and of tanks and poison gas, science is accepted as a paying proposition; but it is still too often looked on as a consultant to be called in special cases, or as a piecework artisan to be paid by the job. The manifesto proclaims a wider and a truer view. It distinguishes between "scientific" and "technical" research—that is to say, between disinterested and utilitarian explorations of nature. The former are demanded by those who know history; the latter mesmerize the bureaucracy. Labor demands a program of research in both senses; it declares the value of the advancement of knowledge to be many times greater than its cost; and it insists that many urgent problems can find wise solution only through scientific and technical research.—London *Times*.

SCIENTIFIC BOOKS

The Schrammen Collection of Cretaceous Silicispongiæ in the American Museum of Natural History. By MARJORIE O'CONNELL, Ph.D. *Bulletin of the American Museum of Natural History,* Vol. XLI., Art. I., pp. 1–261, Plates I–XIV., Map and five text figures. Aug. 1, 1919.

In 1914 the American Museum purchased a collection of 800 specimens of fossil Silicispongiæ, comprising 116 genera and 222 species, and purporting to be types (Belegestücke) used by Dr. Anton Schrammen of Hildesheim in the preparation of his important monograph on the Cretaceous Silicispongiæ of northwest Germany. This material was entrusted to Dr. O'Connell for arrangement in the exhibition hall of the museum, in the course of which work she undertook a careful comparison of each specimen with the descriptions and illustrations in Schrammen's monograph. This led to the discovery that the term "Belegestück" was used in a very loose sense for material representing not only the true types, but also all material collected from type localities, and so included supplementary types (apotypes) as well as typical specimens (icotypes), the total of 358 types including only 86 primary types (with only 5 holotypes). This led Dr. O'Connell to a careful evaluation of the standing of each one of these specimens, which proceeding has greatly enhanced the value of the collection. But beyond this, Dr. O'Connell has gone most thoroughly into the synonymies of the genera and species, Schrammen's work in this respect being misleadingly incomplete, and so she has produced a distinct contribution to the literature of the Silicispongiæ, and supplemented Schrammen's monograph in a manner for which students of these organisms owe her thanks. This constitutes the major part of the work before us, being Chapter IV., and comprising pp. 97–207 of the *Bulletin*.

The first 97 pages of the bulletin however, are of broader scope, and will be of general interest, not only to students of paleontology but to those of stratigraphy as well. The introduction deals with the classification of the sponges and makes the latest classification by Broili (Zittel Grundzüge, 1915), and Schrammen available to American students. Chapter I. (pp. 8–30) gives a review of the development of the science of spongiology, dealing first with the investigations on recent, and then with those on fossil species. The history of investigation on recent forms is divided into five periods: (1) From the days of Aristotle to the seventeenth century; (2) period of determination of systematic position (1600–1750); (3) period of anatomical discoveries and classification (1750–1825); (4) period of detailed microscopic studies (1825–1874), and (5) period of modern investigations (1875–present), which opens with the first paper published by F. E. Schulze. The history of palæospongiology is thus summarized by Dr. O'Connell:

> In going through the literature on fossil sponges, one is struck with the close parallelism in the development of thought in the study of fossil and recent forms but one sees epitomized in the paleontological literature of two hundred years what is spread over two thousand years in zoological literature. The besetting difficulty for both groups of investigators was the determination of the best method of work, and, until this was discovered, all classifications were unsatisfactory and often artificial.

Classification on the basis of form has now given way to classification on the basis of the skeletal elements, a method adopted for recent sponges by Schulze in 1875, and for fossil forms by Zittel in 1876.

In this chapter Dr. O'Connell gives a review of the work done on fossil sponges to date in Great Britain, France, Russia, Bohemia and Germany. Based upon the summaries given by Rauff (Palæontographica, 1893-94) the author has brought the review up to date, and given us moreover a critical evaluation of all the important works which she has been able to examine personally, so that the student, especially the one not conversant with German, will find this the most satisfactory general historical summary in print. It is true that a few important papers have been overlooked, among them Siemiradski's monograph, "Die Spongien der Polnischen Juraformation" ("Beiträge zur Palæontologie und Geologie Osterreich-Ungarns und des Orients," Bd. XXVI., pp. 163–211, 1913, and in the Polish language in the publications of the Scientific Society of Warsaw for the same year), in which 92 species including a number of new ones are described according to modern methods, and illustrated on six quarto pages, and Vinassa P. de Regny's "Trias-Spongien aus dem Bakony" ("Resultate der wissenschaftlichen Erforschung des Balatonsees," Bd. I., 1901) and "Neue Schwämme, Tabulaten und Hydrozoen aus dem Bakony" (*ibid.*, 1908), but as the author's work was primarily with the Cretaceous sponges, such an oversight is not to be wondered at.

