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RECORD OF MEETINGS
OF THE
NEW YORK
ACADEMY OF SCIENCES

JANUARY, 1900, TO DECEMBER, 1900

RICHARD E. DODGE

Recording Secretary

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RECORDS OF MEETINGS
OF THE
NEW YORK ACADEMY OF SCIENCES.

January, 1900, to December, 1900.

RICHARD E. DODGE, *Recording Secretary*.

SECTION OF BIOLOGY.

JANUARY 8, 1900.

Section met at 8:15 P. M., Professor F. S. Lee presiding. The minutes of the last meeting of Section were read and approved. The following program was then offered:

David Griffiths, STRUCTURE AND DEVELOPMENT OF THE SORDARIACEÆ.

F. S. Lee, THE SURVIVAL OF MUSCLE AFTER SOMATIC DEATH.

Wm. J. Gies, THE INFLUENCE OF PROTOPLASMIC POISONS ON THE FORMATION OF LYMPH.

Bashford Dean, ON THE EGG OF THE MYXINE GLUTINOSA.

F. B. Sumner (By Title), KUPFER'S VESICLE IN RELATION TO GASTRULATION AND CONCRESCEENCE.

SUMMARY OF PAPERS.

Mr. **David Griffiths** spoke of the structure of certain species of the Sordariaceæ and briefly reviewed the work which has been done on the group. Certain species were taken as types of the principal genera, and their life history traced; *Sordaria finicola*, *Podospira coprophila*, *Hypocopra equorum* and *Sporormia intermedia* being spoken of specially. Some time was devoted

to a discussion of the much mooted question of fertilization in this and kindred groups. The principal methods of spore distribution were outlined.

Professor **Frederic S. Lee** said that the duration of the life of voluntary muscle in mammals after the death of the individual has not been well known. Under the author's direction, Messrs. Adler and Bulkley have been investigating this in cats and rabbits. In each experiment the animal was killed, a particular muscle was excised and stimulated by electric shocks at five-minute intervals and the resulting contractions were recorded. The muscles used were the *soleus* (deep red) and the *tibialis anticus* (pale). Each survived several hours, the maximum for the red muscle being 14 hours and 37 minutes, and for the pale 12 hours and 20 minutes. It is known that in comparison with white muscle-fibers red fibers contain relatively more sarcoplasm, which is nutritive in function, and relatively less fibrillar substance, which is the contractile part. This may perhaps account for the longer survival of the red muscle. So far no constant difference in duration has been observed between the cat and the rabbit. In both the red and the pale muscle the decrease of irritability was gradual, but occasionally in the *tibialis* there was a sudden fall at the end of about one hour, the irritability then continuing at a low ebb for hours, but with a gradual decline. The sudden fall may have been due to the early death of the white fibers, which, intermingled with red ones, occur in the pale muscle. Besides the theoretic interest, the above results have a practical bearing, since they show that mammalian muscle can readily be used for experimental purposes in the physiological laboratories. This is now being done at Columbia University.

Dr. **William J. Gies** reported upon the changes which may occur in lymph after the administration of protoplasmic poisons. Quinin did not interfere with the usual influence of dextrose, although it did suppress the action of leech extract. The results with dextrose, therefore, indicate that the increase in the quantity of lymph following its injection in large quantity is due mainly to physical factors. In the case of leech ex-

tract, on the other hand, there is an interference with the action of the physiological factors that appear to be responsible for the changes usually brought about by this lymphagogue. That the increase in the amount of lymph after large quantities of dextrose have been injected is not due primarily to increased capillary pressure, as is held by Cohnstein and Starling, was shown in one of the experiments in which quinin caused the death of the animal, and yet from which the lymph continued to flow for three hours. After injecting arsenic, which is said very greatly to increase the permeability of the blood vessels, especially those of the portal system, there was little in the flow and character of the lymph resembling the usual effect of lymphagogues. It appears, therefore, that Starling's hypothesis of increased capillary permeability does not fully account for the action of lymphagogues, and that the mechanical theory of lymph formation fails as long as it does not explain the most striking phenomena of the process—those following the injection of Heidenhain's lymphagogues or Asher's 'liver stimulants.' The physiological theories of Heidenhain and Asher would explain them.

Dr. **Bashford Dean** described the condition in seven eggs which he had received from Professor A. E. Verrill. These had been collected in 1880 on the Newfoundland banks in water of 90 and 150 fathoms. The egg membranes were regarded as more specialized than those of *Bdellostoma*.

FRANCIS E. LLOYD,
Secretary.

SECTION OF GEOLOGY AND MINERALOGY.

JANUARY 15, 1900.

Section met at 8:15 P. M., Mr. G. F. Kunz presiding. The minutes of the last meeting of Section were read and approved. The following program was then offered:

F. B. Peck, ON SERPENTINES AND TALCS IN VICINITY OF EASTON, PENNSYLVANIA.

J. J. Stevenson, C. E. BERTRAND'S THEORY RESPECTING THE ORIGIN OF CERTAIN COALS.

H. Ries, NOTE ON OCCURRENCE OF ALLANITE IN THE YOSEMITE VALLEY.

The following report was presented by Professor **J. J. Stevenson**, in behalf of the Committee appointed November 20, 1899 in reference to the death of Sir J. William Dawson, of Montreal. On motion of Professor D. S. Martin, the report was adopted.

J. William Dawson was born in Pictou, Nova Scotia, October 13, 1820; educated at Pictou College and Edinburgh University. Upon his return to Nova Scotia he was chosen Instructor in Natural History by Dalhousie College, and shortly afterward was appointed Superintendent of Instruction for the Province. When thirty-five years old he became Principal of McGill University, Montreal, then a struggling corporation; with no endowments, few professors, and a wretched equipment. Through his efforts, the struggling college developed into a university with equipment in many respects unsurpassed, with a large corps of professors, an enthusiastic body of students, and a generous endowment.

