practically constant temperature, compared to the earth's interior; since by the terms of the hypothesis the soil has been the seat of living beings during much of the time of cooling.

Furthermore, the rate of outflow of heat is determined solely by the temperature difference on the two sides of a rock layer, and a cloud envelope could only retard such outflow through materially raising the temperature of the surface rock and diminishing the temperature difference on the two sides of the outer zone. This is something which, as shown above, has not taken place, and consequently the delivery of thermal energy from the interior to the surface of a cooling earth may be computed for any fraction of its age. The evolution of life must be restricted to the later portions of the hypothetical cooling process, since, as Lane has pointed out,[1] rocks seem to have been buried in early times to as great a depth as now without metamorphism, save where mashed or injected. To cite a specific instance—the Belt terrane of Montana and Idaho shows formations which were buried to a depth of several miles in pre-Cambrian times, now almost if not quite as unmetamorphic as the Triassic formations of the eastern United States.

The actual thermal energy per unit time now and in past times received from the earth's interior, thus computed, could be compared with that determined by measurement as received in unit time from the sun and without reference to the actual temperatures of either earth or sun. Even in spite of much error in regard to the fundamental constants, unless some surprising error in previous methods is developed, such a calculation would show the earth to contribute but a negligible fraction and would indicate to what an extent a hypothetical cloud envelope and early atmosphere of assumed composition would have to operate as an impermeable blanket to make up for the hypothetical deficiency in solar radiation. Having drawn this thermally opaque envelope about the earth, the Mansonians must next demonstrate how light was able to penetrate to permit the building up of vegetable protoplasm and give employment to the eyes of animals during the Paleozoic and Proterozoic ages.

JOSEPH BARRELL

[1] SCIENCE, April 10, 1908, p. 591.

## *QUOTATIONS*

### THE PUBLIC HEALTH

PROFESSOR WILLIAM T. SEDGWICK'S address on "The Call to Public Health" has been printed in a recent number of SCIENCE, and the perusal of it can not fail to be instructive and inspiring. The health of the public must necessarily be based upon the health of individuals, yet when one speaks of the public health he has in mind something much broader and much more important than the health of isolated members of the community. The public health means the health question socialized, and this broadening of the base so as to include whole populations has arisen from the conception, made vital by modern science, that the health of the individual immediately concerns his family, his neighbor and his city. There is a community of interests vitally affecting human life which makes the public health of importance to the municipality and the state; and, as Professor Sedgwick easily shows, this is a development that has come very late in modern civilization, and to-day calls for a greater degree of attention than has ever before been given to it.

A certain selfishness, or indifference to others, that has naturally resulted from the old individualism, has until recent years blinded the majority of people to the necessary relation between individual and public health. The main concern of the average man has been to keep himself and his family well; all others he had no interest in. He paid the doctor's bills for professional services in the family circle, and there his responsibility ended. Modern science has shaken this form of indifference by demonstrating the preventability of most contagious and infectious diseases. Epidemics have been studied enough to convince the average man that their spread in a normal, civilized community is nothing

less than a wanton massacre of the innocents. And the helplessness of the individual, even when attended by the best of medical practitioners, in contending alone with the general conditions which play havoc with the health of the most favored people, has convinced every one of knowledge and sense that the maintenance of the public health is a public function. As there is a community of interests at the bottom of the health question, so there must be community of effort.—*The Springfield Republican.*

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## SCIENTIFIC BOOKS

*Rocks and Rock Minerals.* A Manual of the Elements of Petrology without the Use of the Microscope. By Louis V. Pirsson. New York, John Wiley and Sons; London, Chapman and Hall. 12mo. Pp. 414, 74 figs., 36 plates.

Few if any petrologists are better qualified by reason of notable attainments in the science, as well as by long experience in teaching it, to write a manual of petrology than is Professor Pirsson, of Yale University, and it is with pleasure that we note the appearance of the book before us. Teachers of petrology will in general, we believe, fully agree with the author's opinion, as expressed in his preface, that there has long been a need for a "small, concise and practical treatise" on petrology in which the subject is dealt with entirely from a megascopic standpoint. Mining engineers and others who have to deal with rocks in a practical way have also felt the urgent need of such a book for purposes of reference. In our opinion the present manual meets this need in a highly satisfactory manner, and its publication marks a distinct advance in the treatment of elementary petrology. A general idea of the scope of the book may be obtained from the table of contents which follows:

Part I., Introductory and General Considerations. Chapter I., Scope of Petrology: Historical Methods of Study; Chapter II., Chemical Character of the Earth's Crust and its Component Minerals.

Part II., Rock Minerals. Chapter III., Important Properties of Minerals; Chapter IV., Description of the Rock-making Minerals; Chapter V., Determination of the Rock-making Minerals.

Part III., The Rocks. Chapter VI., General Petrology of Igneous Rocks; Chapter VII., Description of Igneous Rocks; Chapter VIII., Origin and Classification of Stratified Rocks; Chapter IX., Description of Stratified Rocks; Chapter X., Origin, General Characters and Classification of the Metamorphic Rocks; Chapter XI., Description of the Metamorphic Rocks; Chapter XII., The Determination of Rocks; Index.

The arrangement of the material in the various chapters is admirable throughout, while discussions, descriptions and statements in general are accurate, clear, concise, yet sufficiently complete, and are written in a style which is attractive and easy to read. Chapter IV., dealing with the general petrology of the igneous rocks, seems particularly worthy of notice, since it presents such material of a general character, both practical and theoretical, as is really essential for a clear understanding of igneous rocks, in a manner entirely in keeping with the most recent developments of the science, and yet within the comprehension of those not thoroughly trained in physical chemistry, nor in micro-petrology, a task that is not an easy one. An idea of the contents of this chapter may be gathered from the following topics, which are among those discussed therein: The modes of occurrence of igneous rocks; the chemical composition of magmas and their differentiation; the crystallization of silicate solutions (magmas) and the development of texture in igneous rocks; contact metamorphism; the classification of the igneous rocks.

In regard to the classification mentioned above, a system has been developed entirely consistent with megascopic petrology, all distinctions being based upon differences of texture or of mineral composition that can be made out by the careful study of good hand-specimens with the aid of a pocket lens, and a knife, in some few instances supplemented