Since the accommodations on the island are limited, it is advisable to make reservations in advance. For reservations or further information, application should be made to the secretary, Neil E. Gordon, Central College, Fayette, Mo.

F. R. MOULTON

REPORTS

GRANTS FOR RESEARCH OF THE GEOLOGICAL SOCIETY OF AMERICA

TWENTY-EIGHT grants in support of special research projects were authorized by the council of the Geological Society of America at the April meeting, as follows:

Ralph E. Grim, Illinois State Geological Survey, Urbana. Dr. Grim's well-known exhaustive studies of clays of Illinois have developed a strong interest in the genesis and evolution of the several minerals of the clay groups. In the main, however, materials available to him until now were from the Pennsylvania underclays. With this grant from the society he will have the opportunity to apply his researches to large collections of recent marine clays taken from the floor of the Pacific, $1,800.

Charles A. Anderson, University of California, Berkeley, and Charles W. Merriam, Cornell University, Ithaca, N. Y. Dr. Anderson and Dr. Merriam will spend five to six weeks during the coming summer in the Roberts Mountains, one of the Basin Ranges of western Nevada, rechecking the distribution of Tertiary volcanics and their relationship to the later faulting. An important key to the later structural history of the central Great Basin may be disclosed. Stock-like bodies and sills of alaskite porphyry cutting the Paleozoic formations in the southern portion of the range present a number of interesting problems of petrogenesis to be worked out. $600.

Louis L. Ray, Harvard University, and J. Fred Smith, Jr., Texas Agricultural and Mechanical College. Dr. Ray and Dr. Smith plan to spend ten weeks in the Moreno Valley in the Sangre de Cristo Mountains of northern New Mexico on a study of the tectonic history of the vicinity. This is considered a critical area for the study of the orogenic history of the southern Rocky Mountains. $650.

S. A. Berthiaume, Cornell University, Ithaca, N. Y. Dr. Berthiaume will go to Diamond and White Pine mountains of east-central Nevada to make a detailed study of the late Paleozoic stratigraphy of, and establish a typical section for, that part of the Great Basin. His work will contribute to our knowledge of the late Paleozoic physical conditions, the structure and volcanic history of the Great Basin, and, it is hoped, may disclose an identifiable flora in the white pine shade in which fragmentary plant remains are known. $250.

Ralph W. Chaney, University of California, Berkeley. Dr. Chaney will assemble all the available data on the character and occurrence of late Tertiary vegetation in western America. This is expected to fill out a little-known chapter of floral history. It will have a critical bearing on the interpretation of later Tertiary vertebrates and invertebrates and will assist in the correlation of several of the terrestrial formations of the region. $600.

N. H. Darton, U. S. Geological Survey, Washington. Dr. Darton will continue his field studies of the overlap relations of the Tertiary and Cretaceous formations in eastern Maryland and Virginia. During the course of the study to date several very significant stratigraphic features in the Eocene succession which throw considerable light on the structure and overlap relations have been made manifest. $450.

Victor T. Allen, St. Louis University. Professor Allen will devote several weeks to field work on the west side of the Great Valley of California collecting samples of Eocene white clays and sands. The samples will be studied petrographically, chemically and by x-ray technique, and comparisons will be made with results already in hand from the Ione formation on the east side of the valley. The research is an attempt to answer the question as to whether during the Eocene Sierran minerals were carried across what is now the Great Valley or whether anauxite clays formed at nearly the same time on two widely separated terranes. The results will be a contribution to the physiographic and climatic conditions during the Eocene. $500.

Robert P. Sharp, University of Illinois, Urbana. Dr. Sharp will go to the Ruby-East Humboldt Range of Nevada for two months of field work in completing his study of the boundary structures and Cenozoic history of this Basin Range. The study is expected to contribute to the relations between pre-Tertiary and Basin Range structures. Furthermore, in the southern part of the range the formations are unmetamorphosed, and it will be possible to establish the stratigraphy and thereby contribute to studies in the northern part, where igneous intrusions have cut the formation to pieces. $310.