His contributions to geology are of the first rank. The store of facts accumulated during his term as Superintendent of Instruction was published under the title of *ACADIAN GEOLOGY*, a volume of about one thousand pages. In later years much of his study was given to palæobotany; we are indebted to him for the discovery of many of the earlier forms of land plants, and for the elucidation of many matters respecting relations of Palæozoic and Mesozoic forms. The phenomena about Montreal led him to investigate Pleistocene problems; his numerous papers upon such questions were summarized in a volume published in 1893.

Sir William's labors were incessant. He published many volumes on topics more or less related to geology; he was active in efforts to foster science, to advance the interests of higher education, and to improve the condition of his fellows. He was a consistent Christian, living his belief, respected and beloved

by all who had dealings with him. Honors came to him abundantly; he was President of both the American and the British Association, as well as of the Geological Society of America, and the Royal Society of Canada.

Feeble health came to him in 1892, and soon necessitated the relinquishment of his university duties. Strength never returned to him; but he failed gradually until on November 19, 1899 he passed away, leaving an untarnished name, and a record which is one of the brightest. His memory will be cherished as that of a conscientious man, and an unselfish worker in science.

J. J. STEVENSON,
Chairman.

The Chairman called attention to the coming meeting in Paris this year, of the Eighth Session of the International Geological Congress; described the proposed excursions, and suggested the earnest coöperation of the Section by delegates, contribution of papers, and financial aid. On motion by Professor J. F. Kemp, the matter of representation of the Academy was referred to the Council for action.

SUMMARY OF PAPERS.

In the discussion that followed the paper by Professor **Peck**, Professor **Kemp** stated that in the talc deposits on the west side of the Adirondacks, described by Professor Smyth, the derivation of the talc had been attributed to the magnesian limestone or intrusion of a magnesian silicate rock. Professor Peck replied that he considered the tremolite rock to be due to the alteration of a siliceous dolomite; the talc, possibly to the interchange of silica from the Pre-Cambrian gneisses, and magnesia from the adjacent dolomite limestone. The serpentine and "viridolite" had indeed been subjected to much shearing and fracture, but had been solidly recemented, so that they could be quarried out in large blocks, free from cracks, sometimes of twenty tons weight, in the case of the "viridolite."

In the discussion of Professor **Stevenson's** paper, Professor **F. E. Lloyd** remarked that the cells of algæ, to whose accumu-

lation. Bertrand and Renaud mainly attribute the formations of these coals, are exceedingly delicate and often mucilaginous. Those of *sphagnum* are much thicker, solid and woody, and yet a large quantity of this is required to produce much deposit of carbonaceous matter in swamps.

The chairman inquired whether freezing or the introduction of silty waters might cause the precipitation of ulmic acid referred to by these authors. Professor Stevenson stated that ulmic acid so precipitated would tend to carry down suspended matters and to clear the waters.

Dr. Ries stated that while in the Yosemite Valley in September, 1899, his attention was attracted by a black, coaly looking mineral in the pegmatite veins on the northwestern side of the valley. On closer inspection the mineral proved to be allanite, and as it has not yet been recorded from this region, it seems of interest to note the fact.

The rocks forming the walls of the Yosemite are a grano-diorite, according to Turner (17th Ann. Rep. U. S. G. S., Pt. I, p. 710). Traversing this in many directions are veins of pegmatite, which are sometimes straight and unbroken, at others curved, branched, or even broken into. These pegmatite veins are very prominent on the face of El Capitan and also in the rock forming Eagle Peak. It was in the talus at the foot of the latter that the allanite was found, and while the mineral was at times abundant in the pegmatite blocks, still none of it was noticed in the grano-diorite. In only one instance was a distinctly bounded individual found, and on this a combination of orthopinacoid and base were recognizable. The other specimens were irregularly bounded grains that varied from a sixteenth to a quarter of an inch in diameter.

In addition to the quartz, muscovite and orthoclase present in the pegmatite, there were a number of radiating masses of epidote, which were evidently of primary origin; but in two instances the epidote occurred as a coating on hornblende and then seemed to be secondary. None was found in association with the allanite.

In conclusion it may be said that it is interesting to find that

allanite is evidently not the rare mineral that it was formerly considered to be, and that a careful watch is beginning to show its presence at many localities in the United States.

ALEXIS A. JULIEN,
Secretary.

SECTION OF ANTHROPOLOGY AND PSYCHOLOGY.

JANUARY 22, 1900.

Section met at 8:15 P. M., Dr. Franz Boas presiding. The name of one candidate for resident membership was read and referred to the Council according to the by-laws. The following program was then offered:

Clark Wissler, SOME PHENOMENA OF INDIRECT VISION.

J. McK. Cattell, ON RELATIONS OF TIME AND SPACE IN VISION.

E. P. Buchner, ON NUMBER FORMS.

SUMMARY OF PAPERS.

Mr. **Wissler** described experiments that were made by exposing small letters or numerals in the indirect field of vision, while the attention of the observer was fully occupied with objects in the direct field. The subjects were not conscious of seeing the characters presented in the indirect field, indeed, one of the subjects whose results was reported did not know until several tests had been made that the characters were there at all. In spite of this failure to receive conscious expressions from the letters and figures, two subjects were found who could by association and afterwards by memory, give in a large number of cases the correct numeral or letter. These subjects made their associations in the form of visualized images. Many of the errors made were similar to those made in normal vision. Thus, *c* was mistaken for *o*, 35 for 55, etc. It was held that the experiments suggest a relation between normal phenomena and the abnormal as seen in the hysterical eye, and

that they point out a way to a more complicated experimentation in induced automatic movements.

Professor **Cattell's** paper described experiments on the perception of moving surfaces, which show that a time series may be perceived as a spatial continuum, and explained that the same phenomena held in the ordinary vision of daily life. Although the eyes, head and body are in continued movement, and the images on the retina are constantly shifting, the field of vision appears to be distinct and stationary. Thus, if one glances along a row of books, images follow one another on each retinal element in rapid succession, but these successive and rapid changes result in the perception of a space continuum, *all* the objects being distinct and arranged side by side.

