such as the color variation of flat-fishes (1894), of Chrysomelid beetles (1895), of webbed feet in Antwerp pigeons (1896), of meristic variation in crustacea (1900) and of melanism in moths (1900). And his studies are extended to successive generations so as to cover the inheritance of variations. He writes a general article for *Science Progress* (1897) on "Progress in the Study of Variation" [including heredity]. He had published in 1895 an investigation of the origin of the cultivated cineraria, which he shows to have been through hybridization of several wild species. In 1900 he discusses the inheritance of variation in the corolla of *Veronica Buxbaumii*. Two controversial papers in which he attacks sharply some of the methods and conclusions of the biometric school in the study of variation conclude Volume 1.

Volume 2 includes the papers on heredity and related subjects published by Bateson after the rediscovery of Mendel's law in 1900. This discovery furnished the key-note of all Bateson's subsequent work. He at last had found what up to this time he had been looking for. Mendel's law explained how discontinuous variations were perpetuated and why they were not swamped by crossing. He could now, with the aid of this law, not only see evolution at work, but also control its processes. This with a body of enthusiastic colleagues he now set about doing.

The first paper in Volume 2 is an introduction to an English translation of Mendel's brief but momentous paper published in 1866. The second paper is an exposition of Mendel's principles of heredity reprinted from a book of similar title published in 1902. This was an epoch-marking work which to most English-speaking readers brought the first information that a new day had dawned in the study of evolution. This message it brought in no uncertain terms. The complete failure as a generalized statement of facts of the Galton-Pearson law of ancestral heredity was pointed out, and in contrast it was shown that Mendel's law is a valid and easily verifiable principle governing the transmission of discontinuous genetic characters. The question was raised whether in last analysis all heritable variations would not be found to be discontinuous in character and subject to Mendel's law in transmission.

Next comes a partial reprint of the famous "Reports to the Evolution Committee" of the Royal Society on "The Facts of Heredity in the Light of Mendel's Discovery." In a footnote is suggested the now generally accepted terminology of generations concerned in a Mendelian cross, P_1 (parental), F_1, F_2, etc. (filial).

A paper on the present state of knowledge of color heredity in mice and rats (1903) summarizes the experiments made with these animals previous to and since the rediscovery of Mendel's law and shows that all are consistently Mendelian, notwithstanding the persistently maintained opposite view of the biometric school.

Later contributions deal with the inheritance of heterostylism in Primula (1905), walnut comb in fowls (1905), flower color in sweet peas and stocks (1906). An address before the International Zoological Congress held in Boston in 1907 deals with "Facts Limiting the Theory of Heredity." A paper on "The Heredity of Sex" (1908) deals with sex-linked inheritance in Abraxas first described in 1906 by Doncaster and Raynor. In the same year, "Reports to the Evolution Committee" describe experiments with poultry, sweet peas and stocks.

Subsequent papers are reprinted chiefly from the *Journal of Genetics* established by Bateson and Punnett in 1911. Their substance is known to most students of genetics. Comprehensive experiments with various plants and animals serve to extend the Mendelian principles or show their limitations. The reduplication hypothesis to explain the earlier discovered facts of coupling and repulsion is launched (1911) but partially withdrawn some years later in favor of Morgan's chromosome theory, in a paper on the "Genetics of *Primula sinensis*" (1923). The subjects of somatic segregation, of chimeras, of root-cuttings receive repeated attention. One is, in fact, amazed at the fruitfulness and the fundamental value of Bateson's investigations. A number of reviews of current publications on genetics and evolution complete Volume 2.

W. E. CASTLE

THE AMERICAN GEOPHYSICAL UNION

THE tenth annual meetings of the American Geophysical Union and of its sections will be held in the National Academy and Research Council Building, Washington, D. C., on April 25 and 26, 1929. Following the business meeting of the general assembly of the union on the afternoon of April 26, the union will hear the five following general-interest papers presented by the Section of Oceanography, these all being either regarding work in progress or relating to work recently completed: "The Expedition of the Submarine *S-21* to the Caribbean Sea and Gulf of Mexico," by C. S. Freeman; "Oceanography and the Fisheries," by Henry B. Bigelow; "The International Ice Patrol, with Special Reference to its Economic Aspects," by Edward H. Smith; "The Cooperative

Survey of the Great Lakes," by Charles J. Fish; "The Work of the *Carnegie* to Date," by W. J. Peters.

