SCIENTIFIC BOOKS

GEOLOGICAL TEXT-BOOKS

Geologic Structures. By BAILEY and ROBIN WILLIS. The McGraw-Hill Book Company. Third edition. Pp. xviii + 544. 202 figures. $4.00. 1934.

THE third edition of this well-known text-book in structural geology appeared in the summer of 1934. The subject-matter is essentially the same as that in the second edition, although some additions and subtractions have been made. The most conspicuous change is in the order of the chapters. The division of the book into four sections has been abandoned and in this new edition the chapters are in the following order: Problem of rock deformation, mechanical principles, stratified rocks, flexures and folds, analysis of folding, joints, description of faults, fault types and displacements, analysis of faulting, structures of igneous rocks, structures of metamorphic rocks, physiographic expression of structure, field methods, graphic methods, practical problems, fundamental facts and concepts.

The chapter on practical problems is an innovation and is a distinct addition to the book. It is well illustrated by thirty-one diagrams and contains many problems of an elementary type that the student may meet in the field. The chapter on physiographic expression of structure is an expansion of a few paragraphs in the second edition. The evidence offered by streams, erosion surfaces and differential erosion is discussed. This chapter emphasizes the fact that in active regions the structural geologist must likewise be a physiographer. The chapter on the structures of igneous rocks has also been expanded and greatly improved.

On the whole it is an excellent text both for student and professional geologist. Some portions of the book are unusually well written, actually stirring the enthusiasm of the reader. One student remarked to the reviewer: "That portion of the book convinced me more than ever that I wanted to become a geologist." The text is not too abstruse for the average student but at the same time contains plenty of meat.

Some definitions are not as lucid as they might be. Some, moreover, are actually erroneous—at least, they do not conform to best usage. The reviewer would like to call attention to them at this time, but in so doing he does not mean to imply that the book as a whole is not an excellent publication. Recumbent folds, for example, are illustrated on pages 64 and 65, with the axial planes dipping about 60°. It is customary, however, to restrict the term "recumbent" to those folds in which the axial plane is essentially horizontal. This usage has been followed by Nevin, Collet, Pirsson and Schuchert, Lahee and others.

On page 361 the statement is made that "inlier" is synonymous with "window." This is a mistake that has been made in several recent American text-books. "Window" should be restricted to those instances in which erosion has broken through an overthrust sheet or recumbent anticline to expose the underlying formation. Collet ("Structure of the Alps," p. 15) is very careful to distinguish between window and inlier.

"Upthrust" should be more carefully defined. On page 138 the statement is made: "Thus a horizontal force may act through one mass against another mass which offers more resistance. The resulting shear planes in the first are diverted upward and may outcrop at the surface as vertical faults. Such faults are called *upthrusts*." On page 152: "Cases occur in which a mountain block is tilted away from, instead of toward a great fault. The Sierra Nevada of California is an example, since it is bounded along its eastern side by a fault on which the vertical displacement is as much as 5,000 feet, while the peneplain that now forms the western slope is tilted away from the fault. In this and similar cases the block has plainly been rotated, with the result that one edge has been raised to a great height and the other edge has been depressed. We may say in such a case that the raised edge has been thrust up and the fault may be called an upthrust fault." Page 138 emphasizes the conversion of horizontal motion into vertical motion; page 152 says nothing of this; page 138 states that upthrusts are vertical, but figure 73 shows the Sierra Nevada faults dipping 60°. Under Fig. 97 an ordinary reverse fault is defined as an upthrust. The term *upthrust* must be more clearly defined before it can be incorporated into the geologic literature.

On page 124, the following statement appears: "Fracture, as the word is used in this book, means a rough break. It is distinguished from shear, which is a smooth break." Such a restriction in the use of the word fracture has no justification in engineering practise and nothing is to be gained by such a definition in geology.

The reviewer feels that the classification of faults adopted is far from satisfactory, but he fully appreciates the difficulties involved and would hesitate to offer a substitute. It is to be hoped that eventually geologists will have a genetic classification of faults, instead of one based on angle of dip.

