lines are entirely hypothetic only in the Mississippi Valley, where there was probably some land uplift during the closing glacial epoch, the time of the Labradorian glacier. Except in the district west of Indiana and Michigan the map is intended to show only the Post-Wisconsin uplift, or the rise of the continent subsequent to the removal of the latest (Labradorian) ice sheet.

For Labrador and Newfoundland reliance is placed on the published figures of R. A. Daly, with some help from unpublished data of A. P. Coleman and J. B. Tyrrell.

Shoreline or beach features, bars and cliffs, are relatively uncommon at all stages of the uplifting, and rare at the primitive or summit plane of the sea-level waters, especially in far inland and secluded waters. For the above reason the main reliance in this study, especially when covering large territory in limited time, has not been placed on the uncertain open shore phenomena, but on the sure occurrence of deltas built by rivers debouching into the static waters. To avoid doubt or cavil as to glacial (ice-impounded) waters the main dependence has been on the deltas of streams with southward flow, or with flow directed away from the receding ice margin. To determine the true marine plane discrimination must be made between the sand plains which represent the initial sea level and the aggraded, coarse, upstream plains in the one hand, and the finer, submerged, downstream plains on the other hand. Where the valley stream deltas are heavy, with great horizontal extent and large vertical range, making more difficult the location of the primitive water plane, close determination of the latter is made by study of the deposits of small streams and other static-water features along the adjacent valley walls. Of course, the beach phenomena are utilized wherever possible, and especially on exposed coasts. In the extended paper, noted below, will be found a description of field methods, and a discussion of criteria for distinguishing marine features.

The map reveals strikingly the direct relation of the ice sheet to the diastrophic land movement; the area of uplift being the area of glaciation, and the amount of uplift being, apparently, in proportion to the relative thickness of the spreading ice cap. The map also shows the effect of land and sea on the flow and reach of the ice sheet. The ice deployed widely on the land, but was inhibited by the sea; thus producing more rapid flow and steeper gradients along the radii toward the nearer shores.

An independent ice cap over Newfoundland is indicated by the large local uplift.

The map also suggests that the correct name for this latest ice cap is not Labradorian but Quebecan; since the center of uplift, and presumedly the center of snow accumulation, lies between Quebec City and James Bay, while Labrador, proper, is only the narrow border of the so-called "Labrador peninsula."

For the details in this study, in both methods and results; for the description of features in western New England, Maine, St. Lawrence and Ottawa valleys, Gaspé peninsula, New Brunswick, Nova Scotia, Labrador and Newfoundland; and discussion of the possible effects of any change in ocean level, the reader is referred to the detailed paper, published in the *Bulletin* of the Geological Society of America, Vol. 29.

H. L. FAIRCHILD

DEPARTMENT OF GEOLOGY,
UNIVERSITY OF ROCHESTER

THE AMERICAN PHILOSOPHICAL SOCIETY

THE general meeting was held in the hall of the society on Independence Square on April 18, 19 and 20. On the evening of April 19 there was a reception at the hall of the Historical Society of Pennsylvania, when Lieutenant Colonel Robert Andrews Millikan, Ph.D., Sc.D., of the department of science and research of the Council of National Defense spoke on "Science in relation to the war." At the annual dinner given at the University Club on the evening of April 20, the list of toasts was as follows:

"The memory of Franklin": Hon. David Jayne Hill.
"Our learned societies": George Ellery Hale.
"Our universities": Ethelbert D. Warfield.
"The American Philosophical Society": John C. DaCosta.

New members were elected as follows:

Residents in the United States

Henry Andrews Bumstead, A.B., Ph.D., New Haven.
Philip Powell Calvert, Ph.D., Philadelphia.
Clarence Griffin Child, Ph.D., L.H.D., Philadelphia.
William T. Councilman, A.M., M.D., LL.D., Boston.
Victor George Heiser, M.D., New York.
Herbert C. Hoover, B.A., LL.D., Washington.
Aleš Hrdlička, M.D., Washington.
Gilbert Newton Lewis, A.M., Ph.D., Berkeley, Calif.
Theodore Lyman, Ph.D., Cambridge.
J. Percy Moore, Media, Pa.
Louis Valentine Pirsson, M.A., New Haven.
George Harrison Shull, B.S., Ph.D., Princeton.
Joseph Swain, B.L., M.S., LL.D., Swarthmore, Pa.
William Roscoe Thayer, A.M., LL.D., Litt.D., L.H.D., Cambridge.
Samuel Wendell Williston, A.M., M.D., Ph.D., Sc.D., Chicago.

