that nothing exists except himself. Newtonian physics may well express how things (objects or external events) really are arranged, but Einsteinian physics states only how they seem to us to be arranged.

In the communications of C. H. Goulden and N. T. Gridgeman, there is some confusion between the whole and its parts. To predict accurately the half-life of a piece of radium does not require the theory of probabilities, but to predict when an atom of radium will disintegrate clearly does, with present ignorance of possible differences among the atoms. One should know for what unit prediction is required, and for what units the necessary facts can be obtained. When individual organisms are studied to provide a basis for predicting the behavior of aggregates, which may be very diverse, greater accuracy of prediction comes with greater knowledge of individual differences and of the composition of the particular aggregate. This is to be contrasted with mathematical treatment of the facts of individual behavior in ignorance of differences among individuals.

For mutual understanding there must be agreement in definition. For me "*probability, chance,* and *random* mean ignorance," but evidently not for Mr. Gridgeman. What definitions for these words will exclude the ignorance implicit in "theory of probabilities"? Is the Goddess of Chance, which some scientists would have us worship, to masquerade as Pallas Athene, the Goddess of Wisdom?

Natural science may be defined as being knowledge for accurate prediction of what will happen in relations with other things than oneself, in whose separate existence we firmly believe. That knowledge is inevitably limited to those relations. Mathematics deals with arrangements of things, and thus provides patterns or frames of reference that may be extremely useful in handling varied arrangements in our relations with other things. It can do no more than this.

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(Ed. Note: The editors consider the debate that was touched off by Dr. Huntsman's communication of two years ago concluded with the publication of this reply to his critics.)

Book Reviews

A Textbook of Geology. Robert M. Garrels. New York: Harper, 1951. 511 pp. $5.00.

The eighth volume in Harper's "Geoscience Series," this handsome and competent book is introduced by its author as a new, analytical approach to the subject of geology, a view which this reader confirms. The same introduction acknowledges many omissions in the text (for example, the terms anticline, breccia, dip, drift, jointing, karst, lignite, monadnock, ore, and salt lake do not appear in the index), but stresses that its emphasis alternates between an "investigatory" and an "applicatory" approach rather than remaining at the simple expository level. Here is a well-written text of unusual charm and simplicity, illustrated with refreshingly new photographs, many valuable graphs, and other facile sketches. More mathematics is visible than occurs in many older texts, but not more than the average college student should master. The presentation of subject matter is unusually lucid, with much new material in the way of example, phraseology, and point of view. The professor who reads it will envy its clarity and praise its organization; the student who uses it should gain much perspective for a broad view of the geologic world; and the layman searching for an introduction to earth science should find it a useful and informative guide.

This is a bright volume which is less a fact book for class reference than a script of the lectures of a skilled and artistic teacher. It covers both physical geology and the history of the earth in 26 chapters, with three short appendices on rocks, minerals, and the biologic classification; doubtless it is planned for one semester of geoscience, or for the geological portion of a general science offering. For a full year college course or the introductory course for geology majors, an instructor should document this readable volume with factual and informative material usually reserved for a textbook, or his students will acquire an excellent view of the forest without much acquaintance with trees.

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Scientific Book Register

The Kernel Function and Conformal Mapping. Stefan Bergman. New York: American Mathematical Society, 1950. 161 pp. $4.00.

Aminoplastics. C. P. Vale. New York: Interscience; London: Cleaver-Hume, 1950. 250 pp. $2.75.

The Rhododendron Leaf: A Study of the Epidermal Appendages. John MacQueen Cowan. Edinburgh, Scotland, and London, England: Oliver and Boyd, 1950. 120 pp. 21/– net.

Fundamentals of Electrical Engineering. Fred H. Pumphrey. New York: Prentice-Hall, 1951. 668 pp. $5.75.

The Physiography of Southern Ontario. L. J. Chapman and D. F. Putnam. Toronto, Canada: Univ. Toronto Press, 1951. (Published for the Ontario Research Foundation.) 284 pp. and accompanying maps. $4.00.

A New Theory of Gravitation. Jakob Mandelker. New York: Philosophical Library, 1951. 25 pp. $2.75.