the skies clear, the stroll through the park to the golf club was greatly enjoyed by the members, many of whom visited the Phipps Conservatory on their way.

In connection with the postprandial exercises resolutions of thanks to the officers and trustees of the Carnegie Institute and the various generous citizens of Pittsburg who had provided for the comfort of the association were passed, and the association finally adjourned to meet in Chicago on May 5 as the guests of the Art Institute of Chicago, the Field Museum of Natural History and the Chicago Academy of Sciences, which united in tendering a joint invitation to the association to hold its next meeting in Chicago.

A committee on the publication of the 'Proceedings' of the meeting, consisting of Dr. W. J. Holland, Dr. George A. Dorsey and Professor P. M. Rea, was appointed. A full account of the meeting, together with the papers read will be issued.

The meeting is declared by all who were present to have been most enjoyable, and the American Association of Museums is undoubtedly firmly established as one of the national societies which is destined in coming years to exert a very beneficial influence upon the wide field of activities which is represented by the museums of art and of science in America.

SCIENTIFIC BOOKS

Clays; Their Occurrence, Properties, and Uses, with especial reference to those of the United States. By HEINRICH RIES, Ph.D., Assistant Professor of Economic Geology in Cornell University. Pages xvi and 490. New York: John Wiley & Sons; London: Chapman & Hall, Limited. 1906.

This comprehensive and well-balanced treatise on clays devotes the first five chapters, 276 pages, to the origin, the chemical and physical properties and kinds of clays, and to the methods of mining and manufacture. Chapters VI. and VII., 183 pages, describe the distribution of clays in the United States. The last chapter, of seven pages, is devoted to an account of the fullers' earth, including its properties, methods of mining and uses, and distribution in the United States.

In the special state descriptions the subject matter is set forth in the order of the geological formations as permitting the greatest uniformity of treatment, and as involving the least amount of repetition. In those states with which the present reviewer is most familiar, the descriptions are adequate and well presented, though necessarily in a concise manner.

For this part of the work the author is peculiarly well prepared from first-hand acquaintance, since he has personally examined and written reports on the clays for the geological surveys of a number of states, as well as for the United States Geological Survey. In these reports will naturally be found much of the matter of a general nature of the present treatise, since a general discussion of the origin, properties, and varieties of clays would be an appropriate and desirable introduction to the detailed description of their occurrences in the state reports, yet it must not be inferred that the general or introductory part of the volume before us is a mere compilation and repetition of the material already published in the several state reports by the author. As a matter of fact there is much in the introductory chapters and in the illustrations that has not appeared in any of these reports.

The clay resources of the different states are not equally well known, hence some inequality in the state descriptions, through no fault, however, of the author, because some of the important clay states, like Illinois for instance, have very little literature bearing on their clays.

In discussing the origin of clays the author emphasizes the facts that in the decomposition of feldspar, CO_2 is not an essential factor, since the mineral is decomposed by water alone; and that other feldspars besides orthoclase yield kaolinite. He also opposes the recently advanced view of Rösler that the

kaolinization of feldspar is never due to atmospheric action, but always to post-volcanic pneumatolytic and pneumato-hydatogenic processes.

> The very fact that many of our kaolins pass into undecomposed feldspar or feldspathic rock when the limit of weathering is reached, shows the incorrectness of such a broad statement (p. 7).

The discussion of the origin of clays is followed by a fairly complete description of the secondary changes both mechanical and chemical, in clay deposits, a feature often omitted in similar works.

In most treatises the statement is made that kaolinite is the basis of *all* clays, which are thus to be regarded as mixtures of kaolinite with other minerals. The incorrectness of this statement, the author thinks, will be made evident by an examination of any series of kaolin analyses, which will show that the alumina-silica ratio is often higher than that required for kaolinite, and this seems best accounted for on the supposition that some of the other clay-like minerals, such as pholerite or halloysite, are present. The fact is also pointed out that neither the chemical nor the rational analysis can in every case be relied upon to give certain information concerning the mineral composition and other characters of a clay. Thus, a washed kaolin might have as much as twenty per cent. of white mica, and yet on analysis show a composition approaching rather closely to that of kaolinite. And, moreover, kaolinite, pholerite, halloysite, and muscovite are all decomposed by hot sulphuric acid, and in a rational analysis would be reported as clay substance. This is unfortunate, since mica is not refractory and should not, therefore, be grouped with the other three (p. 167).

In Chapter II. the various minerals occurring in clay and their influence on its behavior, especially as regards shrinkage and fusibility, are quite fully treated. It has long been known that titanic oxide is of universal occurrence in clays, though seldom shown in analyses. Experiments of the author recently carried out with mixtures of kaolinite and titanic oxide up to 5 per cent., prove that even small amounts of this substance lower the refractoriness of clays, one half per cent. bringing the fusing point down half a cone. The importance of determining the titanium in a refractory clay is thus made clear.