Foreign Residents

Joseph Jacques Cesaire Joffre, Paris
Paul Painlevé, Paris.
Raymond Poincaré, Paris.

SCIENTIFIC PROGRAM

Thursday Afternoon, April 18; William B. Scott, D.Sc., LL.D., president, in the chair

Control of prices of food under Queen Elizabeth: E. P. CHEYNEY, A.M., LL.D., University of Pennsylvania. The five years from 1594 to 1598 were a period of great scarcity and high prices of all food products in England. The average price of wheat, transformed into modern values, was for months at a time above $7 a bushel, and in some places and at certain times, especially in the year 1596, it rose to $15 and even $18 a bushel. Rye, oats and barley were hardly cheaper and meats and other food rose in proportion. There was much privation and disorder. The government took the following steps to overcome the difficulty: (1) One set of provisions was directed toward better distribution of what food was in England. (2) Another set of provisions was directed toward increasing the available supply. (3) It is noticeable that the government did not establish a legal price; no relation was established between the price of grain and the price of flour; no substitutes were provided for. (4) The government, town authorities and the rural gentry were constantly in fear of popular uprisings, and there were several threatening movements which were vigorously punished by the government. (5) No satisfactory method of controlling the supply and price of food was worked out at this time, and the suffering was only alleviated by better crops, heavy taxation for the poor, and the cessation of the war.

Control of commerce in war time: WILLIAM E. LINGELBACH, professor of modern European history, University of Pennsylvania.

The influence of Russian political parties on domestic and international questions: ALEXANDER PETRUNKEVITCH, Ph.D., professor of zoology, Yale University.

The relations of French and American thought in the eighteenth and nineteenth centuries: ALBERT SCHINZ, A.M., Ph.D., professor of French literature, Smith College, Northampton, Mass.

Problems of war finance: THOMAS S. ADAMS, Ph.D., professor of political economy, Yale University.

Control of railroads of the United States: EMORY R. JOHNSON, Sc.D., professor of transportation and commerce, University of Pennsylvania.

The sanitation of camps: COLONEL FREDERICK F. RUSSELL, Medical Corps, U. S. A.

Surgical shock: WILLIAM T. PORTER, M.D., LL.D., professor of comparative physiology, Harvard University.

Friday Morning, April 19; J. G. Rosengarten, LL.D., Vice-president, in the Chair

History of the study of Greek vase painting: STEPHEN B. LUCE, curator of Greek antiquities, Museum of the University of Pennsylvania.

The art of George Catlin: EDWIN SWIFT BALCH, A.B., of Philadelphia.

Typewriter keyboards; an inquiry for some rational ones: CHARLES R. LANMAN, Ph.D., LL.D., professor of Sanskrit, Harvard University.

Changing of sex ratio in the rat: HELEN D. KING, associate professor of embryology, Wistar Institute, Philadelphia. This paper gave the results of a series of inbreeding experiments on the albino rat that were made to determine: (1) whether inbreeding increases the number of male offspring, as maintained by Carl Düsing; (2) whether the sex ratio can be altered by selection. The data summarized cover twenty-five generations of inbred rats, comprising 25,452 individuals. Accepting the current view that the spermatozoa are of two kinds, one "male-producing" and the other "female-producing," it is possible to explain the altered sex ratios in the two series by assuming that, in the A series, selection preserved those females for breeding in which the ova had an inherited tendency to attract spermatozoa that were "male-producing"; among the offspring, therefore, there was an excess of males (122.3

males to 100 females). In the B series, on the other hand, selection preserved the females in which the ova tended to attract "female-producing" spermatozoa, consequently the series showed an excess of females (81.8 males to 100 females). The results indicate that it may be possible to swing the sex ratio in a desired direction, even though we are unable to determine the ultimate cause of sex itself.

