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

was held in London from October 9 to 11, 1918. A further conference was held in Paris from November 26 to 29, 1918, at which organization was advanced, and the designation "International Research Council" was adopted.

At the Paris conference resolutions were passed by this International Research Council in favor of the establishment of an International Geophysical Union, "for the purpose of initiating and promoting researches in geophysics." The fields in science to be comprised under this title were not completely specified and only two sections were proposed at that time, viz.:

(*a*) A section dealing with geodesy and allied branches of science, such as the study of tides and mathematical "cartography;"

(*b*) A section of meteorology, with which shall be associated terrestrial magnetism, seismology and vulcanology;

but it was intended that other sections should be provided for. In these resolutions it was provided that "National Committees"[1] shall be appointed under the authority of the principal academy of science in each country, or by its government.

Following this an informal meeting of the Division of Physical Sciences, and invited guests, was held in Washington, D. C., on February 27, 1919, in response to a call by Mr. George E. Hale, chairman of the National Research Council, at which the actions of the London and Paris conferences were reported and discussed, and the general subject and content of the field of geophysics was considered.

A committee, consisting of Messrs. R. S. Woodward, chairman, L. A. Bauer, Wm. Bowie, Whitman Cross, A. O. Leuschner and C. F. Marvin, was appointed to consider the organization of an American Section of the proposed International Geophysical Union. Under date of March 4, 1919, this committee submitted the following report:

[1] Following the precedent in astronomy, in the United States the "National Committee" has been designated the "American Section," of the proposed International Geophysical Union.

To the Chairman of the National Research Council:

Your committee appointed to consider the question of a logical and practicable organization of the proposed American Section of the International Geophysical Union respectfully submits the following report:

The earth is at once the subject and the object of many sciences. Of these the most important are astronomy, geodesy, geology, meteorology, seismology, terrestrial magnetism, terrestrial electricity, tides and vulcanology.

While each of these sciences is more or less distinct in itself, they are closely related to one another, and progress in any one of them may be expected to depend to a great extent on the general progress attained in the others. Each of these sciences has its devotees and its experts, and the number of these in the aggregate is now very large. Hence in any scheme of effective organization it is essential to secure groupings of these various subdivisions of geophysics in order that the number of groups may not be too unwieldy in the transaction of business essential to such organizations. But it should be distinctly understood that in recommending a limited number of groups for purposes of administration it is not desired to discourage relations of closest reciprocity between the devotees to the various sciences included in the groups. On the contrary, it is the opinion of your committee that progress in the future is most likely to result from active cultivation of the borderlands that now serve to diminish, but only indefinitely, the several fields of geophysics.

It should be understood also that the groupings recommended are to be regarded as provisional and subject to such changes as future experience may suggest. It is recognized also that the groupings here recommended may not be the most appropriate for all countries or possibly for an international organization, since much regard should be given in all such matters to historical precedents and to the circumstances presented at any epoch by individual investigators, and especially by governmental organizations, of any country.

With these reservations the committee recommends that the following groups of subjects should be recognized in the organization of the American Section of the International Geophysical Union:

Group 1: Geodesy. This group may be assumed to deal with questions concerning the size, the shape and the mechanical properties of the earth.

Group 2: Seismology and Vulcanology.

Group 3: Meteorology and Mareology, including especially all questions presented by the mechanical properties of the atmosphere and the oceans.

Group 4: Terrestrial Magnetism and Terrestrial Electricity. This group is intended to deal with the magnetic and the electric properties of the earth, including its atmosphere.

The committee recommends that initially the designation of members to constitute the proposed Geophysical Section be made by the National Academy of Sciences. It is further recommended that in making such designations regard be had to the desirability of securing representatives from the following government bureaus:

Bureau of Fisheries,
Bureau of Mines,
Bureau of Standards,
Coast and Geodetic Survey,
Hydrographic Office, U. S. N.
Geological Survey,
Weather Bureau.