F. J. Pettijohn, University of Chicago. Professor Pettijohn will continue his study of the lithology and stratigraphy of the early pre-Cambrian sediments in the Thunder Lake region of Ontario. He expects to spend three or four weeks in the field on a special study of the occurrence of calcareous concretions and limy beds and to make special collections for petrographic and chemical analyses. The record of concretions in the early pre-Cambrian is scanty, and Professor Pettijohn plans to contribute data on these to support the doctrine of uniform operation of geological processes throughout geologic time. $175.

Curtis J. Hesse, Texas Agricultural and Mechanical College. Dr. Hesse is to study a collection of fossil vertebrates from the Gulf Coast of Texas. His report on this collection will provide a means of correlating the marine Miocene invertebrates of the Gulf Coast with the fresh-water Tertiary of the mid-continent and allied faunas of Florida. $500.

Henry C. Stetson, Harvard University. Dr. Stetson's work with the Woods Hole Oceanographic Institution during the past two years has included the taking of about fifty cores from the continental slope and in the Atlantic basin by means of the "Piggot gun." The study of the cores is contributing to our knowledge of

the Pleistocene history of the Atlantic basin and of the conditions of deposition on the slope and in the canyons. The grant is to furnish spare parts for the "gun" in order that operations need not be interrupted by inevitable losses. $215.

John W. Wells, Ohio State University. Dr. Wells and Dr. T. Wayland Vaughan are completing a revision of the madreporarian hexacorals. Since 1884, when the last compilation was made, a considerable volume of data has accumulated concerning the morphology, classification, ecology and geologic distribution of this group, which has played an important role in the formation of coral reefs since Triassic time. The monograph will represent an intensive investigation of original type material both in this country and in Europe and will present a unified outline of present knowledge, paleontologic and zoologic, of this group. $200.

Richard Foster Flint, Yale University. Professor Flint will spend five weeks in an investigation of the emerged Pleistocene marine features of southwestern Newfoundland. The study will lead to a better understanding of the crustal deformation related to glacial unloading in northeastern North America. The research will contribute to the project to be undertaken by Professors Twenhofel and MacClintock on the physiography and glaciology of the interior and will tie in directly with that on strandline study to be undertaken in Labrador by Professor V. Tanner. $845.

Kenneth E. Caster, University of Cincinnati. Dr. Caster's grant is to enable him to complete his catalogue of the North American Devonian Pelecypoda types. $500.

Paul F. Kerr, Columbia University. Professor Kerr plans to spend about six weeks in the tungsten-bearing area of southern Idaho, Nevada, northwestern Arizona and southeastern California, visiting localities previously studied during the course of the past six years as well as others not yet examined. Following necessary laboratory studies a comprehensive report on the tungsten mineralization in the Basin Range region will be prepared. $1,510.

Edward C. H. Lammers, Washington and Lee University, Lexington, Va. Professor Lammers will spend two and a half months in the southern part of the Beartooth Range continuing his structural studies of the past three field seasons. He wishes to determine the amount of coincidence between Laramide and pre-Cambrian structures in order to evaluate the importance of pre-Cambrian zones of weakness in controlling the Laramide deformation of this typical Rocky Mountain uplift. $565.

Maurice Ewing, Lehigh University, Bethlehem, Pa. Professor Ewing will continue his geophysical studies of the emerged and submerged Atlantic coastal plain. The researches of the past three years consist of the measurement of the depth of bedrock across the coastal plain, the shelf and into the oceanic basin. It is hoped that they will clarify the fundamental differences between continents and ocean basins, answer the question of the continuation of continental geologic structures into ocean basins, and give data on the permanence of ocean basins. The work planned under this grant will cover measurements in shallow water at Long Island, Barnegat Bay, Cape May and off the eastern shore of Maryland. $1,200.