The Naiades of the upper Tennessee drainage: ARNOLD E. ORTMANN, Ph.D., Sc.D., professor of physical geography, University of Pittsburgh. The upper Tennessee region (above Chattanooga) has long been famous for the great number of mussel species found in its water. It has been studied by various collectors for nearly one hundred years; but up to the present time great confusion prevailed as to the species found in this region, and their affinities. The present writer made it his chief object during four summers, to collect the shells of this drainage together with the former; this is imperative for a proper understanding of all Nayad shells. It was found that the material collected included practically all species previously reported; it was possible to ascertain, in every case, the proper systematic position of each form, and, finally, the geographical distribution of each form, within this area, was ascertained, and was correlated with the geographical range elsewhere. Thus, the present paper represents a complete account, a synopsis, of everything known hitherto about the upper Tennessee mussels and with numerous additional observations not known previously.

A new type of insect larva: WILLIAM MORTON WHEELER, Ph.D., Sc.D., professor of economic entomology, Bussey Institution, Harvard University. The first larval stage ("trophidium") of two African ants, *Pachysima æthiops* Smith and *P. latifrons* Emery, proves to be unlike the larva of any known Formicid or, in fact, of any known insect, in possessing peculiar exudate organs ("exudatoria") surrounding the mouth. These organs are very primitive adipose glands which evidently furnish a liquid agreeable to the worker ants and are very similar to the exudate organs of ant guests (myrmecophiles) and of termites and their guests (termitophiles). The salivary glands and fatbody have a similar function in other ant larvæ. The relations between ants and their larvæ therefore involve mutualistic or reciprocal feeding and this accounts for the development of the colony both ontogenetically and phylogenetically and therefore for the social habit of the Formicidæ. Myrmecophily, trophobiosis, "social parasitism" among the ants themselves and the relations of ants to plants with extrafloral nectaries and food bodies all depend on essentially the same conditions. Similar conclusions are reached in regard to the origin and meaning of the social habit among social wasps, some bees and termites.

A critical survey of the sense of hearing in fishes: GEORGE H. PARKER, Sc.D., professor of zoology, Harvard University. That fishes could hear was maintained by most of the naturalists of antiquity, such as Aristotle and Pliny. This was also the opinion of such masters of the art of fishing as Isaac Walton and of such students of fish anatomy as John Hunter. In fact this was the universal view of the function of the ears in fish till 1878 when von Cyon declared that their only function was to keep the fish in equilibrium. This opinion was supported by Kreidl, who in 1895 attempted to show that when fishes did respond to sounds they responded through the organs of touch and not through the ear. Following Kreidl's work appeared a series of researches some of which supported the opinion that fishes did not respond to sounds at all while others tended to show that fishes did respond to sounds and that this response was mediated by the ear as well as by the skin. One of the most sensitive fishes in this respect is the common catfish *Amiurus*. Tests on this fish were carried out by Parker and Van Heusen with the following results. In catfishes in which the ears had been destroyed, the skin was found sensitive to the dropping of water, to water currents, to a slow vibratory movement of the whole body of water, to the impact of a leaden ball on the slate wall of the aquarium, but not to a whistle blown in the air. In catfishes in which the skin had been rendered insensitive, the ear was stimulated by a slow vibratory movement of the whole body of water, by the impact of the leaden ball, and by a whistle blown in the air, but not by the dropping of water nor by currents of water. To test more fully the effects of sounds, catfishes were subjected to the tones from a telephone contained in a tight rubber bag and submerged in the water of the aquarium. When the ears were destroyed, the catfishes responded to vibrations 43 to 172 per second but not to vibrations 344 to 2,752. When the skin was rendered insensitive, they responded to vibrations 43 to 638 but not to vibrations 1,376 to 2,753. Catfishes respond, therefore, to a range of low vibrations less freely through the skin, more freely through the ear. Hence they have unquestionable powers of hearing.

The perfecting principle: L. H. Bailey, LL.D., late professor of horticulture, Cornell University.

