

REVIEWS.

Forms of Animal Life. By GEORGE ROLLESTON, D.M., F.R.S.,
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THE book which Professor Rolleston has produced is remarkable in many ways, and has special points of excellence which raise it very far above any general work on comparative anatomy, published in this country for many long years.

We would first of all draw attention to the great care and pains which have been bestowed on his work by the author. No one knows so well, as one who has personally watched the progress of this book, the infinite trouble which Dr. Rolleston has taken to assure himself of the trustworthiness of every statement made therein. Many long and careful dissections have been made, solely for the purposes of the book, so that the author might state with confidence, and of his own knowledge, what he does say. Again, the bibliographical research which he has made is extended far beyond what are the usual limits in such matters, and the student will find the reference to authorities for a host of observations and doctrines, the origin of which he will have previously ignored, besides quotations from the latest and most important contributions to the science. When we consider the amount of time which has been given to this work, and remember also the energy and care with which Dr. Rolleston carries on his teaching at the museum of Oxford, we feel that the less unselfish men of science owe a debt of gratitude to one who so far foregoes the pleasure of working in the field of original exploration, and gives himself so fully to the noble work of teaching. Men who have worked in the museum at Oxford know well the great power which the Linacre professor there exerts; how he has drawn many unemployed minds into the current of work, and by his example of untiring energy encouraged all as a great teacher can. His book will extend his sphere of influence beyond

the limits of Oxford, and may we hope attract new pupils to his laboratories.

This book is not a book for the very youngest beginners, but it is a book for all who wish to push well into the study of zoology. A special feature in its plan is its practical character. It is not a book to read quietly through with easy reference to figures and diagrams, but it is a book to grapple with and to master, and when this is done the student will have obtained a sounder and more adhesive knowledge of comparative anatomy than he can from any other book we know of. The first part gives descriptions of the large groups of the animal kingdom, which may be read as easily as the author's style will permit; the second and third being detailed descriptions of actual dissections or of drawings, require careful comparison with preparations and specimens to which it is *absolutely essential* for the student to gain access, either in some museum, or by his own dissections, as far as possible. We allude above to the author's style, which no doubt will appear a difficulty to many in reading the book, on account of the dense packing of words and allusions into a single sentence. But let us not be understood as objecting to this style; its very difficulty has advantages, it arrests the attention and demands the thought of the student, and it is greatly preferable to the mystifying and wearisome verbosity of some writers on biological subjects. Let us take an example from a part of the work relating to microscopic organisms. "The Gregarinæ would by most writers be considered, as they are here, to be the lowest of the Protozoa. Their ento-parasitic habits, however, which will account for much of the simplicity or degradation of their organism, must not cause us to overlook their close affinity to certain forms of Rhizopoda, especially the *amaebina*; and it has been rather from considerations of convenience, which, in the absence of any actual demonstration of genetic affinity, have weight in classification, that they have been here separated from that class. The Rhizopoda are by some writers placed higher, by others lower, in the scale of life than the Infusoria; but the 'polymorphism' of their more complex forms, amongst which the Radiolaria are usually included, may be considered in some sense to counterbalance the higher grade of specialisation to which the Infusoria in virtue of their digestive, reproductive, and motor organs must be allowed to have attained. The Spongiadæ should, for the same reason, and in the same sense as the Rhizopoda, be placed in co-ordinate rank with the Infusoria." This quotation gives an idea of the suggestive manner in which the

questions of classification and interpretation of structures are discussed by Dr. Rolleston. There is a vast deal more, than a mere expression of judgment as to the position which the Gregarinæ should occupy, in the above sentence. The correlation of parasitism and degradation of structure, the claims of convenience and of the principle of genealogy in classification, the weight to be attached to polymorphism as against individual development, are all incidentally touched upon with much advantage to the student. The constant reference to and enunciation of principles deduced from general study, forms one of the peculiarities of Professor Rolleston's teaching, and where it may not be possible to agree with some of these axioms, yet it is excellent for the pupil to have such briefly stated conclusions on which to thread his facts and exercise his own powers of thought. We cannot commend too highly the categorical way in which the most prominent facts relating to the larger groups of the animal kingdom are set forth. Dr. Rolleston follows Gegenbauer mainly in his classification, and in describing the chief classes of vertebrata, of mollusca, vermes, &c., gives such a body of knowledge as is to be found in no other book—in the English tongue certainly—besides copious references to recent and ancient authorities, which will be valuable to the teacher and observer as well as the class student.