Of the physical properties of clays, plasticity is in many respects the most important, and perhaps the most difficult to explain. The author considers the conception of plasticity as expressed by many as too narrow. He remarks:

> A broader conception, and probably a more satisfactory one to the physicist, would be to define plasticity as the property which many bodies possess of changing form under pressure, without rupturing, which form they retain when the pressure ceases, it being understood that the amount of pressure required, and the degree of deformation possible, will vary with the material (p. 94).

This definition would include many bodies besides clay, which are excluded by the narrower definitions.

The various theories put forward to explain the cause of plasticity are passed in review, with the conclusion that plasticity is not dependent upon any single cause advocated by these theories, but by a combination of them. The relations of texture to tensile strength are illustrated by experiments of Orton, Beyer and Williams, and the author, which go to show that in those clays having the highest tensile strength, the percentages of fine, medium, and coarse particles are nearly equal, and that an excess of either coarse or fine grains lowers the tensile strength.

In Chapter IV. the various kinds of clays, in the order of the purposes for which they are used, and beginning with the highest grades, are described as to their chemical and physical properties. These characters are further illustrated by typical physical tests and chemical analyses. The latter part of this chapter, devoted to descriptions of methods of mining and manufacture, might by some be criticized for lack of sufficient detail, but the book is not intended to be a treatise on the manufacture of clay products alone, and too much technological detail would be clearly out of place.

The illustrations are well selected, not for

ornamental purposes, but for the real illustration of the text. The book is well printed and bound and with no undue share of typographical errors.

While the different topics discussed in this work have been treated in more or less detail in official reports and in special articles, Dr. Ries's book will be welcomed by all interested in the subject of clays, as being certainly the most comprehensive and evenly balanced, if not the only, presentation of the subject as a whole that we have. And though written primarily for American geologists, chemists, and engineers, the introductory part, being of a general nature, should be equally useful to men of all nationalities.

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Biochemie der Pflanzen. Bd. II. By FRIEDRICH CZAPEK, Ph.D., M.D. Gustav Fischer in Jena. 1905. Pp. xii + 1027.

The second volume of this important work on the chemistry of plants has fully sustained the high expectations excited by the first volume. In something over a thousand pages, the author brings his account down to the state of our knowledge as it existed in June, 1905. It is impossible in the space available for this purpose to give more than a most meager outline of the contents of this volume of this truly great work. A general discussion of the biochemistry of plant albuminoids is followed by a treatment in some detail of the phenomena connected with this class of bodies as seen in the physiological processes of various groups of plants from bacteria to phanerogams, and as seen in the various organs and structures of these plants.

The second large division deals with the nitrogen-containing end products of plant metabolism. The discussion is one of rare interest, especially as dealing with the chemical physiology of hydrocyanic acid and with the plant alkaloids. We have had chemical discussions and botanical discussions on these subjects, but the author has here succeeded in making the facts of either category illuminate those of the other, an observation that applies to a remarkable degree to all parts of the book.

The chapters on the physiology and chemistry of the relation of plants and plant products to oxygen is succeeded by a treatment of the part played by ash constituents in plant metabolism in its widest relations. A chapter of unusual interest on the chemical aspects of plant irritability concludes the body of the work.

It would be hard to speak in too high praise of this work. It comes into a place in botanical literature that has never been filled heretofore, and as the drift of plant study in recent years has been strongly in this direction, the need of such a work has been more and more keenly felt. This book will go on to the same shelf of indispensables on which Pfeffer's 'Physiology,' Goebel's 'Organography' and Haberlandt's 'Anatomy' are to be found.

It is to be strongly hoped that the author may find opportunity from time to time to revise the work as the progress of science makes necessary, and thus provide investigators with a ready means of keeping in close touch with the progress of physiology. The author gives evidence of a desire to do this by providing in an appendix references to literature appearing after the body of the work was completed.

This book should be translated into English, and that at an early date.

R. H. TRUE

SCIENTIFIC JOURNALS AND ARTICLES

The American Naturalist for May opens with an article by Herbert W. Rand on 'The Functions of the Spiracle of the Skate,' the conclusion being that it serves chiefly as an in-take for the respiratory stream, and that the reversal of the stream, or spouting, may serve to clear out the gill chambers and be analogous to taking a deep breath. F. H. Pike presents 'A Critical and Statistical Study of the Determination of Sex, Particularly in Human Offspring.' Among the conclusions are that in man there is a slight excess in the number of male offspring; that sex determination probably occurs before the fertilization of the ovum and that sex is