Medicinal plants—present and future supplies: Henry Kraemer, Ph.D., head of department of pharmacology, University of Michigan.

Parasitism among the red algæ: William A. Setchell, Ph.D., professor of botany in the University of California. Parasites among the members of the Rhodophyceæ, or Red Algæ, are becoming more and more known. The author has been paying special attention to these parasites for some years. Of some 51 species, old or new, known to be wholly or partially parasitic, 39 are on plants of the same family of Red Algæ, 8 others are on Red Algæ not of the same family but with some on hosts fairly nearly related; while only 4 are parasitic on hosts belonging to other groups (brown or green algæ). These facts seem significant as to the origin of these parasites. The epiphytic red algæ often penetrate the host plant which is commonly also one of the Red Algæ, but also may be either brown or green. Some light may be thrown on the origin of red parasites, particularly of those parasitic on close relatives by the behavior of the tetrasporangia of *Agardhiella tenera*. As described by Osterhout in 1896 the zonate tetrasporangia germinate as a whole even after division into tetraspores, and produce dwarf unbranched plantlets which penetrate the tissues of the parent plant by basally produced rhizoids. The plantlets produced are largely antheridial, but some are cystocarpic and some even tetrasporic. Such mutations as these plantlets of *Agardhiella* seem to represent, accompanied by a greater or less degree of chlorosis, go far toward indicating a possible origin of these parasites on closely related hosts.

Friday Afternoon, April 19; Albert A. Michelson, Ph.D., Sc.D., LL.D., F.R.S., Vice-president, in the Chair

The genus Galera in North America, with preliminary notes of some new species of Agarics: George F. Atkinson, Ph.D., professor of botany, Cornell University. *Galerula* is a genus of yellow-spored Agaricaceæ including small plants or those of medium size, but slender in form, and fragile. The species have no claim to rank or economic importance, while their ecological rôle as saprophytes is not large owing to the comparatively small number of individuals. Many species are usually associated with mosses on logs or ground in the woods or swamps. A number of species occur on dung heaps or in recently manured grass lands. The larger number of species are some shade of yellow, or tawny, or ochraceous. In taxonomic works the genus is usually divided into sections according to external characters and ecological relations. By this method the species are not grouped according to their real affinities, and in a few cases forms not closely related are assembled under a single specific name. A high degree of internal structural differentiation has taken place in the evolution of the species. In the present study this vantage point has been employed to group the species into sections more nearly in accord with their true relationships. Between 50 and 60 species are recognized in North America.

Temperature, imbibition and growth: D. T. MacDougal, Ph.D., LL.D., director of the department of botanical research, Carnegie Institution of Washington. The effects of temperature upon swelling of biocolloids consisting of agar, and proteins have been previously described. With these results were given measurements of the swelling of sections of *Opuntia* already in a turgid condition with their imbibition capacity nearly satisfied, and not in a growing condition. Special tests were arranged by which the effect of changes in temperature upon the swelling of sections of growing cell-masses and upon the growth of similar masses should be determined. Elongation by growth of the stems in question was at the rate of 5.2 mm. daily at 16°–18° C. and 11–17 mm. daily at 30°–32° C. The increase amounted to a doubling, more or less, for a rise of 10° C. The swelling in transverse sections of similar material was 4.9 per cent. at 17°–19° C. and 7.5 per cent. at 30°–31° C. in distilled water: and 4.9 per cent. at the lower temperature in acidified potassium nitrate and 9.5 per cent. at the higher temperature. The increase by swelling transversely was therefore slightly less than double with a fair inference that it would have been greater in the axis of elongation or growth. It is to be seen therefore that in the elongation of the vegetative axes of plants, the temperature effect is a very complex one, and that the accelerating effect of rising temperature may be primarily an increase in absorption capacity by altered metabolism including lessened accumulations of acids.

Variation in blueberry hybrids: Frederick V. Coville, curator of the U. S. National Herbarium, Department of Agriculture, Washington, D. C.

Organization, reproduction and heredity in Pediastrum: Robert A. Harper, Ph.D., professor of botany, Columbia University.