Professor **Buchner** described, with the aid of sketches, the fixed visualizations experienced since childhood by a woman 35 years of age. There are three distinct, uncolored, tridimensional forms. The first is half fan-like in shape, lying almost entirely to the left of the mental point of regard, and includes the numbers from 1 to 100. The second includes the names of eight days, from Sunday to Sunday. The third has the names of the twelve months from January to December. The paper pointed out the elements which must appear in any theory of the genesis of the phenomena to which this group belongs.

CHARLES H. JUDD,
Secretary.

PUBLIC LECTURE.

UNDER AUSPICES OF THE SECTION OF BIOLOGY.

JANUARY 29, 1900.

Professor **G. H. Parker**, of Harvard University, delivered a lecture ON THE NEURON THEORY IN THE LIGHT OF RECENT DISCOVERIES.

The lecturer gave a summary of the development of our knowledge of the histological structure of the nervous system, and contrasted with the neuron theory as widely understood

that of Apathy's which declares the absolute continuity of the nervous system by means of the fibrillæ in the nerve cells and fibers as demonstrated by his method of technique. The lecture was closed by a criticism of Apathy's interpretation of his preparations.

FRANCIS E. LLOYD,
Secretary.

BUSINESS MEETING.

FEBRUARY 2, 1900.

Academy met at 8 P. M., Professor M. I. Pupin presiding.

The minutes of the last business meeting were read and approved.

The Secretary reported from the Council as follows :

The following nominations of officers for the ensuing year, drawn up in accordance with the rules :

President, Robert S. Woodward.

First Vice-President, Charles A. Doremus.

Second Vice-President, Franz Boas.

Corresponding Secretary, William Stratford.

Recording Secretary, Richard E. Dodge.

Treasurer, Charles F. Cox.

Librarian, Livingston Farrand.

Councillors : Daniel W. Hering, Harold Jacoby, Frederic S. Lee, M. I. Pupin, Edward L. Thorndike, L. M. Underwood.

Curators : Harrison G. Dyar, Alexis A. Julien, George F. Kunz, Louis H. Laudy, William D. Schoonmaker.

Finance Committee : Henry Dudley, John H. Hinton, Cornelius Van Brunt.

The following nominations for Fellows were made in accordance with the by-laws, which say " candidates may be nominated by the Council, in writing, at a business meeting in January or February, and shall then be balloted for at the subsequent annual meeting ":

Dr. W. S. Day,
James Douglas,
Jonathan Dwight, Jr.,
Marshal A. Howe,
Charles H. Judd,
E. G. Love,
Albert W. Trotter,
Henry S. Washington,
Theodore G. White.

The following nominations were made for Honorary and Corresponding Members, in accordance with the by-law that "Honorary and Corresponding Members may be nominated by the Council, in writing, at the business meeting in January or February, and elected at the subsequent Annual Meeting."

HONORARY MEMBERS.

Julius Hann, University of Graz, Austria.
Henry A. Rowland, Johns Hopkins University.
Edward C. Pickering, Harvard University.
H. Poincaré, Sorbonne, Paris.
E. B. Tylor, Oxford, England.

CORRESPONDING MEMBERS.

Professor A. DeLapparent, University of Paris; Paris, France.
Professor W. H. Holmes, National Museum, Washington,
D. C.

Professor Kakichi Mitsuaki, Imperial University of Japan,
Tokyo.

Professor Geo. H. Parker, Harvard University, Cambridge,
Mass.

Professor C. R. Van Hise, University of Wisconsin, Madison,
Wis.

Professor Sho Watase, Tokyo (Univ. of Chicago).

The Council has voted to appoint Professor J. J. Stevenson delegate to the International Geological Congress, to be held in Paris in 1900; and Professor Charles A. Doremus delegate to the International Chemical Congress. The Academy has voted to subscribe to these Congresses.

The Council has voted to change the title of the Section of Astronomy and Physics, so as to read Astronomy, Physics and Chemistry.

The Anthropological Club, which has hitherto coöperated with the Academy in the meetings of the Section of Anthropology and Psychology, has been superseded by the American Ethnological Society, which has been revived. This Society will continue to coöperate with the Academy, as before.

Professor Kemp, as Chairman of the Reception Committee, has made the following report to the Council :

The American Museum authorities have kindly agreed to assign us one of the east wing rooms, 60 x 80, for Wednesday and Thursday, April 25th and 26th, at an expense to us for fittings, etc., as last year, not to exceed \$200.

The following chairmen of sub-committees have consented to serve :

Anthropology, Franz Boas.
Astronomy, J. K. Rees.
Botany, D. T. MacDougal.
Chemistry, C. E. Pellew.
Electricity, Geo. F. Sever.
Psychology, J. McK. Cattell.
Geology and Geography, Richard E. Dodge.
Metallurgy, H. M. Howe.
Mineralogy, L. McL. Luquer.
Palæontology, Gilbert van Ingen.
Physics and Photography, William Hallock.
Zoology, C. L. Bristol.

The following candidates for resident membership, approved by the Council, were duly elected :

Charles L. DuVivier, 22 Warren Street.
Ludwig Riederer, 145 West 94th Street.
James S. Peabody, Mixed High School.
Francis B. Sumner, College of the City of N. Y.
F. C. Waite, University Heights, N. Y.

RICHARD E. DODGE,
Recording Secretary.

SECTION OF ASTRONOMY, PHYSICS AND
CHEMISTRY.

FEBRUARY, 5, 1900.

Section met at 8:35 P. M., Professor M. I. Pupin presiding. The minutes of the last meeting of Section were read and approved.

The following program was then offered:

J. K. Rees, REPORT ON NOVEMBER METEORS. (Read by Dr. S. A. Mitchell.)

J. K. Rees, THE VARIATION OF LATITUDE AND THE CONSTANT OF THE ABERRATION OF LIGHT, AS DETERMINED FROM SIX AND ONE-HALF YEARS OBSERVATIONS MADE AT THE COLUMBIA UNIVERSITY LATITUDE OBSERVATORY. (Read by Professor H. Jacoby.)

Geo. N. Bauer, THE PARALLAX OF μ CASSIOPEÆ AND THE POSITIONS OF 56 NEIGHBORING STARS, AS DEDUCED FROM THE RUTHERFURD PHOTOGRAPHIC MEASURES.