Despite the criticisms given above, the reviewer feels that "Geologic Structures" is an excellent presentation of the subject and is preëminent in its field.

MARLAND BILLINGS

HARVARD UNIVERSITY

Historical Geology. By RAYMOND C. MOORE. ix + 673 pages, with 413 illustrations, including 52 block diagrams in 16 figures, 42 maps, 32 sections and 22 figures comprising numerous graphic representations of stratigraphic sequences. McGraw-Hill Book Company, Inc., New York. $4.00.

THE writer of a text-book in historical geology must make a choice. An adequate presentation in word, picture, chart and map, of the basic facts, the lines of reasoning and the resulting generalizations, such as is needed for a satisfactory introduction to this phase of geology, would exceed the limits of size and cost of a salable text-book. The writer can devote his pages primarily to generalizations, counting on the lecturer to supply the needed supplementary facts, or he can place the emphasis on the actual record.

In his text-book, Dr. Moore has taken the latter course. For each period, for instance, he gives a number of typical sections showing the actual sequence of strata drawn graphically in a striking manner. He leaves it largely to the lecturer to supply correlation tables. Incidentally, the graphical method has made it possible to place into these sections a large part of the over seven hundred stratigraphic names listed separately in the index, without forcing them to the attention of the non-technical reader. This makes the book valuable as a reference work without harming its appeal as a text-book.

Similarly, he presents maps showing the areas of outcrop and of inferred original distribution for the rocks of every system, but omits hypothetical paleogeographic maps. Such maps are most effective when developed by the lecturer on a blackboard map from the data presented in the book.

Throughout the text, emphasis is placed on the facts of observation and on the reasoning employed in the attempt to correlate them and weld them into a consistent picture, in conscious opposition to the tendency evident in text-books of all sciences to tell the student what "science teaches."

Of the several masterly text-books that are now available in historical geology, Moore's book goes farthest in this effort to cultivate the spirit of critical judgment in inductive reasoning.

On the biologic side, Moore departs from traditional methods by figuring a number of fossils of one taxonomic group on one plate, all drawn to a specified scale. There can be no doubt that this method comes nearer creating adequate mental pictures than the customary one of figuring for each period on one plate random samples of animal forms of diverse groups, generally drawn on vastly different scales. In order to make possible such effective grouping, the forms of life are not discussed separately for every period, but only in four chapters, one devoted to each of the following major units; Early Paleozoic, Late Paleozoic, Mesozoic and Cenozoic time. A brief but effective chapter on the geologic history of man ends the book.

Among the other illustrations effective use is made of block diagrams. The quality of some of the halftones is subject to criticism, but their selection is excellent.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

A DEVICE FOR WATER CIRCULATION

A SIMPLE air pump can be easily constructed which will maintain a continuous circulation of clean aerated fresh or salt water through an aquarium. The pump (*p.*, fig. 1) is made from a pyrex glass test-tube, the height of which is 10 cm and the inside diameter is 1.5 cm. A pyrex glass tube (*a.*) with an inside diameter of 5 mm is sealed to the side of the test-tube approximately 2 cm from the mouth and then bent so that the glass tube is parallel with the test-tube. A similar glass tube (*b.*) is sealed to the base of the test-tube. The pump is placed in an inverted position in the reservoir and an exceedingly small air current is permitted to enter the pump through the glass tube (*a.*) at the side. The exact depth at which the pump will give a maximum efficiency may be determined by experimentation; however, the pump should be at least 15 cm below the water level in the reservoir. The air upon entering the pump entrains a small column of water which it pushes out the supply pipe (*b.*) in the manner of a percolator. The amount of air current may be adjusted to give an optimum flow. Although the pump can force the water a distance of some five feet above the reservoir, it works more efficiently if the aquarium (*aq.*) is placed at a lower level.

The supply pipe (*b.*) may be led directly to the aquarium (*aq.*) or first to a Wolff bottle (*bo.*) which merely serves to maintain an even flow into the aquarium itself. Leading from the aquarium is an automatic siphon (*s.*) which keeps the water level at a constant height. The overflow through the automatic siphon is carried into the top of the filter (*f.*). This consists of a glass cylinder filled for the lower