The potentials of certain magnetized bodies (illustrated by lantern slides): LOUIS A. BAUER, Ph.D., D.Sc., director of the department of terrestrial magnetism, Carnegie Institution of Washington. The author has had occasion in connection with various problems to establish, in a convenient form, the mathematical expressions for the potentials and field-components of certain magnetized bodies of revolution, such as, for example, ellipsoids of revolution and elliptic homeoids. The expressions usually found in treatises either stop at those for the problem of gravitation, or apply only to special cases, or they are not given in the most elegant or convenient form possible for mapping out readily the magnetic field surrounding the bodies. Not infrequently, moreover, the published expressions are found to contain errors of one kind or another.

Development of magnetic susceptibility in manganese steel by prolonged heat treatment: CHARLES FRANCIS BRUSH, Ph.D., ScD., LL.D., of Cleveland.

Accelerometers: N. W. AKIMOFF, of Philadelphia.

Luminescence of radium salts: D. H. KABAKJIAN, assistant professor of physics, University of Pennsylvania, and E. KARRER, of Philadelphia. All radium salts luminesce in the dark at ordinary room temperature. It has been found that when a radium compound is heated to a critical temperature it will almost completely lose its luminosity while at this temperature, but when it is again cooled to room temperature it will acquire a luminosity which is many times (from ten to fifty times for radium bromide, barium bromide) its original luminosity. This property of radium compounds has been investigated as regards the following points: (1) Relation between luminosity and the maximum and minimum temperatures to which the salts have been exposed; (2) decay of the acquired luminosity with time; (3) degree of recovery of luminosity after decay by reheating; (4) relation between luminosity and chemical composition of the salt. The phenomena described in the paper can probably be explained if it be assumed that with the greater molecular freedom imparted to the salt at the higher temperatures certain groupings of molecules are formed which are stable at the higher temperatures but unstable at the ordinary room temperatures. The breaking down of these groups by the action of alpha, beta, gamma rays produces the luminescence. These groupings would correspond to the so-called "active centers" which are postulated by Rutherford in his discussion of luminescence of zinc sulphide, but differ essentially from them by the fact that these can be destroyed and reformed over and over again by heating the compound, whereas the active centers in zinc sulphide, once destroyed, can not be recovered by any simple process.

Saturday Morning, April 20; George Ellery Hale, Ph.D., Sc.D., LL.D., F.R.S., Vice-president, in the Chair

Motions in the stellar systems Struve 1836 and Struve 208: ERIC DOOLITTLE, professor of astronomy, University of Pennsylvania. Any double star in our catalogues may be a system of two suns, which are revolving about one another under the action of their gravitation, or their apparent connection may be only an accidental; one star may be immeasurably farther away than the other and they may only appear to be near together because they are in the same direction from us. In the latter case, measures will in time show that the one sun is drifting past the other in a straight line; in the former, the one will move about the other in an elliptic orbit. The two cases examined present especial difficulty because in each case the companion is moving directly toward the principal star in a straight line. Originally the stars were widely separated; now they are close together and are only visible as a double star in the largest telescopes. The path may be an ellipse, in which case we view it almost edgewise, and if this is the case the motion of the companion will be apparently reversed as it passes about its orbit and the motion will soon become very rapid. Observations of such systems should be secured now, while the companion is at a critical part of its path. It was found that each of the two systems examined were true physical systems and that the motion was in each case orbital.

The number of the spiral nebulæ: H. D. CURTIS, astronomer, Lick Observatory, Mt. Hamilton, Calif.

Soldiers' and sailors' insurance: SAMUEL McCUNE LINDSAY, Ph.D., LL.D., professor of social legislation, Columbia University, New York.

Italy in the Triple Alliance: WILLIAM ROSCOE THAYER, Litt.D., L.H.D., LL.D., Cambridge, Mass.

Ballistic experiments by a new (?) method: ARTHUR GORDON WEBSTER, Sc.D., LL.D., professor of physics, Clark University, Worcester, and MILDRED ALLEN.

Some considerations on the ballistics of a gun of seventy-five miles' range: ARTHUR GORDON WEBSTER, Sc.D., LL.D., professor of physics, Clark University, Worcester.

