

ance, even to those with but a slight acquaintance with botany, and there can be no doubt that the authors have provided a work that will supply a real need.

Perusing these pages, it is of interest to note the representation of the various groups. Compositæ are, of course, by far the largest, while Leguminosæ, Iridaceæ, Cyperaceæ and Orchidaceæ follow. But the Ericaceæ are represented by one more species than the orchids, and no less than 102 are species of *Erica*. Another well-represented genus is *Oxalis*, with thirty-three species, of which all but a third are cited as frequent to very common, and only two as very local and one as rather rare. The species of *Erica* afford a striking contrast; only about a quarter are frequent or common, about thirty-two are occasional, sixteen species are local or very local, and twenty-five exhibit varying degrees of rarity and seven species have already become extinct. Here the need for active preservation, before it is too late, is obvious. Of the Proteaceæ, forty-three species are recorded as belonging to nine genera, of which about two-thirds are still frequent to common, a quarter grow occasionally or only locally, while nearly a fifth are rare to very rare. The Restionaceæ and Arizoaceæ are both well represented, the latter by ninety-four species, the former by eighty-six species, of which many are only found occasionally and a number are rare.

A ten-page introduction includes an all too brief account of the habitat conditions from which the absence of any consideration of the soils is to be deplored.

The text is clearly printed and the keys are easy to consult; and, having regard to the size of the work, the price is not unreasonable, doubtless due to the assistance afforded by the South African Council of Scientific and Industrial Research and the University of Cape Town, to which, as to the authors and editors, those interested in the flora of the Cape Peninsula owe a debt of gratitude.

E. J. SALISBURY

THE MATHEMATICS OF INTELLIGENCE

Human Ability

A Continuation of "The Abilities of Man". By Prof. C. Spearman and Prof. Ll. Wynn Jones. Pp. vii + 198. (London: Macmillan and Co., Ltd., 1950.) 16s. net.

"HUMAN ABILITY" was designed by the late Prof. C. E. Spearman as a continuation of the "Abilities of Man", published in 1927. Of the earlier book, an anonymous reviewer (*Nature*, 120, 181; 1929) regretted that "... it is distinctly written for the layman, and he is expected to take many things on faith. He has to trust Prof. Spearman's mathematics and still more Prof. Spearman's arithmetic". Prof. Karl Pearson—for anonymity was no disguise, and the review is included in Morant's bibliography of his writings—was not prepared to trust either, and expressed his lack of confidence at some length elsewhere. It is to these controversies of the 'twenties that readers of "Human Ability" will find their attention often returning. It is not that later work is unacknowledged—the literature of the past twenty-five years has, in fact, been very fully ingested, if not always completely digested—but that this work is presented as a series of purely technical extensions of

method and that important differences of opinion which have emerged about the status of mental factors are scarcely touched on.

Briefly, Spearman's thesis was that the uniformly positive correlations observed between different mental tests could be—and, for economy of hypothesis, should be—explained by two kinds of factor, a general factor G common to all the tests, and a series of specific factors S , each related to a single test. Later, other factors were admitted, which were intermediate in range, being represented in several but not all of the tests. "Human Ability" is partly a recapitulation and partly an attempt to bring the story up to date, describing the development of factor analysis at the hands of Spearman and others, and replying to the various criticisms which have been raised. In the latter part of its purpose, the book is not entirely successful. It is disappointing to find the interpretation of factors considered only in a narrow sense, and the biological reference of these statistical entities dismissed as "metaphysics". Similarly, the objections considered are largely those raised by Pearson and Thomson to the original two-factor theory—not the more radical criticism which in recent years has attacked the whole conception of factor analysis. On the technical side, the book will scarcely stand comparison with the accounts given by Thomson or by Holzinger and Harman, and it has less general interest than Burt's "Factors of the Mind" or Spearman's own earlier works. For the student some introduction to the subject from other sources is indispensable before reading "Human Ability".

The defects of the book are to some extent accounted for by the fact that it was unfinished at the time of Prof. Spearman's death; and Prof. Ll. Wynn Jones, who as part-author prepared the book for publication, has treated an incomplete text with almost excessive reverence. Many parts of the book seem to lack any consecutive theme; and it is difficult to believe that the brief paragraphs on the use of matrix algebra—to take one example—were meant to be published as they stand. If the book is in places little more than a skeleton, the bones are at any rate elaborately clothed. Prof. Spearman's crusading zeal is fully evident—in his comments, for example, on the extensive use now made of mental tests: "Voices are becoming more and more insistent", he writes, "... that the sway of the tests must be extended over the whole national man-power, woman-power, and child-power", a situation which "would appear to be promising, but not free from danger".

Many psychologists are more impressed by the danger than the promise; but whether we agree with Prof. Spearman or not, his views have been extremely influential, and no one interested in human abilities can afford to neglect his writings. Pearson credited him with "the merit of directing attention to the subject", and it is a subject in which interest has grown continuously. Pearson's fear that Spearman's advocacy would "do more harm than good if it leads the non-mathematical psychologist to believe that the author has proved his hypothesis" has fortunately not been confirmed. Non-mathematical psychologists who have interested themselves in the theory have been as active in criticism as in acceptance; and latterly, non-psychological mathematicians have made their contribution to the debate. Both have found in Spearman's work the stimulus of a coherent theory, but neither has been disposed to take much on trust.

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