Charles Deiss, Montana State University, Missoula. Professor Deiss will spend six weeks in southern Alberta and British Columbia in continuation of his revision of the Cambrian in the northwestern states and in the southern part of the Canadian Rockies. This work carried on since 1931 has contributed to the establishment of a usable standard Cambrian time scale for North America and to the paleogeography and sedimentation in the Cordilleran region during Cambrian time. $540.

Fred B. Phleger, Jr., Amherst College, Amherst, Mass. Dr. Phleger is to continue his study of the Foraminifera in cores obtained by means of the "Piggot gun" in the basin of the North Atlantic Ocean. His researches are contributing to our knowledge of the distribution of cold- and warm-water areas during the Pleistocene and Recent epochs, of the depth and areal distribution of living Foraminifera, and of the rate of sedimentation in the ocean basin. $600.

Girard Wheeler, Rutgers University, New Brunswick, N. J. Dr. Wheeler is planning to spend several weeks at Jeptha Knob in Kentucky, extending his study of the structure and stratigraphy. Trenching at strategic points near the base is expected to disclose whether certain dipping strata are due to landsliding or to late Ordovician deformation. Other trenches near the top are expected to disclose whether the surface below the Silurian capping is an angular unconformity. Fossils will be collected for later determination and check on the stratigraphy. $150.

Max Demorest, University of North Dakota, Grand Forks. Professor Demorest will devote two months visiting active glaciers in the northern Rockies, the Cascades and the Canadian Rockies. He will study the structure and flow of glacier ice by means of a modification of the technique of petrofabric analysis. Oriented specimens will be cut and observed in the field. Other specimens of glacier ice will be shipped for laboratory testing. $600.

Marland P. Billings, Harvard University. Professor Billings will devote the summer of 1939 to field work in the Presidential Range, New Hampshire, continuing a special investigation of the changes in chemical composition that have affected high-grade metamorphic rocks. At present there is the suggestion that certain stratigraphic units have undergone slight chemical change, while others have been very susceptible. $500.

Willard H. Parsons, Hamilton College, Clinton, N. Y. Dr. Parsons will go to the Deer Creek-McLeod area in southern Montana to complete a study of the eruptive and intrusive rocks of the Stillwater-Boulder River area. He expects, among other things, to discover the loci of origin in the Deer Creek volcanics and to determine whether or not the Deer Creek igneous rocks were produced during a minor orogenic episode foreshadowing the main Beartooth thrusting. His work will be a contribution to the relation of volcanic activity to the Beartooth thrusting. $400.

J. Harlan Johnson, Colorado School of Mines, Golden. Professor Johnson is to examine Permian algal limestones of Colorado and New Mexico to obtain data on the origin and conditions of deposition as well as descriptions of the lime-secreting algae. $225.

George W. Bain, Amherst College, Amherst, Mass.

Professor Bain will spend six weeks at Marble, Colorado, investigating the fabric of the Treasury Mountain granite and its roof rocks. This study is expected to demonstrate the effect of recrystallization upon petrofabric of quartz, calcite and mica in a variety of rocks, the relation of fabric and grain stability to distance from the intrusive, the areal distribution of strain around a plutonic intrusive and the relationship between contact metasomatism and strains. Data on strains in the granite and the adjacent roof may be expected to yield data bearing upon viscosity of magmas. $300.

Charles C. Mook, American Museum of Natural History, New York, N. Y. Dr. Mook will continue the work on his monograph on the Fossil Crocodilia of the World. This work has been under way for a number of years and will be brought to completion during the year. $1,500.

David Griggs, Jefferson Physical Laboratory, Harvard University. Dr. Griggs's investigation of the deformation of rocks by low stresses acting over long periods of time has been going on for two years. The laws of dry deformation have already been outlined. New experiments on specimens deformed while immersed in solutions show marked differences in behavior. New "creep testers" provided for under this grant will permit further investigation of recrystallization flow. $1,200.

