Mr. Heaviside's treatment of Bessel's functions is interesting and suggestive, but the lack of formal arrangement is here severely felt ; it is not always easy to distinguish clearly between what is proved and what is experimentally assumed to see how it goes as Mr. Heaviside puts it. The student who is previously unacquainted with the properties of these functions will probably find difficulty in following some of the equations written down without proof. In the equation for $K_0 (qx)$, p. 226, for example, all the information given about γ (Euler's constant, but not distinguished as such) is "where $\gamma = 0.5772$ is a certain constant introduced to make $K_0 (qx)$ vanish at infinity"; certain of the conjugate relations are also without proof, but these possibly are left as exercises for the student.

The work is nevertheless one which will well repay careful attention. As has been remarked by Prof. De Morgan :

"The history of algebra shows us that nothing is more unsound than the rejection of any method which naturally arises, on account of one or more apparently valid cases in which such methods lead to erroneous results. Such cases should indeed teach caution, but not rejection."

Mr. Heaviside is much to be congratulated on the light he has thrown on difficult and perplexing questions in both physics and mathematics, and also for calling the attention of mathematicians to a powerful, but somewhat neglected, weapon.   C. S. WHITEHEAD.

OUR BOOK SHELF.

Catalogue of the Lepidoptera of Northumberland, Durham and Newcastle-upon-Tyne. Part I. By J. E. Robson. *Nat. Hist. Trans. of Northumberland, Durham and Newcastle-upon-Tyne*, Vol. xii. Part I. Pp. 195.

THE present instalment of this important catalogue includes the butterflies, together with such of the moths as are comprised in the *Sphingina* (hawk-moths), *Bombycina*, and *Noctuina*. In his classification the author thus far follows Mr. Barrett's monograph of the British Lepidoptera, to the unpublished portions of which he has been supplied with references by Mr. Barrett himself. Whatever faults there may be in the scheme of classification in question, and the nomenclature employed therein, the adoption of a uniform system by different writers is highly desirable ; and we, therefore, consider that Mr. Robson has been well advised in the course he has adopted.

As the author has had the advantage of the cooperation of all the local collectors of repute, his work may be regarded as a thoroughly up-to-date account of the Lepidopterous fauna of the northernmost counties of England. And how different this fauna is from that of the midland and southern counties may be gathered from a glance at the portion devoted to the butterflies. The common Brimstone Butterfly, for example, is only known in the area treated of by two or three stragglers, its normal range not extending northwards of South Yorkshire. Much more remarkable, however, is the circumstance that certain species of butterflies, such as the Comma and the Red Admiral, which were once common in the two counties, have for the last forty years been extremely scarce, although the second of the two mentioned has once again become a familiar object since 1893. It would be interesting to know the reason why so many of these insects left the district during the

sixties ; but on this point the author is silent. On the other hand, as might perhaps have been expected, migratory species, such as the Clouded Yellow and the Camberwell Beauty, which visit England at uncertain intervals in larger or smaller numbers, commonly travel into the northern counties ; the author remarking of the last-named insect that it "visits these counties on most of those rare occasions when a wandering horde strikes our shores." Of the moths, it must suffice to say that the Death's-head has occurred in both counties, and there is reason to believe has bred in them, but that the stock is probably maintained by immigration from the south.

The foregoing instances demonstrate that Mr. Robson's work is very far from being a mere dry catalogue ; and that it really teems with interesting observations on the life-history and distribution of all the species recorded. If the sequel be maintained at the same high level, the complete catalogue ought to prove a very important contribution to entomological literature.   R. L.

The Process Year-Book for 1899 (" Penrose's Pictorial Annual "). Edited by William Gamble. Pp. viii + 108. (London : Penrose and Co., 1899.)

THIS is the fifth year's issue of this most excellent review of the graphic arts, and the editor, together with all his co-workers, are to be congratulated on the production of such a handsome and interesting volume.

As in former years, most of the articles are written by those who are at work in some line of process work, and as these are by no means few in number, the reader is made acquainted with a great amount of experience which may help him to success in the future. The feature of the book is undoubtedly the beautiful illustrations, which bring home to the reader the high state of excellence that the art of reproduction has reached at the present day. All kinds of subjects, from a stellar cluster down to an orchid, are illustrated, and these serve as types for showing the results obtained by the working of different processes.

The high order of merit attained should not only render the book a valuable aid to the process worker and others interested in the art of reproduction, but should find many other friends who would delight to possess such a charming collection of high-class illustrations.

Mathematical Tables. By James P. Wrapson and W. W. Haldane Gee. Pp. 28. (London : Macmillan and Co., Ltd., 1899.)

THIS set of useful tables in a compact form are abstracted from the compilers' larger volume of " Mathematical and Physical Tables." The idea of this present issue is to place before students tables which are suitable for the class and laboratory, and which give sufficient accuracy for such computations.

To sum up the contents, we have four place logarithms and antilogarithms, natural sines, cosines, and tangents, with interpolation to 1'. Logarithmic sines, cosines, and tangents with differences also to 1'. Tables of squares, exponential functions, weights and measures, and finally a table of conversion for the last mentioned.

Opinions et Curiosites touchant la Mathématique. By G. Maupin. (Paris : Carré et Naud, 1898.)

THIS is a collection of curious ideas and essays, which the author has encountered in the course of much heterogeneous reading in ancient scientific works, in which there has been found any reference however remote to mathematical thought. Paradoxes and absurdities alone seem to be considered worth inclusion ; the book is of little or no use as a contribution to the history of mathematics.