togeographic nomenclature, urging the gradual evolution of terminology rather than its rigid prescription. Harry N. Whitford continues his discussion of the forest of Flathead valley, Montana. J. C. Arthur suggests a set of simple terms for the spore structures in the Uredinales, whose confused terminology is at present extremely perplexing.

THE contents of the *Journal of Comparative Neurology* for March are as follows:

IRVING HARDESTY: 'Observations on the Spinal Cord of the Emu and its Segmentation.' With four figures.

S. J. HOLMES: 'The Selection of Random Movements as a Factor in Phototaxis.'

WALTER C. JONES, M.D.: 'Notes on the Development of the Sympathetic Nervous System in the Common Toad.' With twelve figures.

Editorial:—Concerning the Genetic Relations of Types of Action. The Basis for Taxis and Certain Other Terms in the Behavior of Infusoria. The Problem of Instinct.

ISADOR H. CORIAT: 'A Review of Some Recent Literature on the Chemistry of the Central Nervous System.'

SOCIETIES AND ACADEMIES.

THE GEOLOGICAL SOCIETY OF WASHINGTON.

THE 165th meeting was held March 8, with President Merrill in the chair. The regular program included:

Genesis of Ore Deposits at Bingham, Utah: J. M. BOUTWELL.

Three types of ore were described: (1) lead-silver ore in lodes, (2) auriferous copper ore disseminated in monzonite and (3) bedded pyritous copper ore in marbleized limestone. The lode ores are believed to have been transported by heated solutions which ascended from a deep-lying magma along northeast-southwest fissures, and to have been deposited mainly by filling, partially by replacement. The disseminated ore was shown to have been formed at a period subsequent to the date of intrusion, partly from the original constituents of the monzonite and partly from copper, gold and other elements introduced by highly heated solutions or vapors. The immense lenticular beds of pyritous copper ore were formed by molecular replacement of contact metamorphosed limestone, partly from elements emitted by the intrusives contemporaneous with their intrusion and partly by subsequent additions from deep-lying portions of the magma after the superficial portions had at least partially solidified. Since these two periods of ore deposition the primary sulphides have been enriched by superficial alteration to oxides, carbonates, sulphates and secondary black sulphides. The complete report on this district which has been prepared by Mr. S. F. Emmons, Mr. A. Keith and Mr. J. M. Boutwell, is now in press and will appear shortly as Professional Paper No. 38.

The Subterranean Gases of Cripple Creek: WALDEMAR LINDGREN.

A brief account was given of the gases which issue in some of the Cripple Creek mines and which as a rule were not encountered until a point below the zone of oxidation was reached. These gases interfere greatly at times with the work of those mines in which they appear and several deaths have been caused by them. It was found that the amount fluctuates according to the stand of the barometer. At low barometer it issues plentifully from the fissures and the porous rocks, and may fill the mine up to the collar. With high barometer the gas disappears and the change may take place very suddenly. The gas as a rule is heavy and accumulates in winzes and shafts. Its temperature appears to be somewhat higher than that normally prevalent in the mine. It was soon found that the amount of carbon dioxide, of which the gas was believed to consist, was entirely inadequate to produce the effects noticed, and analyses show that a great excess of nitrogen is present. A sample from the Conundrum mine was kindly analyzed by the department of chemistry at Cornell University, with the following result:

CO_2	10.22
O	5.7
N	84.1

Mr. W. H. Weed presented a paper on 'An Asphalt Lake near Tampico, Mexico.'

GEO. OTIS SMITH,
Secretary.

THE BIOLOGICAL SOCIETY OF WASHINGTON.

THE 397th regular meeting of the Biological Society of Washington was held February 11, 1905, with President Knowlton in the chair and sixty-eight persons present. Mr. Vernon Bailey exhibited a large mussel shell, about 13 x 8 cm. in size, from Trinity River in southeastern Texas. He noted that the species is a common food for raccoons. He stated that many pearls are gotten from the region mentioned, and that one had sold for sixty dollars. Dr. L. O. Howard called attention to the first authentic record from the Pacific coast of Mexico of the presence of the yellow fever mosquito (*Stygeomia fasciata*) in this region. The authenticity of the record rests in specimens sent to Dr. Howard by a physician.

The first regular paper of the evening was by Dr. Albert Mann on diatoms. The speaker introduced his subject by referring them to the Conjugatæ of the green algæ, and gave several reasons for this systematic position.

