

three colour as represented a year or two ago at the Royal Institution by M. Gaumont, with such amazing fidelity to the colours of Nature.

Space is not available for more than a bare recitation of some of the things described or illustrated; sufficient, however, has been said to show that a most interesting and attractive book has been produced.

On p. 171 reference is made to a difficulty met with when photographing live microbes in consequence of their being killed by the heat from the concentrated beam from the powerful arc lamp. The use of a water cell in the beam is described as a method of reducing this trouble. While the ever-repeated fallacy of alum solution finds no place here, the author or Dr. Comandon, whose work is being described, do not appear to have known of the use of freshly-prepared solution of FeSO_4 , of such a strength that its colour is just visible, as an effective heat absorber.

C. V. BOYS.

EARLY FOSSIL BRACHIOPODS.¹

THE work before us, which treats of the Cambrian brachiopods of the whole world, must arouse the admiration of all who understand the difficulties of a comprehensive palæontological study of such magnitude. It is a splendid monument to the ability and perseverance of its eminent author, whose previous reputation as an investigator of the Cambrian faunas was so widely established as not to need the further proof afforded by these two handsome volumes. It is a matter both for surprise and congratulation that Dr. Walcott has found opportunity, amidst his many activities, to bring to completion a task so overwhelming: small wonder that it has occupied his available time for ten years or more.

If the wealth and good preservation of the Palæozoic Brachiopoda found in North America has provided an abundance of material favourable for study, how worthily have the palæontologists of the United States utilised their advantages! It may be granted that they owe some measure of their success to generous practical support and to freedom from conservative traditions in the matters of outlook and treatment of their subjects: these are advantages denied to most workers in Europe. Yet no consideration of such favouring circumstances can diminish our indebtedness to those brilliant investigators in the United States who have contributed so largely to the rapid advancement of modern palæontology in all its branches. For models of comprehensive systematic work, for suggestive and original phylogenetic studies, and for inspiring aid in applying the facts of palæontology to many problems of philosophic biology, we in Europe have become more and more accustomed to look westward. Dr. Walcott is one among several of his compatriots who have advanced our knowledge

¹ "Cambrian Brachiopoda." By Charles D. Walcott. Monographs of the United States Geological Survey, vol. li: part i., pp. 872+76 figs.; part ii., pp. 363+civ plates. (Washington: Government Printing Office, 1912.)

of the Palæozoic brachiopods in an extraordinary degree.

It is impossible for a single reviewer either to criticise in detail a work of such wide scope as the present monograph or to do justice to its merits. It must therefore suffice to indicate briefly some of its special features. In this book are described "44 genera, 15 subgenera, 477 species, and 59 varieties of Cambrian Brachiopoda," and "3 genera, 1 subgenus, 42 species, and 1 variety of Ordovician Brachiopoda." The descriptive part of the text occupies nearly 500 pages; yet, bearing in mind that this will remain the standard work of reference on the Cambrian brachiopods of all countries for many years to come, the author appears to have erred on the side of brevity. There are instances where the specific characters might with advantage have been set out more fully and the comparative observations amplified, though the appearance of an unduly meagre treatment may sometimes be owing to limitations in the material itself. The whole descriptive portion of the work affords ample evidence of the author's extensive knowledge and scholarly thoroughness. The 76 figures, chiefly in half-tone process, which are scattered throughout the text are clearly reproduced, while the letterpress is very well printed and edited.

The various tables in which are set forth synonymic references and the geographical and stratigraphical distribution of the brachiopods, are outstanding features of the work. The table of synonyms, giving the names now adopted set in a column alongside those previously applied to the same species, will be of great service to all workers in this field of study. Geographical distribution is shown in a synoptic table arranged according to continents and faunal provinces (pp. 114-122). Another elaborate table, giving the detailed stratigraphical distribution of the Cambrian and some Ordovician species, occupies 34 pages. This is arranged alphabetically according to states or countries, and contains a vast amount of concisely arranged information. Here are included summaries of many local or regional sections, with references to individual localities which are described in detail on subsequent pages: also lists of the brachiopods found at the various horizons and certain leading species of other classes.

The section of the work headed "Zoological Discussion" (pp. 291-326) is of importance to all students of the Brachiopoda. Here are to be found terminological definitions and an account of the morphological characters of the shells; also short chapters on evolution and classification, which strike us as unduly condensed. The bibliography (pp. 13-26) is very full, and should prove of great help to other workers. We miss here a reference to Mr. F. R. C. Reed's memoir on "The Cambrian Fossils of Spiti" (*Palæontologia Indica*), published in the summer of 1910, and the species of brachiopods there recorded are omitted from the descriptive portion of the text. Presumably that work appeared too late to be utilised;

but if this be the case, two years seems a too generous allowance of time to be occupied in passage through the press, to the exclusion of belated additions, even in the case of an elaborate monograph such as that under review. The volume of text concludes with a full and well-planned index, while there is the useful luxury of a second index at the end of the volume of plates.