SUMMARY OF PAPERS.

Professor **Rees**, in the first paper, stated that arrangements were made by the Columbia University Observatory to observe and photograph the meteors during the week of November 12-18, 1899. At West Point Dr. S. A. Mitchell, assisted by Messrs. Bauer and Jenkins, was provided with a Rowland concave grating and two cameras. No photographs however were obtained. At Bayport, L. I., Mr. C. A. Post placed his observatory and his services at the disposal of the Columbia Observatory staff. Six cameras and two telescopes were in use. On one plate in a camera provided with a Goerz lens, a photograph taken on November 15th, between 16 h. 9 m. 30 sec. and 16 h. 40 m. 44 sec. when pointed near Procyon, showed a meteor trail. Dr. Elkins of the Yale Observatory, will measure this plate.

A number of students and others watched for the meteors for the purpose of counting them at West Point, New York and Bayport, with the result as shown in the following table:

Date.	Time (Standard).	Number of meteors.	Leonids.
1899.	(At West Point.)		
Nov. 12.	13 h. 15 m. to 15 h. 30 m.....	5	1
13.	13 h. 10 m. to 14 h. 30 m.....	1	0
14	12 h. 0 m. to 17 h. 0 m.....	0	0
15.	11 h. 40 m. to 15 h. 30 m.....	17	12
16.	13 h. 0 m. to 14 h. 30 m.....	5	1
	(At New York City.)		
Nov. 15.	12 h. 55 m. to 18 h. 0 m.....	68	68
	(by Misses Harpham, Proctor and Tarbox).		
Nov. 15.	14 h. 15 m. to 16 h. 45 m.....	36	
	(by Mr. and Mrs. Woods).		
	(At Bayport).		
Nov. 15.	13 h. 57 m. to 17 h. 35 m.....	39	

Professor Rees, observing casually while attending to the photographic apparatus at Bayport, observed a first magnitude Leonid at 15 h. 29 m. on November 15th, between the two lowest stars in the handle of the dipper. At 15 h. 39 m. he observed another first magnitude Leonid under Sirius. At 17 h. 15.5 m. a fine Leonid trail lasting 3 seconds was seen over Procyon. At 17 h. 30 m. a very bright Geminid was seen 20° south of Regulus.

Professor Rees stated in his second paper that observations of latitude had been made at the new site of Columbia University from April 24, 1893, to the present, and will be continued until May 1, 1900. The observers were Professors Rees and Jacoby, and Dr. H. S. Davis. A zenith telescope made by Waunscaff, of Berlin, was employed throughout. Its aperture is 80 mm. and its focal length is 1 meter. Four groups of stars were used having mean right ascensions of about 6 h., 14 h., 18 h., and 22 h. respectively. Each group contained 7 stars. Up to the present time, 6516 pairs have been observed on 758 nights. From the observations, a curve was drawn showing the latitude. This was compared with the curve required by Dr. S. C. Chandler's formula (*Ast. Jour.*, No. 446). From 1896 the observed epochs of maxima and minima seem to follow the computed time.

These observations give for the constant of aberration of light, the value

$$20''.464 \pm 0''.006.$$

Mr. **Bauer**, in his paper, stated that the star under consideration has a large proper motion and measurements of its parallax have been made by various methods and observers. The present determination is based on 28 Rutherford photographic plates, and the method of position angle was used in measuring them, as Professor Jacoby has already made a reduction using the method of distance. Eleven independent determinations were made, giving a value of

$$0''.238 \pm 0''.014.$$

Professor Jacoby found by the method of distance $0''.275 \pm 0''.024$, these results agree even better than might have been expected. In forming the catalogue of 56 stars about μ Cassiopeiae, the usual corrections for refraction, precession, nutation, aberration, proper action, etc., were applied. Since the coördinates were measured in distance and position angle, these were then converted into difference of right ascension and declination. After finding the positions for the epoch 1872.0 the precession and secular variation were computed and tabulated.

WM. S. DAY,
Secretary.

SECTION OF BIOLOGY.

FEBRUARY 12, 1900.

Section met at 8 P. M., Dr. Bashford Dean presiding.

The minutes of the last meeting of Section were read and approved.

The following program was then offered:

J. H. MacGregor ON THE DEVELOPMENT OF THE SKULL IN CERATODUS.

F. B. Sumner, KUPFER'S VESICLE IN RELATION TO GASTRULATION AND CONCRESCEENCE.

G. S. Huntington, SOME MUSCLE VARIATIONS OF THE PECTORAL GIRDLE.

SUMMARY OF PAPERS.

J. H. MacGregor gave a brief preliminary report on the development of the skull in *Ceratodus*, the Australian lung-fish. The research is made conjointly with Professor Bashford Dean.

Only the early stages of the chondrocranium have as yet been studied; but it is noteworthy that these early stages show even closer resemblance to the amphibian skull than does the adult. The suspensorium is ante-stylic from the first, and the union of quadrate to cranium by ascending and otic processes is exactly as in urodele amphibia. The hyomandibular appears later than the body of the hyoid arch, and has no connection with the jaw. The trabulæ are widely separated, leaving a large ventral fontanelle, also an amphibian character. The palatopterygoid bar is almost entirely suppressed. The one character which is entirely fish-like is the otic capsule.

Dr. **Sumner's** paper brought out the following points:

I. The generally accepted account of gastrulation in the Teleosts, as proposed first by Götte, was shown to be incomplete, in so far as it failed to give a true account of the hypo-blast.

II. A view of Kupfer's vesicle was maintained, closely similar to that proposed by the great morphologist, after whom this structure has been named.

III. The present author has arrived, on purely morphological grounds, at a view of concrescence identical with that proposed by Kopsch on the basis of the latest experimental work.

Dr. **Huntington's** paper dealt specifically with the retro-clavicular group of supernumerary muscles, for the purpose of determining their mutual relationship and common derivation. The new muscle, here described for the first time, completes a series of retroclavicular aberrant muscles which represent different stages in migration and recession of the typical mammalian-sterno-chondro-scapularis. The members of this group appear, therefore, as myo-typical reversions representing persistent portions of this muscular plane, with secondary skeletal attachments, depending upon the degree of recession.

