

THURSDAY, JULY 2, 1874

ON OSTEOLOGICAL MONOGRAPH-WRITING

IN biological Societies, and in others which have any biological interests, there is a question which is daily becoming more and more prominent; one that if not fully investigated shortly will lead to results which are far from advantageous to the science itself, and will throw discredit on its votaries; whilst, if some decided opinion is expressed in such a manner that no doubt can be entertained as to its true meaning, much hard work and unnecessary disappointment may be easily saved.

Some half century or so ago, when zoology was just commencing a new lease of life, as it may be termed, the opportunities afforded to those who were studying the anatomy and physiology of the animal kingdom were comparatively few. Museums were scarce; most of those existing being very incomplete in an educational point of view, and it was almost impossible to procure specimens of any desired species by means of a pecuniary offer. The case is now, however, extremely different. Museums are numerous, and are daily becoming more so. The facilities for locomotion make it easy for anyone anxious to see what cannot be obtained nearer, to visit the British Museum or that of the Royal College of Surgeons; there are dealers who are able to offer typical specimens at a moderate price, and to obtain the rarer forms if necessary. Such being the case it must be evident that a certain change ought to have come over zoological literature, in order that it should progress with the science itself. What was then indispensable is now no longer required, and that which was then unknown takes its place. Nevertheless there are a few comparative anatomists who do not seem to realise the change which has so gradually and so markedly occurred. They think and write with the ideas of fifty years ago, and, what is more, expect us to appreciate their productions as if they were not the least *de trop*.

Formerly, no doubt, it was extremely valuable to have descriptions given in print of the detailed anatomy of particular species. Of their osteology this was especially the case. These descriptions drew attention to previously scarcely recognised characters, and, what was perhaps still more important, did much to fix the nomenclature of the skeleton generally; because, though this had been previously accomplished as far as human anatomy is concerned, there are many reasons, known to all practical students, which make the names adopted in anthropotomy unsatisfactory and incomplete when they have to be applied to the lower vertebrata.

The case is now very different. Skeletons of almost all known animals being contained in museums, and those of common species being abundant, any student prosecuting his investigations in the spirit which insures successful results, will find no difficulty in obtaining opportunities of handling and comparing the bones themselves, and will have but little or no need to refer to plates or descriptions, which are never so satisfactory as the specimens themselves, and are often as difficult to obtain as they are expensive to purchase.

It therefore becomes a question, and a not unimportant

one either, as to whether it is to the best interests of our learned Societies to expend their funds in encouraging the further publication of long and exhaustive descriptions of the osteology of common types, and the execution of a large number of elaborate drawings of bones, whose intrinsic worth is considerably less than the cost of their putting on wood or stone. In several instances within the last two or three years, lengthy papers, without doubt the result of much time and attention, have been presented to different Societies, evidently with a full idea on the part of the authors that their monographs will be published, unopposed, in the form in which they send them in; and yet these many pages are found to contain nothing more than the monotonous and unsuggestive descriptions of the bones, one by one, and surface by surface, profusely illustrated, of animals as common as some of the best-known Marsupial mammals or Struthious birds.

A full account of the myology, neurology, or visceral anatomy of almost any animal has a value which no one would wish to depreciate in the least, because these parts are difficult to preserve, and it requires a special training, together with considerable experience in one direction, before such investigations can be undertaken, as they are but too infrequently. But as bones are so easily preserved in a state which cannot shock the most delicate hands or the most sensitive nose, there is no excuse for any student not practically knowing the most important peculiarities of any skeleton, nor for his not prosecuting his investigations to any degree of minuteness when occasion requires.

It has been remarked that these fully illustrated monographs are of especial value in palæontological investigations; that the study of the Pleistocene remains of Australia, for instance, can be conducted on the spot with greater facility when comparisons can be made with existing forms. But, we may ask, where can it be easier, than in Australia itself, to obtain the skeletons of now living Marsupials? and we all know how much better it is to have the bones themselves than drawings of them, however well executed. Further, it has been said that after a certain time it is impossible for any author, however able, to continue to develop generalisations and theories from any number of fresh facts; and such being the case, can those who really like their subject do better than devote themselves to the careful description, uncomplicated with any attempt at inductive reasoning, of what they have the opportunity of observing? We think they can, for we see no reason why the inferior productions of an able man should, on account of his previous reputation, be allowed to be placed on a level with the better work of others, and above those productions of the same quality, the attempts of less known authors.

The fact, however, is that the time is passed for the publication as simple statements of the commonplace facts of osteology; the subject is more than overladen with them already. What is now wanted is the application to them of some methods by which, like the doctrine of evolution, or the vertebrate theory of the skull, those at present on hand may be turned to better account in determining the true affinities of different animals, or the means by which the present state of things has been arrived at. The comparison of simple fact-accumulation to the introduction of fresh methods of research, or lines of thought, is so insuperably in favour of the latter, that the former

has quite descended below the level of that quality of work which needs the distinguishing encouragement afforded by the publication of the results obtained in the "Transactions" of any learned Society.