He then took up their distribution, stating that they are to be found in all latitudes and all waters, fresh, brackish or salt; that the tropical are the largest and most ornamental, but they are most prolific in individuals in arctic waters. Geologically he placed their first appearance in the Upper or Middle Cretaceous, stating that the claims of Castracane and others of their presence in the coal measures or even lower are inconclusive. Many of the great beds of diatom earth were referred to.

The box-like structure of these algæ was next illustrated by drawings and the elaborate ornamentation of the valves described. Outside of this silica case the organic pellicle, erroneously called a 'gelatinous' sheath, and inside the case the large symmetrical chloroplasts, the cytoplasm, nuclei, vacuoles and oil globules were explained by diagrams.

Under the physiology of the diatoms the speaker explained the normal processes of plant assimilation and stated that their dependence on sunlight precluded their being found living in subterranean waters or deep-sea beds; the limit of the latter he placed at 100 fathoms. Saprophytic diatoms, *Nitzschia putrida* and *Nitzschia paradoxa* were mentioned, the latter semi-saprophytic.

The multiplication of the diatoms by fission was illustrated by several diagrams and the consequent progressive reduction in size commented on. Sexual reproduction, by which the full dimensions were regained, was then described and illustrated, three variations in method being mentioned.

The mystery of diatom movement was discussed and the various theories explained.

Dr. Mann closed his paper by briefly enumerating the economic uses of the diatoms and by a short description of methods of collection. He then exhibited forty-one lantern slides prepared from the negatives of the Hon. A. A. Adee, assistant secretary of state.

The second paper was by Dr. Edgar A. Mearns, on the 'Animal Life of Mount Apo, of the Philippine Islands.' He said, as the result of a month's examination of the solfataric volcano Apo, the giant of the archipelago, its animal life became sufficiently familiar to admit of at least a partial comparison with that of the better explored mountains of Luzon and other islands of the Philippine group. The constituent fauna of Mount Apo partakes largely of peculiar elements, which isolate it not only from the lowlands of Mindanao, but from the highlands of other Philippine islands, and give it a faunal position comparable in importance to that of Monte Data in Luzon and Kina Balu in Borneo. Several of the genera and most of the species of mammals collected on the higher portion of Apo are new to science; and three genera and more than a score of species of birds have been recently added to the Philippine avifauna from Mount Apo. Dr. Stejneger has recently described two new species of frogs and one new Gecko from the speaker's Mount Apo collection.

THE 398th regular meeting of the society was held February 25, 1905, with President Knowlton in the chair and thirty-seven persons present. Under Notes, Dr. C. E. Waters referred to the paper of the preceding meeting by Dr. Mann, on diatoms, and to papers by Kramer and White, and asked if it were

probable, as suggested, that petroleum was formed from the oil found in the protoplasm of diatoms. This was answered in the negative by Dr. Mann. Dr. E. L. Greene asked if any of the biologists present knew of a Rafinesque other than the one who has contributed so fully to American science. No one replied, and Dr. Greene then stated that in a list of botanical authors, printed at Zurich, Switzerland, in the year 1772, occurs the name of P. I. Rafinesque. He is credited with the authorship of an essay on economic botany, purporting to have been published in 'Memoirs of the Society for Economics,' at Berne, the date of the volume being 1763.

The first regular paper of the evening was by Dr. E. L. Greene, on the 'Earliest Local Flora.' The speaker gave a sketch of the 'Flora Hercynia, a Catalog of the Plants of the Harz Mountains,' by Dr. Joahnes Thalius, published at Nordhausen, Germany, in 1588; a work in which many new plants are named and defined, besides several genera; among these *Alsinanthemum,* a type known since Linnæus by the name of *Trientalis;* also even that more than two centuries later indicated as if new under the name *Eleocharis* R. Br.

The second paper on the program was by Mr. David White, on 'Fossil Plants of the Group Cycadofilices.' This paper was profusely illustrated with lantern slides. Mr. White gave a synopsis of the Pteridospermeæ, describing the more important and interesting anatomical characters of the stems and petioles, and illustrating a number of foliar types and fruits more or less definitely correlated with the other parts of the plants. A number of genera, including *Eremopteris, Triphyllopteris, pseudopecopteris* and *Megalopteris,* were tentatively referred to the pteridosperms, which are to be regarded as comprising the most characteristic plant life of the Carboniferous. Attention was called to the antiquity (Middle Devonian) of one of the types, *Kalymma grandis,* and the consequent probable antiquity of the heterosporous Filices which must have antedated the Cycadofilices.

