certain Cambridge foundation should be *Queens'*, not *Queen's*. (The ladies in question were Margaret of Anjou and Elizabeth Woodville.)

The plates are from early nineteenth-century illustrations, and beautifully reproduced. The red lines superposed on them are no more than needed to show the geometry of the canonic discipline, and they serve their purpose well. For a research so concerned with elemental questions in æsthetics (a quotation from Albertus Magnus in the preface is most appropriate), one would expect a comely volume. Assuredly this is such a one, easy to handle and delightful to behold.

F. I. G. RAWLINS

A NEW GUIDE TO THE DISSECTION OF THE HUMAN BODY

A New System of Anatomy

By Sir Solly Zuckerman. Pp. xiii+579. (London: Oxford University Press, 1961.) 75*s*. net.

HOW much anatomy—or for that matter any of the other subjects in the medical curriculum—should a medical student know? Who should decide? Should it be teachers of the subject, surgeons, physicians, or general practitioners or a committee of all concerned? Are the majority of medical graduates to become general practitioners, and if so should the entire medical course be designed primarily with an eye to the needs of general practice first and foremost? Will it ever be possible to obtain general agreement on such debatable matters? These and many other questions are under constant review by those responsible for the teaching of medical students, but it is almost a case of *quot homines, tot sententiae*, for it is practically impossible to reconcile conflicting points of view.

To discuss with a reasonable degree of plausibility the necessity for reforms in medical education, to emphasize the need for a broad general training before medical studies are begun, to explain how imperative it is to reduce the ever-growing burden of factual knowledge which the medical student is compelled to acquire, to suggest that the essential feature of a good medical education is to inculcate the capacity to go on learning throughout life—all this is relatively easy, though it does not lead very far. But to discuss or write about medical education in a manner which will really carry conviction, so that all who read will at once feel "This is the way in which medicine should be taught"—to do this is, as Macaulay might well have said, the rarest of intellectual distinctions.

There are several reasons for this state of affairs, and one of the most frequent is that teachers assign too much importance to their own particular subject, and not enough to others. Sir Solly is among those anatomists who have not hesitated to prune their subject vigorously, and he began to do so fifteen years ago, by reorganizing the course in topographical anatomy at Birmingham. The present volume indicates the way in which this pruning has been translated into practice.

The book sets out to help and guide the student in his task of dissecting the body. Its outlook is intensely practical, and much that has been traditionally found in dissecting manuals has been discarded. The text has been reduced by omitting unnecessary detail and concentrating only on those things which the student may reasonably be expected to see when he dissects the body under normal dissecting-room conditions. This severely practical approach is further reflected in the very excellent illustrations, which are touched-up photographs of actual dissections, reproduced in black and white without the addition of vivid and garish colours for different structures.

The abuse of colour has long been a defect of most anatomical illustrations, particularly when the colour conventions have become highly stereotyped and artificial. I have previously emphasized this in an earlier review (*Nature*, 181, 972; 1958). If the object of an illustration is to help the student recall his actual dissection, or to allow comparison with the dissection, then it is unquestionably easier for him to superimpose a visual image of the original on a black-and-white illustration than on one which is already vividly tinted with colours which bear no resemblance whatever to those found in the cadaver.

The illustrations in this volume have a further advantage in that they have been prepared on a sufficiently large scale to make them very easy to use. In a dissecting manual this is particularly important, since the student must be able repeatedly to turn from dissection to illustration, in order to identify at a glance what is required, and then turn back to the dissection. Small and crowded illustrations with guide lines difficult to follow and legends in print too small to read are unfortunately only too frequently found in so-called practical manuals.

The Oxford University Press is to be congratulated on the general format of the book, which is very pleasing. Paper, printing and typography are excellent. The book is a bold attempt to meet a difficult situation. It undoubtedly supplies a long-felt need.

J. M. YOFFEY

PRINCIPLES OF ANIMAL TAXONOMY

Principles of Animal Taxonomy

By Prof. George Gaylord Simpson. (Columbia Biological Series, No. 20.) Pp. xii+247. (New York: Columbia University Press; London: Oxford University Press, 1961.) 35*s*. net.

PROF. SIMPSON'S title *Principles of Animal Taxonomy* may suggest an elementary text-book on taxonomy. The author is, however, using the word 'principle' in its most philosophical sense and the first part of the book, and much of what follows, in fact, constitute a most scholarly exercise in philosophy as applied to taxonomy.

Part of the fascination of the practice of taxonomy lies in the fact that it is a combination of science and art. There was a time when taxonomy was largely an art, in contrast to such disciplines as physics and chemistry, which were thought of as 'exact' sciences. The gap has, however, closed in recent years—from both ends—and will undoubtedly close further. From the physics end Heisenberg's formulation of his principle of indeterminacy, and more recent and ever-changing views on the nature of fundamental particles, have lessened the earlier certainties. From the taxonomic end the increasing use of physiological data and the development of biochemical and biophysical techniques such as serum protein and

hæmoglobin electrophoresis, and genetical, cytological and enzyme studies are leading to some unexpected results and providing increasing determinacy in taxonomy.