PICKERING'S "PHYSICAL MANIPULATION"

Elements of Physical Manipulation. By Edward C. Pickering, Phayer Professor of Physics in the Massachusetts Institute of Technology. Part I. (London: Macmillan & Co., 1874.)

TO write a satisfactory text-book for students in physical laboratories is a task beset with difficulties; and although Prof. Pickering has had the advantage of no small experience and judgment in the composition of the work the title of which is given above, we do not think that he has entirely overcome them.

There can be little doubt that oral teaching is that which is best suited to students who are beginning experimental work of any sort, and that as much may often be learnt in five minutes by seeing another perform an experiment as would be acquired in as many hours with the aid of a book alone to explain the construction and use of the apparatus; and Prof. Pickering is therefore right in aiming at supplementing rather than superseding the efforts of an instructor.

The work is divided into sections, each of which relates to one or more experiments, and comprises two parts, the first of which, entitled "Apparatus," gives a description of the instrument required, and is designed to aid the instructor in preparing the laboratory for the class, while the second, headed "Experiment," explains in detail to the student what he is to do.

The subjects treated of in the first volume, the only one at present published, are Mechanics, Sound, and Light, an arrangement that does not agree with the order in which they would probably be studied in the laboratory, as the elementary parts of heat ought certainly to be taken with mechanics; but the plan adopted has the advantage that heat and electricity, the subjects in which tables are most required for reference, will be placed together in the second volume, in which also, we presume, sets of tables will be included among the "matters of general interest to the physicist" that are promised in the preface.

Apart, however, from any detailed criticism, we must notice the important preliminary question, how far a work of this sort is likely to fulfil the object with which it is written, of enabling an instructor to superintend a larger class than he could otherwise attend to at once? The members of the class, according to the method of instruction pursued in the Massachusetts Institute, and described in the preface, are not informed precisely what experiments will be allotted to them until they enter the laboratory, and as such is the plan probably generally adopted where the number of pupils is large, it is absolutely necessary for the instructor to have at hand, either in a text-book or in manuscript, short papers on the theory of the different experiments. We do not, however, feel sure that the descriptions of apparatus and methods of performing experiments will prove so valuable as might at first sight appear

probable. The instruments required for physical work are often so costly as to make constant supervision necessary over those who are not accustomed to them, and their construction is so various, at all events in minor particulars, that directions for their use which might be all that could be desired in one laboratory might be misleading in another. Another difficulty arises in describing experimental proofs of the simpler laws of Mechanics and Physics which do not require elaborate apparatus for their exhibition, as a choice has often to be made between several different methods, an account of all of which would make the text-book unwieldy in bulk, while the omission of any is apt to make it less useful in laboratories other than that for which it was originally intended. The selection of experiments of this sort must in great measure depend upon the time the pupil is able to devote to the study of physics, the objects he has in view in pursuing it, and in many cases upon his knowledge of mathematics; and we regret that Prof. Pickering seems occasionally to have chosen those which are likely to give the best numerical results, in preference to others which, depending more upon skill, are not indeed so suitable for the exact verifications of physical laws, but have a greater educational value in improving the powers of observation.

The method selected, for instance, for illustrating the laws of falling bodies is that of suspending a ball to a spring, which, when the connecting thread is severed and the ball allowed to fall, completes a galvanic circuit in which a chronograph is included, and which is again broken by the impact of the ball on a plate placed below to receive it. This method is well adapted to show the relation between the time of falling from rest and the distance traversed; but Attwood's machine, of which no account is given, illustrates the fundamental laws of dynamics much more completely, is capable, if fitted with proper electric arrangements, of giving extremely good results, and is better suited for use by the pupil, as in our opinion all such instruments ought at first to be used, with some means of measuring time, such as the stop-watch, water-clock, or metronome, dependent upon skill, and not upon a purely mechanical arrangement.

Some of the experiments described are avowedly given as a preparation to those who may have to give lectures on physics, and others are, we presume, inserted with the same intention, as it would hardly be necessary for those possessing that "moderate familiarity with the general principles of physics" which "the class is supposed to have previously attained" to spend time over the experimental proofs given of the laws of the composition of forces, or the equality of the angles of incidence and reflection.

The earlier pages of the book are devoted to general remarks on physical measurements, and on methods of working up the results of experiments, and they will prove very useful.

The knowledge of mathematics assumed throughout is small, and in several instances the line has in this respect been drawn too tightly, no account being given of the method of determining the coefficient of torsion by means of the torsion pendulum, or of the determination of gravity by the reversible pendulum, probably on account of the small amount of rigid dynamics required in these problems.