in the introduction reproduced in Hattendorff's first edition, a science of physics (or more literally "a scientific physics") first existed after the discovery of the differential calculus. A sound knowledge of the differential and integral calculus is assumed in this book, but in Germany such a knowledge is acquired by the majority of students at the commencement of their academic curriculum, a stage where, in this country, many students are still attending lectures on fractions, highest common factor and Euclid. Those possessing the necessary preliminary training will find in Weber's new edition of Riemann an excellent introduction to the methods of applying mathematical principles to the problems of modern physics.

G. H. B.

THE CLASSIFICATION OF EARS.

The Human Ear, its Identification and Physiognomy.

By Miriam Anne Ellis. Pp. x+225. (London: A. and C. Black, 1900.) Price 3s. 6d. net.

A SIMPLE, workable, absolutely trustworthy system is still urgently wanted for the detection of criminals, and if the authoress of this book has succeeded she certainly deserves the thanks of all the Governments of Europe. Whatever worth her method may have when it comes to be applied practically, it has some decided drawbacks when the data are examined on which it is founded.

It so happened that about seven years ago the reviewer came to the conclusion that the external ear ought to yield some clue to the relationship of man and ape, and of one race of man to another. As is well known, the characters of the ear are fully inherited, and afford fairly trustworthy clues to family relationship, of which the authoress gives some good illustrations. Founding his method of observation and classification on data derived from a study of the development and comparative anatomy of the external ear, the reviewer proceeded to examine by hundreds the various peoples and races living on the shores of the North Sea, first on the Continental side, then on the British, to see how far the data he accumulated would support the semi-traditional accounts available concerning the early Saxon invasions of Britain. These observations were continued into the Highlands of Scotland, to Ireland and Wales. To test the "criminal-mark" theory of Lombroso and many others, he examined the ears of more than 800 confirmed criminals, and of more than two thousand inmates of asylums for the insane, situated in parts of the country where he had already examined the ears of the sane. Altogether the ears of more than 40,000 people of different races and of different moralities, besides those of about 300 apes and anthropoids, were examined, but the total results of this elaborate investigation were almost entirely of a negative nature.

The authoress appears to take it for granted, and evidently has not inquired into the matter, that the ear of the criminal is peculiar. If the reviewer's methods and observations are correct, the confirmed criminal's ear is the ear of the average inhabitant of Great Britain. Nor did the ears of the insane differ, on an average, from those of the people from which they were drawn, and if the authoress had carried her observations over a number

of men of genius or of high ability, instead of drawing elaborate deductions from single observations, she would probably have arrived at a similar conclusion as to them.

The great difficulty in a matter of this kind is to arrive at a method of classification, and it is in this that all the systems propounded break down when applied practically, and the system propounded here is worse than those that have gone before it. In her classification, the first division is a separation of ears into (1) large; (2) medium; (3) small. Unfortunately, she proposes no definite measurements, but if she did it would be found that a great proportion of ears fell on the limits of the medium line, and it would be a matter of the greatest difficulty to say to which of the great divisions it belonged. There is another great obstacle to the application of measurement of the ear to detection of criminals, of which the authoress is unaware. As Schwalbe showed years ago, and as the authoress may verify any quiet half hour during sermon time, the ear, in the later decades of life, undergoes a very considerable growth—enough to shift the ear of a woman aged forty from the medium division to the large division when she is aged sixty.

The authoress has used one of the most variable and untrustworthy features of the human ear for the purpose of subdividing and indexing the forms in which it is found. She detects in its helix (the upper and posterior border of the ear) five divisions, separated by indentations more or less marked. The three great groups of large, medium and small ears are subdivided according to which and how many of these divisions of the helix are present. In many cases no two observers would agree as to the number of helical subdivisions present, which is not remarkable when it is remembered that the helix on the posterior border is a vestigial structure, the result of the infolding of the free margin of the ear. The amount of infolding does not indicate, as the authoress supposes, certain psychological peculiarities, but merely the degree of retrogression in the ear examined. Like all truly vestigial structures, the infolded margin of the helix is subject to such a variety of forms that it defies classification.

One or two interesting, although minor, points might also be mentioned. The statement that the length of the ear depends on the length of the nose, and that the measurement of the one is identical with that of the other, will be found, on trial, to be the exception and not the invariable rule. In most anatomical works the relation of the breadth to the length of the ear is used as a method of classification; quite a useless one, in the reviewer's opinion. The statement made here is that "the width of the pinna should be at its middle part exactly half its length. . . . Any deviation from these exact measurements at once forms a valuable aid in identification." The scientific part of this book was read in the Anthropological Section at the meeting of the British Association at Bristol in 1898, and many of the observations it contains were made on the ears of eminent men of science. The authoress proposes the term of "otomorphology" to cover the science of the external ear, but from the phrenological character given it by this work perhaps the name of "earistry" were better.

A. KEITH.