Chapter II. deals with the morphological characters of the Silicispongiæ, and this chapter is of value because it gives to the student the only comprehensive account of the characters and classification of the skeletal elements to be found in the English language not excepting that of Hinde. It is a more systematic presentation, because arranged chiefly in tabular form, than the elaborate one given by Rauff, and on that account will be found more serviceable to the general student. It is also more complete than that of Rauff, because it includes a number of new types introduced by Schrammen, and renders moreover into English a number of terms so far only used in German literature. This chapter is illustrated by 14 plates of outline drawings, selected from the illustrations given by Rauff and Schrammen. By an oversight these are all credited to Schrammen on page 34, though 48 out of the total of 71 are from Rauff, as correctly given in the description of plates. Plates I.–V. give an illustration for each type of spicule, while on Plates VI.–XIV. are given illustrations of the actual spicules of the species represented in the American Museum collection. The relationships of the many special types of spicules to, and their derivation from the three fundamental types the triod, tetraxon and the triaxon are also clearly set forth. In the discussion of the microscleres, reference should have been made to the important, though preliminary paper by P. Ortman, "Die Mikroscleren der Kieselspongien in Schwammgesteinen der Senonen Kreide" ("Neues Jahrbuch für Mineralogie," etc., 1912. Bd. II., pp. 127–149).

Chapter III. presents in 50 pages a summary of the stratigraphy of the Upper Cretaceous formations of Europe, and is in many respects the most valuable part of the work. Here the student will find what is probably the best general summary of this subject in the English language and the reviewer would recommend the perusal of this chapter to all students of European stratigraphy. It is not merely a summary of text-book literature, but is evidently based on a study of the original works, and reveals the author's grasp of the fundamental principles of stratigraphy. The study of the Cretaceous stratigraphy of Europe was undertaken by Miss O'Connell, as she tells us in the preface, as a part of the research work under the Sarah Berliner Research Fellowship for Women which she held for the year 1917–1918, and which was a study of the "Habitat of the Silicispongiæ." In this discussion of the stratigraphy the field is divided into eleven provinces, the disconnected character of which is primarily the result of post-Cretaceous erosion, which in many areas has removed the transitional facies of the

sediments, so that there is often a decided lithic and faunal distinction between the deposits of the several provinces.

In the British province the chalk shows a transgressive character from the southeast towards the northwest, and generally begins with a basal clastic series which rests upon the eroded surface of various older formations. This is followed by greensands and glauconitic chalk, which formations are thus lithic rather than stratigraphic units, being of Aptian age in southeast England, of Cenomanian age in southern Antrim, Ireland, and of Senonian age in northern Antrim. The age of the base of the pure chalk varies in like manner. From the detailed analysis of the sponge faunas of Great Britain, it appears that there was in general a corresponding shifting in the maxima in the same general direction, the siliceous sponges of the Cenomanian, Turonian and Emsherian, being confined to the southern and southeastern counties, while the Senonian sponge fauna is best represented in Norfolk and Yorkshire.

A similar transgressive character of the Cretaceous sea and corresponding overlap and change of facies of the sediments is seen in the deposits which underlie the Tertiaries of the Paris Basin, and which are structurally stratigraphically and faunally united with those of southeast England and belong to the sediments of the Boreal sea of Cretaceous time. Marine conditions in part of this region began however in Lower Cretaceous time. The deposits of southern France, together with those of the Alps, belong to the persistent Tethys sea, and here extensive marine limestones accumulated in Lower Cretaceous time as well. The Cretaceous deposits of northern Germany (indicated upon an excellent copy of Walther's map, which unfortunately is reproduced on too small a scale), and those of Bohemia, also illustrate the transgressive character of the Cretaceous sea, most extensive in the Cenomanian, and further show a striking general change in facies from prevailingly sandy (Quadersandstein) on the east to calcareous character on the northwest, the calcareous facies beginning as intercalations of thin-bedded limestones (Pläner) in the sandstone series. Local contributions of sands from the Harz uplands, etc., also modify the facies, but the main events of Cretaceous paleogeography of the northern European basin as indicated by the sediments were the progressive transgression of the sea towards the west and north and the simultaneous advance of the terrigenous sands from the Bohemian and Vienna regions over the calcareous deposits, the two types being in the relation of replacing overlap. This is the key to the distribution of the sponge fauna of the several districts.

The bibliography which is limited to Cretaceous Silicispongiæ and important stratigraphic papers contains 280 titles all of which except 24 were consulted by the author, surely a remarkable piece of industry when it is considered that many of these are monographic works, and that several European languages are represented.

A few typographical errors have crept in, those noted being as follows: p. 52, end first paragraph, the reference to the *following table* should be to the *preceding table;* p. 61, *Wealden anticline* is used instead of *Wealden anticlinal* as elsewhere, to indicate the compound character of this structure.

Altogether the work here reviewed is most creditable, alike to the author and to the geological-paleontological department of the museum, and while it does not pretend to be an original contribution either to spongiology or to European stratigraphy, it is distinctly one in its keen analysis of European literature, and in the synthesis of the important facts of European stratigraphy into a comprehensive and very readable unit and for this American students will be grateful to the author.

A. W. GRABAU

ORGANIZATION OF THE AMERICAN SECTION OF THE PROPOSED INTERNATIONAL GEOPHYSICAL UNION

AT the invitation of the Royal Society issued June 17, 1918, an Inter-Allied Conference on International Scientific Organizations