Similarly, the committee suggests that representatives also may be fitly chosen from the following national societies:

American Astronomical Society,
American Mathematical Society,
American Physical Society,
Geological Society of America,
Seismological Society of America.

The committee further recommends that in order to promote research and discovery in geophysical science in general steps be taken by the American Section of the International Geophysical Union toward the formation of a new society to be called the American Geophysical Society.

Signed: R. S. WOODWARD,
for the Committee

This report was referred to the Division of Physical Sciences of the National Research Council, and was considered by this division at a special meeting held on March 10, 1919, called, in part, "to consider the organization of a Geophysical Section of the division to represent the division on the proposed International Geophysical Union." After discussion the Division of Physical Sciences voted to recommend to the Council of the Academy and to the Executive Board of the National Research Council.

1. The approval of the organization of a Section on Geophysics, to include the following groups of subjects:

Geodesy,
Seismology and Vulcanology,
Meteorology and Aerology,
Earth and Ocean Tides and Mareology,
Terrestrial Magnetism,

with the provision that the exact designation of subjects to be included and their grouping be determined by the section after its organization, in harmony with the general plans of the International Geophysical Union.

2. That the question of the formation of a geophysical society be referred to the Geophysical Section after its formation;

3. That the initial membership of the Section on Geophysics be constituted as follows:

Messrs. J. F. Hayford, R. S. Woodward, William Bowie, Joseph Barrell, Frank Schlesinger, A. O. Leuschner, E. W. Brown.

Messrs. H. F. Reid, J. C. Branner, H. O. Wood, A. L. Day, R. A. Daly, R. B. Sosman, Whitman Cross.

Messrs. A. G. McAdie, C. F. Marvin, W. J. Humphreys, E. H. Bowie, W. R. Blair, Max Mason, R. A. Millikan.

Messrs. G. W. Littlehales, J. T. Watkins, A. A. Michelson, F. R. Moulton, G. F. MacEwen, H. B. Bigelow.

Messrs. L. A. Bauer, S. T. Barnett, R. L. Faris, W. F. G. Swann.

On April 15, 1919, upon recommendation of Mr. A. O. Leuschner, acting chairman of the Division of Physical Sciences, the executive board of the National Research Council made the following appointments:

1. *Acting Chairman of the American Section of the proposed International Geophysical Union,* Mr. William Bowie.

2. *A committee to prepare recommendations regarding international cooperation in geophysical subjects for consideration by the American Section of the proposed International Geophysical Union,* Messrs. R. S. Woodward, *chairman,* L. A. Bauer, William Bowie, Whitman Cross, A. O. Leuschner, C. F. Marvin and H. F. Reid, with power to increase its membership.

At its first meeting, on May 20, 1919, this committee assumed the title, Provisional Executive Committee, and added Mr. H. O. Wood to its membership as its secretary.

3. *A Committee on Variation of Latitude of the American Section of the proposed International Geophysical Union to confer with a similar com-*

mittee of the American Section of the proposed International Astronomical Union to make joint recommendations with this Committee in regard to the future organization of researches on the variation of latitude, Messrs. William Bowie, chairman, F. R. Moulton and C. F. Marvin.

The executive board also determined that the organization meeting of the American section of the proposed International Geophysical Union should be held in Washington, in conjunction with the June, 1919, meeting of the American Section of the proposed International Astronomical Union, and that pending that meeting further organization of the American Section of the proposed International Geophysical Union should be left with its acting chairman with power.

At the meeting of the Interim Committee of the Executive Board of the National Research Council, on May 20, Mr. H. O. Wood was appointed acting secretary of the American Section of the proposed International Geophysical Union.

In preparation for the organization meeting and for the meetings in Brussels in July, 1919, of the International Research Council and the International Geophysical Union, four meetings of the Provisional Executive Committee were held, on May 20, June 3, June 10 and June 17. The organization meeting was held in three sessions, on June 24 and 25, 1919, at the building of the National Research Council, in Washington, D. C.