Special praise must be accorded to the plates, upwards of 100 in number, which illustrate this work. These are well reproduced in colotype process from beautifully executed drawings, mainly by Miss Frances Wieser, of the United States Geological Survey. The careful and detailed work of the artist is a fine achievement. To many who have little acquaintance with the Cambrian brachiopods beyond the scanty assemblage found in our own country, the perusal of this volume of plates will prove a revelation. It is indeed astonishing to find that such a profusion of species had been evolved and such elaborate specialisation had been attained by many of them in those remote ages. One can only picture in imagination the long and slowly evolving lines of precursors of which no trace has yet been found.

Dr. Walcott deserves the warmest thanks of all palæontologists and geologists for a treatise which must long remain a classic. The public department which has issued the work in such handsome form is also to be congratulated. What higher service can such a department perform than thus to give practical encouragement to arduous scientific labour?
F. L. K.

THE TRANSMISSION OF PLAGUE BY FLEAS.

THE third Plague Supplement of the *Journal of Hygiene* maintains the high standard both of research and of editing set by the previous numbers. It contains eight good articles, chiefly by S. Rowland and R. St. John Brooks, on the bacteriology of plague and by A. W. Bacot on the rat flea. The former articles deal with the influence of cultivation in serum-containing media upon the virulence and immunising properties of the plague bacillus; upon the facility with which it is ingested by human leucocytes; and upon its virulence—all points of importance in regard to bacteriology in general. Mr. Bacot's most laborious and well-set-out researches upon the influence of temperature and humidity upon the pathophores and on the effect of vapours as insecticides deserve much commendation; but perhaps the most interesting article is by him and Prof. C. J. Martin on the mechanism and transmission of plague by fleas. They sum up a very careful paper by the following remarks:—

“Under conditions precluding the possibility of infection by dejecta it was found that two species of rat fleas, *Xenopsylla cheopis* and *Ceratophyllus fasciatus*, fed upon septicæmic blood, can transmit plague during the act of sucking, and that certain individuals suffering from a temporary obstruction at the entrance to the stomach were responsible for most

of the infections obtained, and probably for all. In a proportion of infected fleas the development of the bacilli was found to take place to such an extent as to occlude the alimentary canal at the entrance to the stomach. The culture of pest appears to start in the intercellular recesses of the proventriculus, and grows so abundantly as to choke this organ and extend into the œsophagus. Fleas in this condition are not prevented from sucking blood as the pump is in the pharynx, but they only succeed in distending an already contaminated œsophagus, and, on the cessation of the pumping act, some of the blood is forced back into the wound. Such fleas are persistent in their endeavours to feed, and this renders them particularly dangerous.”
R. R.

NOTES.

WE announce with deep regret the death on March 16, as the result of a motor accident, of Sir John Murray, K.C.B., F.R.S., the distinguished naturalist and oceanographer.

THE Right Hon. Sir Francis Hopwood has been appointed by the president and council of the Royal Society to a seat on the general board and executive committee of the National Physical Laboratory, in succession to Sir Arthur Rücker, F.R.S., resigned.

WE notice with regret a Reuter message from New York reporting the death on March 16 of Prof. E. S. Holden, director of the Lick Observatory from 1888 to 1893, and author of a number of papers and other works on astronomical subjects.

THE death is announced, on March 7, at seventy-three years of age, of Prof. Antonino Salinas, professor of archæology at the University of Palermo and director of the Archæological Museum.

PROF. J. G. ADAMI, F.R.S., Strathcona professor of pathology and bacteriology, McGill University, Montreal, has been awarded the Fothergill gold medal of the Medical Society of London for 1914, for his work on pathology and its application to practical medicine and surgery.

THE death is announced, in his sixty-seventh year, of Dr. E. J. Houston, one of the inventors of the Thomson-Houston system of arc lighting. He was twice elected president of the American Institute of Electrical Engineers, and was the author of more than fifty books, mainly on electricity and allied subjects.

PROF. F. KEEBLE, F.R.S., professor of botany, University College, Reading, has been appointed director of the Royal Horticultural Society's garden at Wisley, with the view of making it of more general practical service. Mr. F. Chittenden will remain in charge of the educational section, and Mr. S. T. Wright will continue to act as superintendent of the garden.

MISS A. CANNON, whose critical examination of Harvard College Observatory photographs has led her to the discovery of many new variable stars and other objects of interest, has been elected an honorary mem-