E. L. Morris,
Recording Secretary.

THE NEW YORK ACADEMY OF SCIENCES. SECTION OF ASTRONOMY, PHYSICS AND CHEMISTRY.

The regular meeting of the section was held at the American Museum of Natural History on Monday evening, March 20. The program consisted of the following papers:

The Sixth Satellite of Jupiter: S. A. Mitchell.

Dr. Mitchell gave an interesting account of the recent discovery of a sixth, and also a seventh, satellite of Jupiter by Professor C. D. Perrine at the Lick Observatory, and described the details of the photographic method by which these satellites were discovered last December and January.

Dr. Mitchell also spoke of the discoveries of satellites of the other planets, including the ninth satellite of Saturn which was found by Professor W. H. Pickering in August, 1899.

A Pocket Form of the New Piezic Barometer: Ernest R. von Nardroff.

The Piezic barometer measures the atmospheric pressure by measuring the *elasticity* of a portion of air. In the small pocket form of the instrument exhibited, a piece of heavy barometer tubing of 3 mm. bore and about 12 cm. long was provided at its lower end with a pear-shaped bulb, having an internal volume equivalent to about 70 cm. length of the tube. At its upper end the tube was provided with a second small bulb containing about 1 c.c. of mercury. Entering into the tube from above was a short tube having at its lower end a capillary opening. Through this tube the mercury was introduced.

In using the instrument all the mercury is brought into the upper bulb by inverting. The instrument is then turned into the erect position, when the mercury enters the main tube a few centimeters, the exact distance depending upon the atmospheric pressure. The less the pressure and hence the less the elasticity of the air, the more the mercury will enter. The mercury stands in the upper portion of the tube and partly in the upper bulb without any tendency to run down the sides of the tube. A scale on the main tube drawn *by comparison* with a standard barometer indicates the pressure.

To understand the theory of the instrument assume the lower bulb replaced by a continuation of the barometer tubing of equal volume. Let b stand for the standard barometer height, m for the length of the thread of mercury entering the tube, and a for the length of the column of compressed air. Then from Boyle's law ($pv = p'v'$) we have

$$b(a + m) = (b + m)a,$$
$$b = a,$$

and hence

$$\Delta b = \Delta a.$$

That is, the divisions of the scale on the Piezic barometer are of the same size as those on the ordinary barometer. However, in practise the upper bulb always contains some mercury after the air is entrapped. The general effect of this is to make $\Delta a < \Delta b$.

The Exhibit of the U. S. Geological Survey Radium Collection shown at the St. Louis Exposition: G. F. KUNZ.

Mr. Kunz described the object of and the success of the exhibit, stating that many of the most eminent investigators, including Sir William Crookes and Professor Rutherford, had sent their original material. The collection was shown in an upper hall of the museum. There was also exhibited the Kunz 1,081-pound mass of Cañon Diablo meteoric iron, the largest mass known of this meteoric iron. Mr. Kunz stated that Professor Henri Moissan, of Paris, had discovered in dissolving 183 pounds of this material (Cañon Diablo meteorite), not only crystalline diamonds, but the crystalline substance, carbon silicide, never before discovered as a natural product, but extensively manufactured and used in the arts under the name of carborundum. In view of the many eminent discoveries of Professor Moissan in the field of chemistry and electrometallurgy, as well as in the study of meteorites and of diamond formation, Mr. Kunz suggested that this mineral be named *moissanite* in his honor.

Experimental Research concerning Indirect and Secondary Skiagraphic Rays: L. G. COLE.

The immediate discharge from an X-ray tube consists of two distinct classes of so-called rays—direct and indirect. The direct rays have their inception at the focal point of the anode and radiate in direct lines and are not reflected, but deflected, and do not set up secondary rays, but are absorbed by the tissue of the body in proportion to the amount of solids contained therein.

The indirect rays radiate from the walls of the tube, are projected at various angles, and cause secondary rays in objects with which they come in contact, especially the soft tissue, and give great penetration. The effect attained depends on the amount of current, frequency of interruption and molecular action of glass.

Dr. Cole then described the life history of a tube, stating that definite changes occur in a tube when used, including a crisis, and explained the difference between the action of new and seasoned tubes and the difficulty of exciting very old tubes.