A digest of the action taken at these meetings is given below:

At the first meeting of the Provisional Executive Committee on May 29 the following gentlemen were designated as committees of one to prepare brief statements for the use of the delegates to the meetings at Brussels in regard to the past history, present status, and scientific purposes of each of the following international scientific bodies:

1. International Geodetic Association, Mr. Wm. Bowie.

2. International Seismological Association, Mr. H. F. Reid.

3. (*a*) International Meteorological Committee and (*b*) International Committee for the Study of the Free Atmosphere, Mr. C. F. Marvin.

4. International Commission of Terrestrial Magnetism, Mr. W. J. Peters.

Also Mr. R. S. Woodward, as chairman of the committee, was requested to prepare a brief statement for the use of the delegates in regard to the past history, present status, and scientific purposes of geophysics as a distinctive field in science.

As a result of discussion with respect to the appropriate place of vulcanology in the organic scheme Mr. Whitman Cross was requested to prepare a statement in regard to vulcanology similar, so far as possible, to those regarding the other subdivisions of geophysical science in their international aspects.

Two printed pamphlets issued by the Royal Society, entitled "Proposals for the Convention for an International Union of Geophysics —Approved by the Royal Society" and "International Geophysical Union," were read and discussed, and Mr. Leuschner was requested to prepare a clarifying statement in regard to foreign proposals for organization.

A committee consisting of the acting chairman of the American Section and the Chairman of the Provisional Executive Committee was appointed to consider the appointment of delegates to the Brussels meeting.

A Committee on Publications was appointed, consisting of the acting chairman and the acting secretary of the American Section, and Messrs. F. E. Fowle and G. S. Fulcher.

At the second meeting of the Provisional Executive Committee, on June 3, considerable time was devoted to the consideration of a project for geophysical investigations in the Arctic regions in cooperation with Roald Amundsen's expedition, under the auspices of the Norwegian government, which had been brought to the attention of the National Research Council by the Director of Naval Intelligence. Recommendations with respect to feasible action were made by the committee which were transmitted by the acting chairman of the section to the council.

Mr. Leuschner read a clarifying statement in regard to foreign proposals for organization which he had been requested to prepare. The substance of this, omitting illustrative

information given at length, is summed up in the following paragraph.

A large number of formal and informal international scientific organizations existed previous to the war. As a result of it these have lapsed, effectively, and in some cases the terms have expired during the course of the conflict. Because of the war the International Association of Academies has become defunct practically. A strong effort is being made to reconstitute the latter in the "International Research Council," and at the same time, to reconstitute, centralize, simplify in organization and minimize in number the previously very numerous international scientific organizations as "International Unions" affiliated with the International Research Council.

Attention was given to a "Proposed International Hydrographic Conference to be held in London in June, 1919," and action was recommended intended to secure a suitable correlation of this with the interests of the Mareological subsection as represented at Brussels.

A report was read by Mr. Bowie, for the Committee on Variation of Latitude which met jointly with the committee of the same title of the American Section of the proposed International Astronomical Union; and the report was approved for transmittal to the section.

A report was read by Mr. Wood, for the Committee on Publications, which was approved for transmittal to the section.

At the third meeting of the Provisional Executive Committee, on June 10, in connection with consideration of delegates to the meetings in Brussels, action was recommended to the chairman of the National Research Council toward the appointment of men already delegated to attend the Hydrographic Conference in London.

A Committee on the Investigation of Earth Tides, consisting of Messrs. A. A. Michelson, chairman, T. C. Chamberlin and F. R. Moulton, was appointed in response to a communication from Mr. Moulton recommending action on this subject.

A request from the Division of Geology and Geography to the Division of Physical Sciences that a member of the latter division be appointed to represent the division on a committee of the Division of Geology and Geography to consider a specific project in seismology, was referred to this committee and the acting chairman of the American Section was requested to recommend to the Division of Physical Sciences a member of the division to be appointed to serve with the committee of the Division of Geology and Geography.

After brief comments on the subject Mr. Bowie was requested to prepare a statement in regard to isostasy for the June meeting.