The relation of deposits of iron and coal to the great war: William H. Hobbs, Ph.D., Sc.D., professor of geology, University of Michigan.

The peculiar geographical features of northeastern France and their bearing on the war: William Morris Davis, Sc.D., Ph.D., professor emeritus of geology, Harvard University. The strata of the so-called Paris basin lie nested in one another, like a series of broad and shallow platters, the largest one beneath, the smallest one above, but the edges of all of them reaching to about the same altitude, except that the less resistant layers have been worn down somewhat lower than the more resistant ones. As a result, the more resistant layers rise in upland belts of moderate altitude above the intermediate depressions, and both the uplands and the depressions are arranged in concentric arcs around Paris as a center. Eight of these upland belts may be counted in northeastern France, where they dominate the topography. The arrangement of the rivers with respect to the uplands is varied and peculiar. The local features between Verdun on the Meuse and Lunéville on the Meurthe are best understood when described in terms of the upland belts, the depressions and the river valleys.

Rig-veda repetitions: Maurice Bloomfield, Ph.D., LL.D., professor of Sanskrit and comparative philology, Johns Hopkins University.

The Babylonian origin of the Jewish method of slaughter: Paul Haupt, Ph.D., LL.D., professor of Semitic languages, Johns Hopkins University.

Saturday Afternoon, April 20; William B. Scott, D.Sc., LL.D., president, in the Chair

Symposium on food problems in relation to war:

Introductory remarks: Alonzo E. Taylor, M.D., professor of physiological chemistry, University of Pennsylvania.

Physiological effects of prolonged reduced diet on twenty-five men: Francis G. Benedict, Ph.D., Sc.D., director of the nutrition laboratory of the Carnegie Institution of Washington. The possibility of facing stringent food shortage made it desirable to study with the greatest accuracy the physiological effects of a prolonged reduced ration upon a group of healthy young men. Twenty-five men in two squads, volunteers from the International Y. M. C. A. College in Springfield, Massachusetts, were placed upon a reduced ration, approximately one half the number of calories, and at the end of about two months had lost 10 per cent. of their body weight. From there on the calories were adjusted to hold the weight at a constant level. A long series of measurements of the basal metabolism, the neuro-muscular processes, strength tests, etc., as well as a careful clinical examination, were repeated from day to day. The men showed remarkable stamina in the face of the reduced ration, carried out all of their activities, academic and physical, in connection with their college life, and, aside from obvious degree of emaciation, presented no unusual picture. A marked reduction in calories in the intake was effected.

Food conservation from the standpoint of the chemistry of nutrition: Henry C. Sherman, Ph.D., professor of food chemistry, Columbia University, New York City.

Some economic aspects of the American food supply: J. Russell Smith, Ph.D., professor of industry, Wharton School of Finance and Commerce, University of Pennsylvania. One of the first acts of the government with regard to the bread supply was to interfere with the law of supply and demand by guaranteeing increased home consumption and reduced home production. Despite innumerable reports that maximum price fixing had been unsatisfactory in Europe, we tried it. As one of the first big steps in the United States we reduced the maximum price of wheat at a time when more wheat was needed. We also fixed a minimum price for the 1918 crop lower by a dollar than the price prevailing in the spring of 1917. The American farmer quietly but effectively made his answer. The government, through the Department of Agriculture, called for planting of 47,337,000 acres of winter wheat, and it got 11 per cent. less than this, or 42,170,000, almost exactly the amount sown in 1914. Probably the worst part of this wheat price fixing is that it resulted in a destructive price ration. The high prices of meat pushed the price of corn to such a figure that in many parts of the country it was cheaper to feed the pigs on wheat and rye than on corn, and you may depend upon it many of these four-footed brethren got the breadstuff. In some parts of New York state wheat was 40 to 50 cents a bushel higher than corn. The production of such a condition by legislation as our Congress brought about is not to be called food conservation. It is food destruction. As an outraged citizen I protest against legislation that makes me eat corn and makes the pig eat wheat. If I were a pro-German I would secretly applaud it.

Food control and food conservation in the United States army: John R. Murlin, Major, Sanitary Corps, N. A.

Arthur W. Goodspeed,
Secretary