A further peculiarity of this book, which we would point out, and which in our judgment gives it a special value, and accounts for much of the freshness of its style, is that Dr. Rolleston looks at forms of animal life as probably no other distinguished anatomist of the day can do; he looks at these forms *not* as an artist; he does not draw; and he does not accordingly treat morphology at all from the same point of view as does the observer, who instinctively apprehends and generalises a structure in a forcible sketch, as for example Gegenbauer does. Though we have to regret on this account the rather hard and unreal appearance of some of the wood-cut figures in this book, over which we know both draughtsman and author spared no pains; yet it is due to this same cause that Professor Rolleston is so careful in his descriptions, and so accurate in the use of language, an immense advantage for the student. The style of treatment in this work is rather by close and careful definition and detailed description, appealing to the logical faculty, than by diagrammatic outlines and word-sketches, dependent on an artist's perception of form. Though we think it impossible to overestimate the value of artistic power in the morphologist, it yet is

exceedingly valuable to have so cultivated a thinker as the author treating morphology apart from this power, for so far he here stands almost alone as the representative of unbiassed thought.

There are two points in which we may venture to express dissent from the author's classificatory views, and there are probably many others in the book which are open to discussion, but make their enunciation by Professor Rolleston none the less valuable and interesting. Above we have quoted a sentence in which Dr. Rolleston says he would assign a rank to Spongiadæ among the Protozoa equal to that held by Rhizopoda, and for the same reason, viz., the polymorphism exhibited by some of the forms of these groups. We cannot call to mind any polymorphism in the Radiolaria to which Dr. Rolleston alludes, for simple aggregation does not constitute polymorphism, and the association of units to form a secondary aggregate is carried no further in these creatures. In the sponges, on the other hand, there is most complete polymorphism amongst the primary units, that is to say, "histological differentiation"; and not only that, but the secondary aggregates formed of these differentiated elements with endoderm and ectoderm, antimera, and central osculum, exhibit polymorphism in their aggregation to form tertiary aggregates in some cases, so that certain abortive "persons," as Hæckel terms them, share the mouth of a central "person." These characters of the sponges seem to us to separate them by a huge gap from Rhizopoda, among which we never see a trace of "division of labour" structurally expressed, or individuation, in connection with the aggregation of units in such forms as are compound, and they go far to justify Hæckel's and Leuckart's placing of Spongiadæ as Coelenterata. Our second point is as to the dissociation of Trematods and Leeches, and the arrangement of the latter with the Chætopods. We are strongly persuaded that the digestive, vascular, reproductive, muscular, tegumentary, and locomotive system of the Leeches are but slight modifications of the Trematod's, and suspect that in placing Discophora with Chætopods, too much weight is given to a physiological phenomenon of great variability, viz., the presence of the Hæmoglobin in the vascular fluids (not in homologous vessels) of the two groups of worms, which have but very remote genetic affinities.

To the private student, and indeed to many teachers, a more exact account of methods of and apparatus for dissection in different cases would have been very valuable, and we feel

sure when it is known that this is a strongly felt want, Dr. Rolleston will not delay to supply it.

To students attending classes in our universities and elsewhere, to those working in their own studies, to all interested in any branch of comparative anatomy, we most earnestly, and with the confidence which comes of experience, commend "Forms of Animal Life" as a thorough piece of work, and certainly the best book on comparative anatomy in our language.