—that its rightful heritage of sane instruction shall be secured to the youth of our land.

Mathematical Papers for Admission into the R.M. Academy and the R.M. College. Feb.-July, 1917. Edited by R. M. MILNE. Pp. 30. 1s. 3d. 1917. (Macmillan.)

The regular appearance of this collection is a matter of satisfaction to teachers in Army and other classes. The answers to each paper are appended.

The Principles of Rational Education. By C. A. MERCIER. Pp. 87. 2s. 9d. net. 1917. (Mental Culture Enterprise, 329 High Holborn, W.C. 1.)

Dr. Mercier's contribution to the great controversy on education is like everything else from his pen—trenchant, informing, and stimulating. He