He also gave his opinion of the cause of the purple color of the glass of a tube and suggested that there is a molecular rearrangement of glass similar to that occurring in steel when magnetized. In a new tube the direct rays amount to 30 to 40 per cent., while in some seasoned tubes as much as 75 to 90 per cent. Furthermore, the indirect rays project themselves behind the bones, causing a lack of definition of bones and obliteration of detail of soft parts, while direct rays give detail in soft parts, showing even the blood in the veins.

Dr. Cole, who is skiagrapher at Roosevelt Hospital, will publish his paper in full in the *Archives of the Röntgen Ray Magazine.*

C. C. TROWBRIDGE,
Secretary.

THE SCIENCE CLUB OF THE UNIVERSITY OF WISCONSIN.

THE sixth meeting of the club for the year 1904–5 was held on Tuesday, March 21, at 7:30 P.M. in the physical lecture room, Science Hall.

The first paper on the program, by Dr. R. Fischer, treated the subject 'Food Adulterations and their Detection.' The various methods of adulteration of human foods met with this state, and the methods of their

detection, were explained by the speaker, and a large array of choice specimens of adulterated goods were shown which furnished strong testimony to the cupidity of some manufacturers of food articles and, in many cases, to their lack of regard for human health.

The second paper of the evening, by Dr. C. A. Fuller, was on the subject, 'The Dissemination of Typhoid Fever by Oysters.' Outbreaks of this disease have occasionally been traced to infected oysters. Bacteriological examinations of these shell-fish usually demonstrate the presence of bacterium coli. The survey of 3,000 acres of oyster ground in Rhode Island waters showed that both water and oysters from sections within six miles of the outlet of the capital city sewer contained sewage bacteria, while samples taken at a greater distance from the source of contamination were not infected; similar conditions were observed to prevail in a number of the oyster beds on the east coast of the United States.

F. W. Woll,
Secretary.

MEETING OF EXPERIMENTAL PSYCHOLOGISTS AT CLARK UNIVERSITY.

The second yearly meeting of teachers and students of experimental psychology was held in the Clark University laboratory, at the invitation of Professor E. C. Sanford, on Friday and Saturday, March 31 and April 1. At the first session, on Friday afternoon, papers were read by Mr. L. M. Terman, on 'Tests of Bright and Dull Boys'; by Mr. A. L. Gesell, on 'Handwriting and Scholarship'; and by Mr. W. F. Book, on the 'Learning of Typewriting.' The visitors then inspected the laboratory, under the guidance of Professor Sanford, who demonstrated, among other instruments, two devices for the determination of the temporal limen of disparate sense impressions, a rotating-prism color mixer, and an apparatus for investigating the sensible discrimination of purple. Professor A. H. Pierce, of Smith College, next described three researches now in progress in his laboratory; and a paper by Professor Max Meyer ('Auditory Sensations in an Elementary Laboratory Course') was read by Mr. H. C. Stevens, of Cornell University. A discussion followed, in which Professors Pierce, Sanford and Titchener took part. In the evening the visiting psychologists were entertained at dinner by Professor Sanford.

The session of Saturday morning was opened by President Hall, with a paper on 'Some Tendencies and Dangers of Experimental Psychology.' The paper was discussed by Dr. Hylan and Professor Titchener. Adjournment was then made to the physical laboratory, where Professor A. G. Webster demonstrated his apparatus for the measurement of the objective intensity of sound. The last hour of the morning was spent in further inspection of the psychological laboratory, after which the guests enjoyed the opportunity of meeting the Clark University students at a luncheon given by President Hall.

At the afternoon session Professor Bentley, of Cornell University, read a paper on the 'Analysis of Tones,' and afterwards demonstrated his method and certain of his results. The meeting was fittingly concluded by an inspection of the new library building, arranged by Mr. L. N. Wilson. All psychologists know the treasures of the Clark University library, and the willing courtesy of their custodian; and all present on this occasion were delighted with the disposition and conveniences of the library.

It was decided to accept Professor Judd's invitation to hold the meeting of 1906 in the Yale University laboratory.

DISCUSSION AND CORRESPONDENCE.

ALTERNATION OF GENERATIONS IN ANIMALS.

In the February number of the *Botanical Gazette,* Dr. C. J. Chamberlain writes, "After hesitating for several years I have decided to publish my belief that animals exhibit an alternation of generations comparable with the alternation so well known in plants. In short, the theory is this: the egg with the three polar bodies constitutes a generation comparable with the female gametophyte in plants; similarly, the primary spermatocyte with the four spermatozoa constitutes a generation comparable with the male gametophyte