

the remote epoch when it diverged from the Nilotic culture, and Mr. and Mrs. Hawes's little book is designed to instruct those who wish to know the story of its origins. *Felix qui potuit rerum cognoscere causas.* Religious ideas have largely directed the general interest in our origins towards the "Biblelands," whence sprang the exotic oriental religious element in our culture, but the growth of knowledge and of civilisation is steadily weaning us from our Semitic and mediæval foster-parents, and interesting us more and more in Greece and Rome, the real parents of our minds and thoughts; and the origin of Greece and of Rome was Crete, and Crete may have sprung from the same common source as Egypt.

Of the Egyptian inspiration which we see in the early art of Crete the authors of this little book say little. They have no space in which to discuss disputed points, and their personal bias is, perhaps, rather away from any even so-called "oriental" influences (we do not admit, by the way, that Egypt was ever "oriental" in the sense that the Semitic world was and is). They merely describe what has been found in Crete and is to be seen there, either in the ruined palaces of Knossos and Phaistos, or in the towns of Gournià and Palaikastro, or in the museum of Candia, where the treasures found in the course of the excavations of these places are preserved. They conclude with a chapter on Cretan (Minoan) art which strikes us as very correctly appreciative of the peculiar genius of the earliest European artists, so unequal in quality, so good, so magnificent in conception and workmanship at times, at others so weak; yet honest and free, unshackled by any of the conventions that bound the artists of Egypt and Assyria (who, but for these conventions, would have done as well as the Minoans), and the worthy ancestors and forerunners of the artistic genius of Hellas. On this we must always insist; the Minoan art of Greece was the ancestor of that of the Hellenes, who inherited their artistic genius, not from the Indo-European Greek-speaking northern originators of half their blood, but from their other ancestors, the ruddy non-Aryan Mediterraneans, brothers of the Egyptian and of the Etruscan. It is from these, albeit we ourselves in the north have little or none of their blood in our veins, that we have derived most of what makes us civilised beings.

#### PRACTICAL CURVE TRACING.

*Practical Curve Tracing, with Chapters on Differentiation and Integration.* By R. Howard Duncan. Pp. vii+137. (London: Longmans, Green and Co., 1910.) Price 5s. net.

THE methods employed in this book, which presents an attractive appearance, are almost entirely independent of the aid of general mathematical principles. For instance, the form of the graph of  $y=ax+b$  and its dependence on  $a$ ,  $b$  are explained by plotting graphs of the equations obtained by varying  $a$  while  $b$  remains constant, and then those obtained by varying  $b$  while  $a$  remains constant.

NO. 2119, VOL. 83]

Naturally greater difficulties occur in handling the equations  $y=ax^2+bx+c$ ,  $y=ax^3+bx+c$ , &c., by the same method. Inexpert mathematical students of the type for whom the author writes find it very hard to get hold of the notion of a parameter, and a great deal could certainly be done by adopting the plan indicated above, and steadily followed in this book. Even the ordinary student of analytical geometry would probably get at "the facts of the case" sooner if he approached, for example, the equation  $x^2+y^2-ax-b=0$  by drawing graphs of the circles of the specified system, keeping  $b$  a positive constant and giving  $a$  various values, then keeping  $b$  a negative constant and varying  $a$ .

It is this positive and distinct advantage that is emphasised by the author, and from this point of view are discussed the parabolic, hyperbolic, exponential, and logarithmic curves, together with the sine curve, of the natures of which a good account is given. For students of graphs who have at their disposal algebraic machinery up to division and quadratic equations, the road to a knowledge of the forms of many graphs could be made shorter. The artifices of change of origin and scale-unit, even without those of successive approximation, do not offer a great difficulty to a student of small mathematical ability, and go a long way towards establishing the rough form of the graph of an equation which would appear alarming if it had to be discussed by the plotting of points.

Two chapters on the calculus are added to those on curve tracing. The author knows that "the method of measuring the slope of a curve by actually drawing the tangent is sometimes objected to on the ground of inaccuracy"; but his experience "shows that by good and careful workmanship it is possible to rely on the results so obtained to a degree of accuracy which is sufficient for practical purposes." Yet the degree of accuracy indicated in some of the results tabulated in the chapter on differentiation must be very difficult to attain. Indeed, curves of  $y=x^2$ ,  $y=x^3$ , &c., are constructed, tangents are actually drawn,  $dy/dx$  and  $x$  are tabulated and then plotted against one another directly or logarithmically, with so much accuracy that the rules for the differentiation of  $x^n$ ,  $e^x$ ,  $\log x$ ,  $\sin x$ ,  $\cos x$ , are deduced. The reader certainly will have it very definitely impressed upon him that  $dy/dx$  measures the slope of a curve. Of course, there remains the difficulty for an engineer, or any other who applies the calculus, of being able to identify the slope with the rate of variation of the corresponding function, and of appreciating the very varied significance of the derivative in its applications; but the book does not profess to enter on this field.

A few examples on each chapter are gathered together at the end of the volume, the purpose of which is evidently that the reader should be clear regarding the facts at the base of the equations and functions discussed before he sets out to equip himself in the practice and applications of the methods explained.

P. P.