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A Manual of  
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Use of Students. By H.  
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D.Sc. F.G.S., &c. 2nd  
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tions respecting the distribution and occurrence of those bodies.

There is scarcely any phenomenon in the plant-world under the influence of light for the judging of which some new or essentially changed points of view are not gained through the theory here set up of the action of chlorophyll, and through the proof of the influence of light upon the respiration of plants. In the already mentioned memoir (in my 'Jahrbücher für wissenschaftliche Botanik'), with the preparation of which for the press I am now occupied, and which will bring into view the various forms of the hypochlorin needles, I hope to introduce some further details even in this direction.

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#### BIBLIOGRAPHICAL NOTICES.

*A Manual of Palæontology for the Use of Students.* By H. ALLEYNE NICHOLSON, M.D., D.Sc., F.G.S., &c. 2nd Edition. Revised and greatly enlarged. In two vols. Edinburgh and London: W. Blackwood and Sons, 1879.

THE study of fossil remains may be considered under different aspects—either in their biological relations, or in relation to the nature and succession of life in time, or as characteristic medals of different geological periods, or as explaining, from the known habits of closely-related forms, the conditions under which the various sedimentary formations were deposited. In whatever way we may wish to interpret them, a concise account of their nature and character is essential to the student of the life-history of the globe.

Few special treatises have been devoted to this subject, although notices of fossils occur in most geological text-books. The earlier works of Parkinson in 1811 and 1822, useful for their time, were twenty-two years later superseded by Mantell's 'Medals of Creation' (1844-54), which in its turn was followed (1860-61) by the more special work on Palæontology of Prof. Owen. Based upon the same principle as the latter work, the first edition of Prof. Nicholson's 'Manual of Palæontology' appeared in 1872, containing about 600 pages and 400 woodcuts.

With the exception of the omission of the last section, devoted to historical and stratigraphical geology, and which is, to some extent, embodied in the author's 'Ancient Life-History of the Earth,' in general arrangement the present edition is similar to the former; but it has been so thoroughly revised, greatly augmented, and largely rewritten, with the addition of nearly double the number of woodcuts, that it may be considered almost a new work, comprising a comprehensive account of the leading

principles and facts of the vast and ever-increasing science of Palæontology.

The work is divided into three parts: the first part contains a general introduction to the study of palæontology, and treats of the characters, formation, and succession of the aqueous rocks, geological continuity and contemporaneous deposits, the conclusions to be drawn from fossils, the respective value of the vertebrates, invertebrates, and plants as tests of geological age and position of strata, and the general succession and progression of organic types, with a tabular arrangement of the leading subdivisions of the animal kingdom. Some additional matter is distributed in the six chapters forming this part, as regards fossilization, the condition and mode of occurrence of fossils (which might have been extended), the replacement of organic and other substances by silica and carbonate of lime. The chemical and organic origin of flint and limestones is fairly explained, as also that of phosphate of lime, either disseminated or concretionary in the sedimentary rocks due to organic agency; but this does not account for the veins of apatite or phosphorite in Spain, Norway, and other places; and it may be doubted how far the thick deposits of apatite in the Laurentian of Canada are directly due to vital agency. The origin of the red clay of the Atlantic depths (p. 25) has been attributed to other sources than the disintegration of the tests of Foraminifera. The "colonies" of Barrande (p. 53), like those stated to occur in the Lake district, may perhaps be otherwise interpreted than by the explanation given (p. 54), when the contained fossils or the physical structure of the district is further investigated.

The second part, comprising the history of the Invertebrata and Vertebrata, forms by far the larger part of the two volumes (chaps. vii. to xlviii.); and of these two divisions the former naturally occupy the greater space, on account of their state of preservation, their comparative abundance and general distribution in the sedimentary strata, and "especially upon the ground that palæontological students are, as a rule, much more largely interested with the former than the latter."