FRANCIS E. LLOYD,
Secretary.

SECTION OF GEOLOGY AND MINERALOGY.

FEBRUARY 19, 1900.

Section met at 8:15 P. M., G. F. Kunz presiding.

The minutes of the last meeting of Section were read and approved.

The following program was then offered:

Henry S. Washington, THE MAGNET COVE LACCOLITH, ARKANSAS.

SUMMARY OF PAPER.

The structure of the complex is described and, from the evidence of the form of the area, the relations to the surrounding shales, the presence of an overlying zone of metamorphosed rock, the arrangement of, and the serial petrographical and chemical characters of the main rock types, with other minor points, the conclusion is drawn that the igneous complex is probably a laccolith, and certainly a unit; and that the main component abyssal rocks are not due to successive injections, as was suggested by J. F. Williams, but are the result of a differentiation *in situ* of the mass of magma.

The main rock types are described, some new analyses being given, and they are shown to form a regularly graded series of interesting rocks, ranging from basic jacupirangite, through ciotite-ijolite, typical ijolite, shonkinitic syenite and leucite-syenite, to foyaite. This serial, and common genetic character is shown both mineralogically and chemically. It is probable that the dikes of tinguaitite and nepheline-porphyrty are aschistic, while those of monchiquitic rocks are diaschistic.

The arrangement of the abyssal rocks is shown to differ radically from most other cases of differentiated laccolithic masses and dikes, in that there is progressive increase in acidity toward the periphery. One or two other instances of this are mentioned, the most closely analogous being the laccolith at Umptek in Kola (Finland).

An explanation of this is given, based on a process of fractional crystallization or freezing of the magma, and the idea ap-

plied to other cases. It is suggested that the laccoliths and similar magmatic masses, which have been studied, may be referred to three distinct types, the differences between which would be satisfactorily accounted for by the hypothesis.

In the ensuing discussion, Dr. Washington pointed out that the specimens of the rocks, represented by his analyses, had not been selected in a radial line, but in various directions at increasing distances from the central mass of basic constitution.

The following specimens were exhibited by the Chairman:

Corundum from Raglan Township, Ontario, Canada.

Various colored sapphires from a new locality, Clear Creek, Granite County, Montana.

Corundum from a serpentine dike at a new locality, Corundum Hill, Plumas County, California.

Professor **R. E. Dodge** announced the death of Dr. Hans Bruno Geinitz, on December 30, 1899. The Chairman briefly discussed the character and work of Dr. Geinitz, and, on motion, Professor Stevenson was appointed a committee to prepare a minute on this great loss to the Academy and to science.

ALEXIS A. JULIEN,
Secretary.

SECTION OF ANTHROPOLOGY AND PSYCHOLOGY.

FEBRUARY 23, 1900.

Section met at 8:15 P. M., Dr. Franz Boas presiding. The following program was then offered:

Carl Lumholtz, SYMBOLISM OF THE HUICHOL INDIANS.

A. L. Kroeber, SYMBOLISM OF THE ARAPAHOE INDIANS.

F. Boas, THE GROWTH OF CHILDREN.

SUMMARY OF PAPERS.

Dr. **Lumholtz** stated that the Huichols are a small tribe of about four thousand souls living in the southwestern part of Mexico, on a spur of the Sierra Madre. Their country being

difficult of access, they have been left comparatively untouched by civilization, and thus preserved their ancient beliefs and customs intact to the present day. The paraphernalia of the warrior of ancient times, *i. e.*, of the gods of the present race, furnish the principal symbolic objects by which prayers are expressed, and the most important of these articles is the ceremonial arrow left as a sacrificial offering in the temples and considered a carrier of prayers. It is painted and otherwise decorated with symbolic emblems, and attached to it are representations of other paraphernalia of the warrior, as the front shield and the back shield, the latter being also viewed as the mat or bed of the god. Frequently the object of the prayer is incorporated in an attachment to the arrow. The vivid imagination of the people makes them see analogies in the most heterogeneous phenomena. They see serpents in the sky, the clouds moving through space, the wind sweeping over the fields, the rain falling down, even in their girdles and ribbons. Certain insects which appear during the wet season are identical with corn, and corn is identical with hikuli, and hikuli with deer. The same tendency to consider heterogeneous objects as identical may be observed in the fact that a great variety of objects are considered as plumes. Clouds, cotton-wool, the white tail of the deer, the deer's antlers, and even the deer itself are plumes, and the serpents are believed to have plumes. Naturally, much ambiguity is found, and there are few symbols that express always the same meaning; nor is an idea always expressed by the same symbol. Although this gives a certain individuality to the symbolic objects, we can always trace the connection between the thought to be expressed, and the symbol expressing it.

In Mr. **Kroeber's** paper it was shown with the aid of lantern slides that the decorative art of the Arapahoe Indians is throughout realistic (*i. e.*, pictorial) or symbolic. Geometric patterns occur, but rarely, and the general character of the art is suggestive rather of pictography. Symbols representing animal life, physical nature and abstract ideas predominate.

Professor **Boas** showed that a series of measurements of chil-

dren repeated at annual intervals proves that the variations of growth must be interpreted as mainly due to acceleration and retardation of growth, combined with hereditary influences, which determine the amount of annual growth. It has shown that it is possible to determine the essential elements which determine the amount of annual growth by admission of regulated measurements. These result in a determination of (1) the relation between final development and development of any given period; (2) the typical development at a given period; and (3) the variability of the series in regard to period.

CHARLES H. JUDD,
Secretary.

ANNUAL MEETING.

FEBRUARY 26, 1900.