But when all this knowledge has been applied it seems likely that the ultimate taxonomic analysis in many groups will still involve judgment, or to put it another way, art. Taxonomy is likely to continue to be a subject which, while requiring a sound general scientific training at least up to degree standards, can never be completely imparted by lectures or learnt from text-books. The difference between a student at a university who specializes in taxonomy and a taxonomist is from many points of view similar to the difference between a medical student and a doctor—the transition being a matter of experience and judgement over the years.

It is the taxonomist, the scientist who has really acquired the feel of taxonomy, who will really enjoy the exacting discipline of Prof. Simpson's philosophy, and who will derive the full benefit from the re-thinking which a careful study of the book impels. This is not to say that there is not plenty of material for the beginner. There is, and the elementary matter is expressed with great clarity. But the student should be prepared to find it sandwiched between passages the significance of which may not be fully appreciated until a later stage.

It will be interesting to see how far taxonomists will follow Simpson in all his definitions. For example, the terms 'taxonomy' and 'systematics' are very generally treated by most workers as synonymous (though 'taxonomy' does seem to mean something slightly different to botanists and zoologists). There may be a tendency, as Mayr has pointed out, for the term 'taxonomy' to be preferred in North America and 'systematics' in the Old World, though this author uses the two terms indifferently, as does the prospectus for the proposed new International Association for Systematic Zoology which begins with the words "Dear Fellow Taxonomist". Simpson, however, differentiates and defines systematics as "the scientific study of the kinds and diversity of organisms and of any and all relationships among them", and taxonomy as "the theoretical study of classification, including its bases, principles, procedures, and rules". Systematics as here understood is therefore wider in scope than the 'systematics = taxonomy' of most workers, embracing as it does such things as phenotypic variation and ecology; and at the same time taxonomy as here defined is rather narrower.

On the subject of nomenclature Simpson expresses the feelings of many: " . . . it is an arbitrary device that has become an enormously complex, strictly formal, rigidly legalistic system. Some zoologists do seem to enjoy those legal, essentially non-zoological, seemingly endless rules, discussions, and operations, but for the most part they are a necessary evil taking begrudged time from more important matters". It is to be hoped, however, that the revised *International Code of Zoological Nomenclature* which has just been published will make things easier by providing the answers to many day-to-day nomenclatorial problems and so avoiding overloading the Commission with applications.

As is to be expected from an author whose own taxonomic work has known no artificial barrier between palæontological and recent forms, but who has considered the whole as a flowing continuum, the thread which runs through the book is the evolutionary basis of taxonomy: taxonomy is incomplete where it is confined to a consideration of recent forms only. Prof. Simpson's account of the history of typological theory, inextricably linked as it is with philosophic idealism and therefore to be excluded from modern science, and his discussion of scholastic logic in taxonomy, amount to a valid criticism of the taxonomic outlook of some workers even at the present day. His emergent argument and repeated emphasis of the point that "if such a thing as natural classification can meaningfully be achieved, it must be evolutionary classification", form perhaps the most fundamentally important part of the work.

Principles of Animal Taxonomy is a text which will be referred to and re-read many times by working taxonomists, each time with greater profit.

T. C. S. Morrison-Scott

PROJECT MOHOLE

A Hole in the Bottom of the Sea

The Story of the Mohole Project. By Willard Bascom. Pp. 352. (London: Faber and Faber, Ltd., 1961.) 42*s*. net.

THESE are the days when the Jules Verne type of idea is rapidly converted into a project of scientific respectability. This is what has happened with the Project Mohole. The Committee of the American Miscellaneous Society, under the chairmanship of Dr. Gordon Lill, has turned an oceanographer's dream into reality, and it is generally admitted now that drilling through the sea-floor is one of the most promising advances in the Earth sciences. Not only will the primary object of sampling the mantle help those who investigate the interior of the Earth, but also the incidental probing of the sea-bed sediments will provide new thought and fact for the geologist.

Dr. Bascom is the director of the National Academy of Sciences Project Mohole, and his drive and initiative in overcoming the many difficulties inherent in this work are reflected in this entertaining account of the whys and hows of the problem. The trials off the Island of Guadalupe last year, when it was demonstrated that a hole could be drilled from an unanchored floating ship in two miles of water, have paved the way for the full-scale attack on the mantle. The techniques that were employed, and the methods by which the Mohole itself will be drilled are clearly described. When it is remembered that even the preliminary experiments resulted in an increase in the maximum length of sea-bed core of from about 60 ft. to 600 ft., the magnitude of the operation can be visualized.

This excellent book provides the answers to those who wonder why oceanographers need to drill through the Earth's crust. The chapters on how our present store of knowledge of the sea-floor has been gathered are a most useful introduction to geophysics and physical oceanography, and the fascinating collection of sometimes far-fetched ideas about the inside of the Earth are a delight to read. For the cynical, there is some good advice on how to organize a large project, in face of normal conservative scepticism.

The tenders for the complete work are now with the National Science Foundation. When the contract has been awarded there will be more news of the progress of this success story. The reports will be much more interesting if they are read against the background of Dr. Bascom's book.

T. F. Gaskell