The meetings of the six sections will be held on the mornings of April 25 and 26 and the afternoon of April 25. For each section short business meetings will be followed immediately by progress-reports and scientific papers. The section of geodesy (morning, April 25) will be devoted to progress-reports and recent developments in gravity and geodetic work in Mexico, Canada and the United States as follows: "Gravity-work in Mexico During the Past Year," by Pedro C. Sanchez; "Gravity-comparisons in Europe and America," by A. H. Miller; "The Measurement of Gravity at Sea," by F. E. Wright; "Recent Developments in Time-service Methods," by C. B. Watts; "Recent Developments in Geodetic Instruments," by D. L. Parkhurst; "Geodetic Work in Canada During the Past Year," by Noel Ogilvie; "Geodetic Computations and Investigations," by H. G. Avers; "Accomplishments in Field Geodesy During the Year April, 1928, to April, 1929," by William Bowie. The section of terrestrial magnetism and electricity (morning, April 25) will hear a symposium on physical theories of magnetic and electric phenomena, including the following papers: "The Corpuscular-ray Theory of Aurora," by N. H. Heck; "The Ultra-violet-light Theory of Aurora and Magnetic Storms," by E. O. Hulburt; "The Atmospheric Dynamo-theory of Variations in Earth-currents and Terrestrial Magnetism—A Review," by O. H. Gish; "A Tentative Theory of the Permanent Magnetic Field of the Sun and Earth," by Ross Gunn; "Echo-sounding of the Kennelly-Heaviside Layer," by M. A. Tuve.

The section of oceanography (afternoon, April 25) will hear the following communications: "Oceanography and Meteorology," by Charles F. Brooks; "Oceanography and Littoral Geology," by Douglas W. Johnson; "The Significance of Plankton Investigations," by Charles J. Fish; "Oceanographic Observations in Monterey Bay, California," by Henry B. Bigelow; "Recent Work on the Dynamic Oceanography of the North Atlantic," by C. O. Iselin; "Echo-sounding," by W. E. Parker. Additional oceanographic papers of general interest in this vast field will be presented as indicated above at the general assembly on the afternoon of the following day. The section of volcanology (afternoon, April 25) will hear and discuss the following papers: "Volcanic Oceanic Islands," by H. S. Washington; "Volcanoes of Java and Bali," by E. G. Zies; "The Volcanic History of the San Juan Mountains, Colorado," by E. S. Larsen; "Recent Eruptions of Kilauea," by T. A. Jaggar.

The sections of meteorology and seismology will hold meetings on the morning of April 26. The first will be devoted to the report of the meteorological division of the committee on the physics of the earth, which will include the following: "Introduction," H. H. Kimball; "The Origin and Composition of the Atmosphere," by W. J. Humphreys; "Meteorological Data and Meteorological Changes," by C. F. Marvin and A. J. Henry; "Solar Radiation and its Rôle," by H. H. Kimball; "Meteorology of the Free Atmosphere," by W. R. Gregg; "Dynamic Meteorology," by Edgar W. Woolard and Hurd C. Willett; "Physical Basis of Weather Forecasting," by Carl-Gustaf Rossby and Richard H. Weightman. The scientific program of the section of seismology will include: "Surface-waves," by J. B. Macelwane; "Forces and Movements at the Earthquake-origin," by H. F. Reid; "The Velocity of Surface-waves," by F. Neumann; "The Seismicity of the Arctic as Indicated by Instrumental Data," by E. A. Hodgson; "Earth-vibrations from Dynamite Blasts," by L. D. Leet.

The scientific sessions are open to persons interested in geophysics, whether members of the union or not, and all such are cordially invited to attend. These annual meetings are increasingly interesting each year, not only because of the stimulus afforded the study of problems concerned with geophysics but also by reason of the cooperation of the corresponding geophysical organizations of Canada and Mexico which is making for initiation and coordination of geophysical researches depending upon international and national cooperation.

JNO. A. FLEMING,
General Secretary

SCIENTIFIC APPARATUS AND LABORATORY METHODS

THE IN VIVO CULTIVATION OF INTESTINAL PROTOZOA IN PARASITE-FREE CHICKS

As every one knows, who has attempted experiments with animal parasites in laboratory animals, one of the greatest difficulties is to secure parasite-free animals for infection purposes. During the past two years a number of interesting experiments have been carried on in this laboratory with parasite-free chicks. Chicks offer a number of advantages; they can be obtained at any time of the year; they are free from animal parasites when they hatch from the egg; they are very inexpensive; they can be maintained in the laboratory free from animal parasites without difficulty and at low cost, and they can be inoculated very easily per os or per rectum with material containing animal parasites.

Fowls are known to be infected in nature by a number of intestinal protozoa; these include amebae,