

haemoglobin 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 palaeontological and recent forms, but who has considered the whole as a flowing continuum, the thread which runs through the book is the evolution-

ary 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 evolutionarily 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.

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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.) 42s. 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.

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