Horace G. Richards, New Jersey State Museum, Trenton. Dr. Richards will join forces with Professor H. H. Hess, of Princeton University, on an expedition to the Island of Margarita off the eastern Venezuelan coast, there to collect and study Pleistocene and Recent mollusks. His work will be of immediate value to Professor Hess in his studies of the very large negative gravity anomalies of the vicinity and will contribute further knowledge of the paleogeography of the Caribbean region. $300.

SPECIAL ARTICLES

ON THE PRESENCE OF AZOTOBACTER AGILIS IN AMERICA

BEIJERINCK[1] created the genus *Azotobacter* for the non-symbiotic nitrogen-fixing aerobic bacteria discovered by him in 1901. Two species were suggested; namely, *Azotobacter chroococcum,* a soil organism, and *Azotobacter agilis,* isolated from water. Lipman,[2,3] in America, described two additional species: *Azotobacter Vinelandii* and *Azotobacter Beijerinckii.* The former is related to *Az. agilis* by the formation of a greenish pigment, while the latter is similar in certain characters to *Az. chroococcum.* All four species are recognized at the present time. In addition, other species reported in the literature are *Azotobacter Woodstownii* by Lipman[3] and *Azotobacter vitreum* by Löhnis and Westermann.[4] These, however, generally are not recognized as well-defined species.

Of all the above *Az. chroococcum* is considered the most typical species of the group, and apparently it has world-wide distribution in soil. *Az. Vinelandii* and *Az. Beijerinckii* have been reported also as present in soil, although not so frequently as the former species. It was first believed that the presence of *Az. agilis* was restricted to the canal water of Delft, Holland, from which the original isolation was made by Beijerinck. The Beijerinck strain being lost, Kluyver and van Reenen[5] isolated an organism identical with *Az. agilis* excepting that there was a lack of pigment formation. Later, Kluyver and van den Bout[6] isolated a pigment-forming strain, and considering it typical of *Az. agilis,* they named the previous isolation *Azotobacter agilis* var. *atypica.*

Recently, the extensive investigation of Winogradsky[7] reported the isolation of this species from surface waters in France. Many characteristics useful in the identification of the species were included in this publication. This isolation, together with the present report, indicates that *Az. agilis* may be distributed more widely than was supposed previously.

In the present investigation, begun in early July of 1938, the technique of Winogradsky was followed using several samples of surface water in 100 cc amounts of different origins at Madison, Wisconsin, and, later, from San Francisco, California. In addition to the original medium recommended by Winogradsky, in which ethyl alcohol is the source of carbon, a slight modification of this was included in which Fe citrate was substituted for Fe chloride.

As shown in Table 1 five samples of water and one sample of sewage effluent were positive out of twenty-two samples examined. The advantage of the modified medium is shown in samples 1, 3 and 5, in which growth occurred only in the modified medium and also in samples 2 and 4, in which cases growth occurred first in the modified medium. Positive samples were characterized by a peculiar purple or violet coloration, especially in the modified medium.

The strains isolated although similar, may be divided into two groups. The strains isolated from lake water are characterized by the lack of pigment and scanty growth in solid mediums, and the production of a

[1] M. W. Beijerinck, *Centralbl. f. Bakt.,* II Abt., 7: 561–582, 1901.

[2] J. G. Lipman, N. J. Agr. Exp. Sta. Ann. Report, 24: 217–285, 1903.

[3] *Ibid.,* 25: 237–289, 1904.

[4] F. Löhnis and T. Westermann, *Centralbl. f. Bakt.,* II Abt., 22: 234–254, 1909.

[5] A. J. Kluyver and W. J. van Reenen, *Archiv f. Mikrobiol.,* 4: 280–300, 1933.

[6] A. J. Kluyver and B. T. van den Bout, *Archiv f. Mikrobiol.,* 7: 261, 1936.

[7] S. Winogradsky, *Ann. Inst. Pasteur,* 60: 351–400, 1938.