The six subkingdoms of the Invertebrata are treated in a somewhat similar manner, although not upon any absolutely uniform plan, as to the general diagnostic characters and the characters of their respective classes and orders, their distribution or range in time, and to the part which any of them has notably contributed to the formation of the solid crust of the earth. A short summary is generally given of the principal fossil groups, the object being to select "for notice and characterization those *leading types* of each great group of fossils which may seem to demand mention on the ground of their being *common*, or in other respects, geologically or zoologically, of peculiar importance."

This object is carried out in the successive chapters. The Brachiopoda, from their importance, are fully noticed, as also the Lamelli-branchiata; the characters of the chief groups and genera and their geological range are also given. In noticing the peculiar mode of

attachment of one species of *Productus* (p. 457), by the twisting of some of the spines of the ventral valve round the column of a crinoid, we may mention that Prof. King, in 1850, had shown that some forms of *Strophalosia* were attached to other bodies by their long umbonal spines.

The Gasteropoda, Pteropoda, Heteropoda, and Cephalopoda are described in the same manner as the preceding orders of Mollusca. Under the Cephalopoda a classificatory table is given, adopted by M. Favre, which is primarily based on the presence or absence of an aptychus, with the new subgeneric names introduced by Waagen, Suess, and others for the comprehensive genus *Ammonites*, which hitherto have not been introduced into text-books. Although now accepted, "it must be admitted that it is generally impossible to refer particular specimens to these sections, unless they are in a state of unusually complete preservation, or the observer be provided with a very extensive *suite* of examples of a given form."

In treating of *Eozoön* the author speaks with caution, although he gives fully the characters by which its organic nature has been recognized. While briefly alluding to the opinions as to its non-organic origin, Dr. Nicholson does not consider that the arguments of Möbius are by any means decisive.

Under the Cœlenterata the division "Tabulata" is still retained. Although, as stated in this work and the separate memoir on the same group noticed in this Journal (Nov. 1879), from the researches of Verrill and Moseley, the "Tabulate Corals" are a most diverse group, and have reference to a structure not characteristic of any natural one, still, says Dr. Nicholson, "there remain some extinct groups of corals which may, in the meanwhile, be retained to form the section *Tabulata*, though their true affinities and systematic position are matters of great doubt" (p. 199).

*Codaster* and *Codonites*, which make a close approach to *Pentremites*, are placed in the Cystoidea, as advocated by Billings, and may be regarded as transitional forms between that order and the Blastoidea, and thus extending the range of the Cystideans to the Carboniferous. In describing the older fossil Polyzoa, the author makes some remarks on the position of some fossils referred to *Chætetes*, *Monticulipora*, &c.; some of the forms described under these names he considers really Polyzoa, while the tabulate forms of these genera may be regarded as being Actinozoa. The Secondary and Tertiary Polyzoa are so numerous and varied that only a brief and general review of the leading groups is given. The structure of *Heteropora* is described at some length, as it is considered to have an important bearing on the structure and systematic position of *Chætetes*, *Fistulipora*, &c.

Under the Mollusca it might have been useful to have given the sectional divisions of the important genera *Trigonia* and *Inoceramus*, and also of *Nerinea*. It may be noticed that *Anomia* and *Cyrena* occur in the Jurassic strata; and that the subgenus *Trivia*, typified by *Cypræa europæa*, stated not to occur in a fossil condition (vol. ii. p. 22), is found in the Craig deposits.

The descriptions of the five classes of Vertebrata occupy twenty chapters; but, from the fragmentary condition in which their remains frequently occur, a more general account of each class is given, with definitions of the orders and a brief notice of the leading forms of each, except in cases of special interest, which are more fully described.

Under the class of Fishes the author notices the bodies called "Conodonts" from the older Palæozoic rocks, and which have been variously referred to Mollusca, Crustacea, and Fishes. The latter affinity, as originally suggested by Pander, is supported by Prof. Newberry, who is inclined to the view that they are really the minute teeth of Cyclostomatous fishes allied to the living Lampreys and Hag fishes. A similar opinion is held by Mr. Hinde (in a paper to the Geological Society), from the examination of a large number of specimens from the Cambro-Silurian and Devonian rocks of Canada and the United States, who considers, notwithstanding the differences in minute structure, we should not reject altogether the probability that they may have belonged to a similar low type of fishes as the existing Myxinoids.