The Academy met for the Annual Meeting at 8:15, President Osborn in the chair, who opened the meeting with the following address:

Members of the New York Academy of Sciences:

You are welcome to the 81st annual meeting of the Academy. We must congratulate ourselves upon our increasing strength which we trust is keeping pace with the rapid development of the City of New York as a scientific centre. This is not an institution for popular scientific education—a duty we may well leave to the Schools, the Universities, the Museums, and the recently established scientific parks. Our main object is the centralization of the best scientific thought of the city. In cordial coöperation with the several other scientific societies, this object should constantly be kept in view. We meet for high thinking and the encouragement of research. The rise of this Academy in the esteem of the people of this city and of similar academies abroad, will depend, not upon our scientific organization, which we now believe to be well nigh perfect, thanks to the careful efforts of the last few years; but upon the scientific discoveries which are stimulated and made known here. We all stand for plain living. The votaries of science

do not need an elaborate meeting place; but there is a certain stimulus in the scientific atmosphere of the historic associations which cluster around this Academy, which we shall lack until we secure a building of our own. We ask the intelligent people of this city, who owe everything they possess to the applications of science, for two large funds. First, an endowment fund for the publication of our researches; this fund should not be less than \$60,000. This, in my judgment, is of more pressing importance than the building.

Secondly, we ask for a building fund for a suitable meeting place, which we propose to share with the other societies of the Scientific Alliance. To this fund one of our Patrons, Mrs. Esther Herrman, has already generously contributed.

Upon the whole the sections of the Academy have gained steadily in strength. We regret that the disbandment of the Philological section became necessary. At the same time we appreciate the fact that the Anthropologists have recently organized an Ethnological Society, but will continue to hold part of their meetings with us; this branch of science, stimulated by the expeditions of the American Museum of Natural History, promises to be very strong. We have added Chemistry to the subjects covered by the Astronomical and Physical section.

During the past year I regret to say that some of our most distinguished Honorary Members have passed away. Among these are the veteran chemists, Professor Bunsen, of Heidelberg, and Sir Edward Frankland, Foreign Secretary of the Royal Society of London. We also mourn the loss of Sir William Dawson, the eminent geologist and palæontologist of Canada; and of Professor Geinitz, who long held a leading position in Germany. I must refer to the death of Sir William Flower, Director of the British Museum of Natural History, as a personal loss, for I had the pleasure of esteeming him among my warm friends. He rendered great services to the study of mammals and to the development of scientific museums.

In retiring from the Presidency, I desire to express my warm appreciation of the honor you have conferred upon me, and I trust you will give equally cordial support to my successor.

The minutes of the last Annual Meeting were then read and approved.

No report of the Corresponding Secretary was given.

The report of the Recording Secretary, which is filed herewith, was then read and approved.

The accompanying report of the Treasurer was read and referred to the Finance Committee.

The accompanying reports of the Librarian and Editor were accepted, and votes of thanks passed for the work of the Librarian and Editor.

The following nominations for Honorary Members were read, as selected by the Council :

Julius Hann, Ph.D. Professor of Meteorology, University of Graz.

Edward Charles Pickering, LL.D. Paine Professor of Practical Astronomy, Harvard University.

Jules-Henri Poincaré, F.R.S. Professor of Mathematical Physics, Faculty of Sciences, Paris.

Henry Augustus Rowland, LL.D. Professor of Physics, Johns Hopkins University.

Edward Burnett Tylor, D.C.L., LL.D., F.R.S. Professor of Anthropology, University of Oxford.

Brief addresses in reference to the candidates were made as follows :

Dr. Hann, Professor Richard E. Dodge.

Professor Pickering, Professor J. K. Rees.

Professor Poincaré, Professor Woodward.

Professor Rowland, Professor Hallock.

Professor Tylor, Dr. Franz Boas.

The Secretary was then empowered to cast one ballot for the list as read.

The following list of corresponding members was nominated by the Council, and the Secretary was instructed to cast one ballot for their election, which was done.

Albert De Lapparent, Professor of Geography, École Libre de Hautes Études, Paris.

William Henry Holmes, Curator, United States National Museum, Washington, D. C.

Kakichi Mitsukuri, Ph.D., Professor of Zoology, Imperial University of Tokyō.

George Howard Parker, Ph.D., Associate Professor of Zoology, Harvard University.

Charles Richard VanHise, Ph.D. Professor of Geology, University of Wisconsin,

Sho Watase, Ph.D., Professor of Histology, Imperial University of Tokyō.

The following list of resident members was nominated as Fellows; by the Council, and the Secretary was instructed to cast one ballot for their election, which was done.

Dr. W. S. Day, Secretary Section of Astronomy, Physics and Chemistry.

James Douglas, Pres. American Institute of Mining Engineers.

Jonathan Dwight, Jr., Ornithologist.

Dr. Marshall A. Howe, Curator of Columbia University Herbarium.

Professor Charles H. Judd, Professor of Psychology, N. Y. University.

Dr. E. G. Love, Entomologist.

Alfred W. Trotter, Civil Engineer and Mining Expert.

Dr. Henry S. Washington, Petrographer.

Dr. Theodore G. White, Palæontologist.

The President then appointed as tellers, Mr. Kunz, Professor Lloyd, and Dr. White, to take charge of the election.

Dr. E. G. Love was nominated as Curator in place of Mr. W. D. Schoonmaker, who was not eligible.

Ballots were distributed, votes received and counted, and the following list of officers elected.

President—Robert S. Woodward.

First Vice-President—Charles A. Doremus.

Second Vice-President—Franz Boas.

Corresponding Secretary—William Stratford.

Recording Secretary—Richard E. Dodge.

Treasurer—Charles F. Cox.

Librarian—Livingston Farrand.

Councillors—Daniel W. Hering, Harold Jacoby, Frederic S. Lee, M. I. Pupin, Edward L. Thorndike, L. M. Underwood.

Curators—Harrison G. Dyar, Alexis A. Julien, George F. Kunz, Louis H. Laudy, E. G. Love.

Finance Committee—Henry Dudley, John H. Hinton, Cornelius Van Brunt.

The President-elect then took the chair, and after a brief address, introduced the retiring president, who gave his presidential address, entitled: THE GEOLOGICAL AND FAUNAL RELATIONS OF EUROPE DURING THE TERTIARY PERIOD, AND THE THEORY OF THE SUCCESSIVE INVASIONS OF THE ETHIOPIAN FAUNA.