At the fourth meeting of the Provisional Executive Committee, on June 17, further consideration was given to the matter of the delegates to the Brussels meeting and of the instructions or advice which should be given them.

After discussion it was the sense of the committee that the delegates to Brussels should have power to confer for the purpose of arriving at definite understandings in regard to the future status of international organization in science.

But, in order to provoke discussion and the free exchange of ideas in regard to this it was decided to transmit to the section the following recommendations:

That the International Research Council take such steps as are required to perpetuate the work of international organizations in science, if necessary by terminating previously existing arrangements, whether informal or dependent upon treaties or conventions; and

That the International Research Council recommend to the appropriate international unions the appointment of suitable committees on special subjects where continuation is desirable or necessary to provide plans for resumption and continuation of organization.

The opinion was stated that definite action to terminate previous international arrangements would probably be necessary in most cases.

The plan of the Royal Society in regard to financing the administration of the International Geophysical Union was discussed in

connection with a general consideration of this problem and certain specific details.

It was the sense of the committee that geochemical investigation should have appropriate representation in the American Section of the proposed International Geophysical Union.

It was recommended to postpone the question of the formation of an American Geophysical Society until after the Brussels meeting.

HARRY O. WOOD,
Acting Secretary

(To be concluded)

SPECIAL ARTICLES

BACTERIUM SOLANACEARUM IN BEANS

IN June, 1919, some badly diseased bush beans were received from Lynn Haven, Florida. The leaves were wilted and more or less brown. Often the petioles also were brown and wilted to their base. The roots were brown and the epidermis somewhat decayed in places. The woody parts of the plants, both stems and roots, had dark stained vascular bundles. Cross sections examined microscopically showed from 50 to 100 per cent. of the vessels to be full of bacteria and no fungi were visible. As the discoloration of the leaves was generally uniform, with no lesions apparent while the roots showed lesions and contained bacteria in great numbers the supposition was that the disease must be due to the bacteria and that they must have entered through the root system. The loss in the Florida field was about 20 per cent. of the beans planted.

Agar-poured plates gave pure cultures of a white bacterial organism having all the characteristics of *Bacterium solanacearum.*

Cultural work in other media and needle-prick inoculations made with sub-cultures of colonies taken from the poured plates confirmed this diagnosis.

A number of different legumes were inoculated by pricking the bacteria into the stems. Of beans, Waxbush, Red Valentine and Refugee proved very susceptible. These plants began to wilt two days after inoculation and a number were entirely wilted and fallen over in seven days. In addition to those already mentioned, good infections were secured in: Lima beans (Fordhood variety), Pinto beans (a brown speckled variety) and Great Northern (a white Navy bean).

Inoculated in peas this parasite acts more slowly than in beans, but is not without pathogenic properties at least on some varieties. Following stem inoculation by needle pricks there is a slow drying and shriveling of the leaves but not a sudden wilt. The plants become stunted. Cross sections of the stems show bundles discolored and containing bacteria though in less abundance than in infected beans, tobaccoes, or tomatoes. Telephone, Little Marvel and Mammoth Luscious Sugar were the varieties of peas that became infected. The organism has been reisolated from both beans and peas, and proved to have the same characters and infectiousness (tested on tobacco and beans), as the original culture.

The organism was also found to be infectious to soy beans (variety Ito San) and to cowpeas (variety Black Cow).

Tobacco and tomato plants used for control showed typical *Bacterium solanacearum* infections.

So far as known this is the first time this disease has been observed in beans, peas, soy beans or cowpeas, although known to occur in peanuts, in *Mucuna* sp., and in some other legumes. Fortunately beans appear to be very susceptible only in early stages of growth.

ERWIN F. SMITH,
LUCIA MCCULLOCH

SCIENCE

A Weekly Journal devoted to the Advancement of Science, publishing the official notices and proceedings of the American Association for the Advancement of Science

Published every Friday by

THE SCIENCE PRESS

LANCASTER, PA. GARRISON, N. Y.

NEW YORK, N. Y.

Entered in the post-office at Lancaster, Pa., as second class matter