Causal Geology. By E. H. L. Schwarz, Professor of Geology at the Rhodes University College, Grahamstown, South Africa. Glasgow, Blackie & Son; New York, D. Van Nostrand Company. Pp. 248, with numerous figures and plates. $2.50.

The aim of this treatise is set forth by the author in his preface in the following words:

> In the ten years spent on the Geological Survey of the Colony of the Cape of Good Hope I was brought into contact with most of the geological problems that are presented by our earth in a way which, I believe, is afforded nowhere else. The whole country, practically, is bare of soil and the rocks lie ready to the hammer everywhere, while the enormous gashes sawn through the land by the rivers reveal sections of unparalleled magnitude and clearness. As year by year went by the facts presented themselves to me in an order different from that stated in the text-books, and the theories as to their origin and nature became simplified and different from established ones. There seemed to me no need to speculate on enigmatical problems, but the facts observed, if allowed to arrange themselves according to their natural sequence, explained many of the problems that are the subject of so much controversy. I feared that in the isolation from centers of current geological thought I had gone off on a side track which led nowhere, but the publication of Professor T. C. Chamberlin's "Planetismal Hypothesis"[1] showed me that I was traveling in a direction which, at least, was being taken by others. The planetismal hypothesis allows known facts to weigh more than theories, and enables one to build up a system of geology without an appeal to the unknown and unknowable. It is not for me to judge the merits of this hypothesis, but in my opinion it is the most positive advance in natural science that has been made for a very long time. . . . In many cases I have gone much further than Professor Chamberlin, but the object I have set before me is to lay the whole case from the single point of view of a solid earth.

The author in the first chapter makes five postulates concerning which he remarks that, while he can not prove them, "they are general conceptions which follow naturally from the investigation of geological phenomena and that where current ideas differ from them there has interposed between the fact and the conclusion theories brought in from other sciences or developed within the domain of geology, and these have served as a screen which has blurred the outline of objects."

These are: (1) That the rocks of the earth's crust are in constant motion. (2) That the force of cohesion in rocks is insufficient to keep them rigid when in large masses, the rotational force of the earth being thus quite competent to mould the cold and solid earth into the shape which it possesses—that which would be adopted by a revolving fluid mass. (3) That the area of the surface of the globe is not a diminishing one. (4) The surface of the earth is uniform in average texture throughout. The continental masses are thus not relatively lighter than the suboceanic portions of the earth's surface and the theory of the permanence of ocean basins must be abandoned. (5) That the earth is growing by the addition of meteoric matter and the composition of the earth, as a whole, is represented by the average composition of this matter. While this is true, the exterior portion of the earth's crust has been worked over and over by processes of weathering and erosion during which the more soluble substances, principally iron and magnesium, have been carried away in solution downward, toward the earth's center, leaving behind a residue more siliceous than the average composition of the globe.

Taking these postulates which he considers to be true, as granted, the author then explains the geological processes at work within the earth and upon its surface. The accession to the material of the earth's surface by the fall of meteorites is considered at length and in the case of Coon Butte it is stated that there seems to be no reasonable doubt that this crater is actually the result of the impact of a huge bolide. Turning then to the moon as illustrating a stage in the earth's evolution, the author considers that the hypothesis which best explains the *maria,* is that great meteors fell upon the moon, and by their impact pro-

[1] T. C. Chamberlin, "Year Book Carnegie Institution," No. 3, 1905, pp. 208–253; T. C. Chamberlin and R. D. Salisbury, "Geology," "Earth History," Vol. II., London, 1906, pp. 38–81.

duced sufficient heat not only to melt up their own substance, but a good deal of that comprising the adjacent lunar surface, and then adds "having established then the fact that giant meteors may have fallen on the earth and may have melted up tracts of country which would be deluged with lava—we may legitimately enquire whether there are any evidences of such occurrences on the earth's surface." He considers that the tufas, lavas and agglomerates in the Archæan of Great Britain, the great lava sheets of the Snake River in Idaho and those of the Kapte Plains of British East Africa may eventually prove to have had such an origin. It is even considered a by no means impossible theory that the New Caledonian nickel deposits are portions of a gigantic meteor which fell long ages ago and which by earth movements has been so crushed and folded that it has all the appearance of an igneous dyke.

The origin of the water on the earth's exterior and the part which it plays in modifying the earth's surface, is then taken up and the recent work of various investigators is well presented and discussed. In referring to the fact that during the weathering of rocks the lime which they contain tends to go into solution more readily and thus to be more completely removed than the associated magnesia, the author gives it as his opinion that in the processes of solution and redeposition the lime tends to pass upward and outward in the earth's crust while the magnesia most frequently passes downward, and adds "Why it goes downward is at present entirely a mystery; from an analogy with iron one might suggest that the magnesium of the earth's nucleus exerts an attraction and thus draws it downward," for the author holds that when compounds of iron are dissolved they become ionized and that the great central mass of metallic iron within the earth "must thus exert a pull on the iron in solution, and this pull lasting over innumerable myriads of years, yet ever persistent and increasing, would gradually draw downwards the ions of iron as they become formed in the surface water of the earth."

In treating of the work of underground water, Mr. Schwarz accepts Posepny's theory of the origin of ore deposits and believes it to be the explanation which is now adopted by an ever-increasing body of geologists.

The subjects of earth folds, the earth's surface, cold volcanoes, normal volcanoes, earthquakes and Archæan rocks are then taken up in succession. Many statements are made which are highly debatable and some of which are certainly incorrect. The book, however, is well written and is worthy of perusal by all geologists interested in the fundamental problems of the origin of the globe, although one can hardly agree with the author when he says that the work "constitutes an appeal for a return to rationalism after a period of romanticism," for in it the romantic element is developed in a manner as striking and interesting as in any of the modern treatises of the more orthodox school.

FRANK D. ADAMS

A Text-book of Psychology. By EDWARD BRADFORD TITCHENER. New York, The Macmillan Co. 1910. Pp. 565.

The review of a text-book, like the book itself, reflects a personal equation. The fate of a text is a venture, sharing somewhat in the psychology of advertising. However good the article or inviting the appeal, the test comes in its reception. It is legitimate to appraise a text in terms of its intrinsic merits in form and content and execution; it is equally legitimate to consider its service. For the purpose of ever so good a text is bound up with its use. It must first appeal to the instructor; yet he tests it practically and is prepared to revise his judgment. The comments of the users might be gathered by the questionnaire method, with anonymity to secure frankness of statement.

In a science like psychology, with traditions in the making and doctrines appreciably shifting, yet with essential principles of large scope and sufficient definiteness, the makers of text-books have wide latitudes. It is easy to find agreement that the purpose of the text is to help the student from a casual to a system-