The Academy then adjourned.

RICHARD E. DODGE,
Recording Secretary.

REPORT OF THE TREASURER.

February 26, 1900.

RECEIPTS.

Balance on hand, as per last annual Report.....		\$1,489.85
Income, Permanent Fund.....	\$420.14	
" Publication Fund.....	90.00	
" Audubon Fund.....	89.86	600.00
Life Membership Fees.....		200.00
Initiation Fees.....		80.00
Annual Dues, 1895.....	10.00	
" 1896.....	10.00	
" 1897.....	65.00	
" 1898.....	150.00	
" 1899.....	2,340.00	
" 1900.....	50.00	2,625.00
Total Receipts.....		\$4,994.85

DISBURSEMENTS

Cost of Publications.....	\$1,250.45
Less received from sales....	130.85
	<hr/>
	\$1,119.60

Rent of Rooms.....	440.00	
Expenses of Officers:		
Recording Secretary.....	\$363.09	
Librarian	278.48	
Treasurer	43.81	685.38
Sectional and General Expenses.....	28.11	
Cost of Lectures.....	66.48	
Cost of 6th Annual Reception.....	366.17	
Preliminary Expenses of 7th Annual Reception.....	50.00	
		<u>\$2,755.74</u>
Balance now on Hand.....		<u>\$2,239.11</u>

DETAILS OF PERMANENT FUND.

Balance, as per last Annual Report.....	\$1,468.68
Life Membership Fees rec. during year.....	200.00
Initiation Fees, rec. during year.....	80.00
Balance now on hand, for Investment.....	<u>\$1,748.68</u>

DETAILS OF GENERAL INCOME ACCOUNT.

CREDIT.

Received from Annual Dues.....	\$2,625.00
Income of Permanent Fund.....	420.14
" Publication Fund.....	90.00
	<u>\$3,135.14</u>

DEBIT.

Deficiency brought over from last year..	\$281.55
Net Cost of Publications.....	1,119.60
Rent of Rooms.....	440.00
Expenses of Officers.....	685.38
Sectional and General Expenses.....	28.11
Cost of Lectures.....	66.48
Cost 6th Annual Reception.....	366.17
Balance, surplus.....	<u>\$2,987.29</u>
	<u>\$ 147.85</u>

SUMMARY.

Balance to credit of Permanent Fund...	\$1,748.68
" " " " Audubon Fund....	100.00
Total, awaiting investment.....	<u>\$1,848.68</u>
Accumulated Income of Audubon Fund awaiting appropriation by the Council.	292.58
Balance to credit of General Income a/c available for future expenses.....	147.85
	<u>\$2,289.11</u>
Less, amount advanced for Preliminary Expenses of 7th Annual Reception.....	50.00
Balance, cash on hand.....	<u>\$2,239.11</u>

It appears from the foregoing figures that the total expenses of the Academy for the year were \$429.40 less than its available income, so that a deficiency of \$281.55 was wiped out, and a surplus of \$147.85 created in General Income Account.

ASSETS.

Cash in Bank	\$2,239.11
Investments in Bonds and Mortgages @ 5%:	
a/c Permanent Fund	\$8,402.75
a/c Publication Fund	1,800.00
a/c Audubon Fund	<u>1,797.25</u> 12,000.00
Annual Dues in Arrears:	
For 1896	40.00
" 1897	130.00
" 1898	200.00
" 1899	<u>450.00</u> 820.00
Total.....	<u>\$15,059.11</u>
Amount last year.....	14,109.85
Gain for year	<u>\$ 949.26</u>

C. F. Cox,
Treasurer,

REPORT OF THE RECORDING SECRETARY.

FEBRUARY 26, 1900.

The last Academy year has been one of progress, but has not been marked by any striking events that make it noteworthy. The attendance at the meetings has continued pleasing, and in every way the work of the Academy has continued along the lines previously adopted.

During the last year there have been seven meetings of the Council, six Business meetings, thirty Sectional meetings, four Public Lectures, and one Public Reception. At the Sectional meetings and Lectures there have been presented a total of eighty-two papers, which may be classified as follows:

Anthropology 7.	Palæontology 6.
Archæology 3.	Petrography 5.
Astronomy 5.	Philology 4.
Botany 2.	Physics 8.
Electricity 1.	Physiography 1.
Descriptive Geology 5.	Physiology 1.
Economic Geology 3.	Psychology 9.
Mechanics 2.	Unclassified 1.
Mineralogy 3.	Zoology 15.
Ornithology 1.	

There are at present a total of 333 members, and there have been elected during the last year 16, of whom 7 have not yet qualified. There have unfortunately been 13 resignations. It is with regret, also, that the Academy records the death of seven Honorary Members.

There are pending for consideration this evening five nominations for Honorary Members, six for Corresponding Members, and nine for Fellows.

The Annual Reception and Exhibition was held in April, in the American Museum of Natural History, and like its predecessors, was extremely successful. For the first time since the Reception has been held in the American Museum it was pos-

sible to have an unoccupied room, whereby there was no confusion between the Academy and Museum exhibits. The same plan will be followed during the coming year. The Academy feels that it owes a great deal to the President and Trustees of the American Museum of Natural History, for their kindness and courtesy in allowing the Annual Reception to be held in the Museum, under such favorable auspices, and at such a moderate expense to the Academy.

A few changes have been made during the last year in the organization and management of the sections. It is with regret that the Academy has seen the Sub-Section of Philology discontinued because of lack of public interest in the meetings. It is with pleasure that the Council has added to the field of operations in the Section of Astronomy and Physics by incorporating therewith work in Chemistry. Mention should also be made of the extremely satisfactory and pleasing work which is being accomplished by the Section of Anthropology and Psychology.

During the last two years the Anthropological Club has been coöperating with the Section of Anthropology and Psychology in their meetings. This Club has lately been superseded by the Ethnological Society, which has been revived. The Ethnological Society will continue to coöperate with the Section of Anthropology and Psychology, and it is hoped that strength may be acquired by both organizations through this mutual assistance.