The elevation of the Platysomoid fishes to the "rank of a distinct division of the Ganoids," as given at p. 138 on the authority of Dr. Traquair, *does not* coincide with the views of that author, as no such proposition occurs in the unpublished paper referred to by Dr. Nicholson in the footnote of the same page. On the contrary, Dr. Traquair (in a letter to the 'Annals,' Dec. 1879) holds "that the Platysomidæ, as a family, are not really allied to the Pycnodontidæ, but are, on the other hand, so closely linked to the Palæoniscidæ by ties of structure, that wherever we place the latter family, thither the Platysomidæ must follow."

The remarkable forms of Vertebrata lately described by Professors Cope and Marsh from the rich fossiliferous localities of the Western Territories, and which have so largely enriched the museums of Newhaven and Philadelphia, are noticed. Of these the most important are the Sauranodontia, Pteranodontia, and Dinosauria among Reptiles, the Tillodontia, Dinocerata, and Brontotheridæ of the Mammals, and the Odontornithes among the Birds—which latter group will probably receive further elucidation from the forthcoming memoir of Prof. Marsh.

The third part, containing four chapters, is devoted to Palæobotany; but scarcely any thing more is attempted than to give a brief and elementary sketch of the general distribution of plants in time, to which is added a short summary of the chief forms of vegetable life which more particularly characterize each of the great formations. The subject instead of being botanically is geologically treated; so that only the main features of the successive floras from the Pre-carboniferous to the Tertiary are noticed. But little new matter has been added to this part; so that the account of the Carboniferous, Permian, Triassic, Jurassic, and Eocene plants remains nearly the same as in the former edition.

The work is well printed; the 722 woodcuts, with a few excep-

tions, are generally excellent; and, besides lists of the more important works relating to each great division, there is a useful glossary and copious index.

Notwithstanding every possible care, a text-book embracing so wide a field as the present one must occasionally present some shortcomings or omit some details which may be considered necessary; still the subjects are placed before the reader in a clear and concise manner by the author, himself a practical geologist and experienced teacher, fully conversant with the requirements of the student; and in this respect we consider he has succeeded in producing a very useful and well-arranged Manual of Palæontology. At the same time we cannot but regret that, even with the increased size and additional woodcuts, the publishers have so greatly advanced the price as probably to preclude its acquisition by some of those for whom it was specially intended.

*An Introduction to Animal Morphology and Systematic Zoology.*—Part I. *Invertebrata*. By ALEXANDER MACALISTER, M.B. &c. 8vo. London: Longmans, 1876.

*An Introduction to the Systematic Zoology and Morphology of Vertebrate Animals*. By ALEXANDER MACALISTER, M.B. &c. 8vo. Dublin, Hodges; London, Longmans, 1878.

THESE two books, although published at an interval of two years and under different titles, really constitute the two volumes of a single work. The author, no doubt for cogent reasons, having taken advantage of an offer, on the part of the Board of Trinity College, to bring out his second part as one of the "Dublin University Press Series," was compelled so to modify it and its title as to convert it into a separate treatise; and although the existence of a first part without a formal successor is always to be regretted from a librarian's point of view, we do not know that in the present case the students for whose use these books are specially intended need be very loud in their complaints.

The author's motive in preparing this work was to furnish students with a text-book of animal morphology, compiled, as he himself tells us, from the most recent and authoritative writings upon the various groups of the animal kingdom. Thus he makes no pretence to originality, but has brought together from scattered sources the information that appeared to him necessary to convey a clear idea of the structure of animals, and the classification founded upon its peculiarities and differences, in order, as he says himself, to bridge over, as far as practicable, that gap which he finds not unnaturally to exist between ordinary manuals of zoology and the "monographic literature" of the subject. That he has done this with considerable success must be admitted: and the success is well deserved; for the labour expended in bringing together such a mass of material must have been immense, even leaving out of consideration the further task of working up the materials when collected into a compact whole, in the mode of performance of which we see