The Council feels that the success and increased interest evident in the meetings since the removal of the meeting place to this building is a very pleasing feature in the Academy's work. Almost without exception the meetings of the different sections have been individually and as a whole largely increased in attendance during the last year and a half. Many faces that were never seen at the other meeting places are now regularly seen at the sections that most interest them.

The work of the Recording Secretary's office has been systematized, and in many ways improved during the last year, so that the necessary and frequent details are managed more efficiently and with less expenditure of energy and time.

The needs of the Academy remain as a year ago, many. The particular need is for a larger publication fund, which will make it possible for the Academy to publish a number of large and important papers which it is now obliged to refuse, owing to a lack of funds. A publication fund would be one of the best endowments that the Academy could receive.

The other great need of the Academy, as it is the need of all the other scientific societies in the city, is a permanent meeting place, at which the library could be housed, and where members would have freedom at all times. The Academy trusts that the beginning of a fund of this sort, so kindly started last year by Mrs. Herrman, may be increased in the near future.

No changes in the policy or plan of procedure of the Academy are anticipated for the coming year.

Respectfully submitted,

RICHARD E. DODGE,
Recording Secretary.

REPORT OF THE LIBRARIAN.

FEBRUARY 26, 1900.

The Library of the Academy consists in round numbers of 9,000 volumes. The total number seems a small one; but it will be recalled that the value of the Library consists largely in its sets of scientific periodicals. Hardly five per cent. of the volumes are in separate title. On the shelves of the Library are now about 8,500 volumes; the remainder, consisting of Consular, Signal and Patent Offices reports, educational, health, and statistical State publications, have been placed for the present, at least, in storage; they are so disposed, however, that they are accessible on short notice. The following statistics may be added: Bound volumes, Quarto, 505; Octavo, 6,115. Unbound volumes, Quarto, 220; Octavo, 950.

At the beginning of his term of office, the Librarian found the room, 507 Schermerhorn Hall, provided with cases for the reception of the collection. The books, it will be remembered,

had up to this time been stored in the basement of Schermerhorn Hall, pending the provision of the class rooms, and furnishings of Columbia University. His first duty, therefore, was to attend to the time-consuming work of unpacking the Library, arranging it on the shelves, revising the catalogue, and adjusting the entire matter of serial publications. The last-named task proved in many ways the most difficult, since owing to the moving of the University, the serial publications had accumulated since 1896 or 1897. Recalling that the Academy has upwards of 800 Societies on its exchange list, it is easily seen that the mass of exchanges was represented by a small mountain of periodicals in all languages, in almost hopeless confusion. The receipt of the exchanges had also to be acknowledged. At the present time the following items are noted as having been accomplished :

The volumes have been arranged on the shelves, the latter have been numbered, and all serial publications—the greatest part of the Library—can be readily found by reference to the shelf numbers now placed in the card catalogue. The card catalogue has been carefully revised, it having been found that the subject and locality titles had been unsatisfactorily arranged. The room of the Library has been suitably lighted. One hundred volumes have been bound and added to the shelves. For the convenient grouping of the incoming periodicals, a large case has been prepared and the present stock of pamphlets (periodicals) has been classified and are in large part placed in order in this case. A geographical arrangement has been found most convenient. Suitable labels will be put in place, different colors representing different countries, so that the visitor can find the recent numbers with the least possible loss of time.

There are many things left undone which I intended to do. I had in mind the publication of a catalogue of the collection, to be sent to the members of the Academy. This I had hoped to bring up to date ; but unexpected difficulties found in the classification of the periodicals have prevented me from carrying out the plan. I was also in hopes of having all separate pamphlets and odd volumes recorded by shelf numbers in

the card catalogue. The most that I have succeeded in doing in the last matter is the arrangement of these volumes or pamphlets on definite shelves, according to their subjects, a grouping which will, I think, temporarily, at least, serve a useful purpose. Thus, the visitor who wishes to determine whether a separate book or pamphlet is in the library, say on the subject of Zoology, will be told that if an octavo he will find it in case 27, or if a quarto in case 41, shelves 1 and 2, or 4 and 6. If the book is, as is usually the case, entered in the card catalogue, the visitor will have no difficulty, I think, in thus securing his book with very little loss of time.

Respectfully submitted,

BASHFORD DEAN,
Librarian.

REPORT OF THE EDITOR.

FEBRUARY 26, 1900.

The Editor desires to make the following report for the past Academy year :

Volume XII of the ANNALS, Part I, comprising 3 papers of 89 pages, with 4 figures, has been printed and distributed. Parts II and III of Volume XII will be issued together, making a total of 14 papers and about 600 pages in the complete volume. Of these numbers 4 to 9 have been issued as author's separates.

Six numbers, in all about 250 pages, are already in hand for printing in Volume XIII.

Volume II, Part I of the Memoirs, entitled "The So-Called Devonian Lamprey, *Palæospondylus gunni*, with notes on the systematic arrangement of the fish-like vertebrates," Bashford Dean, 4to, pp. 1-32; pl. I (litho), January 20, 1900, has been distributed; and Volume II, Part II, entitled "The Egg of the Hag-Fish, *Myxine glutinosa*," Bashford Dean (7 typewritten pages and 1 plate), is in press.

The following is the list of papers already issued as separates, soon to appear in the remaining parts of Volume XII. Arthur Hollick—"Some Features of the Drift on Staten Island, N. Y.," pp. 91-102 (July 7, 1899), pl. I (map); Richard Weil—"Development of the *Ossicula Audita* in the Opossum," pp. 103-118; pls. II and III (zinc) (July 7, 1899); Frederick J. H. Merrill—"Origin of the White and Variegated Clays of the North Shore of Long Island," pp. 113-116 (July 8, 1899); Hubert Lyman Clark—"Further Notes on the Echinodermata of Bermuda," pp. 117-138, pl. IV (zinc); R. P. Whitfield—"List of Fossils, Types, and Figured Specimens used in the Palæontological Work of R. P. Whitfield, showing where they are probably to be found at the present time," pp. 139-186 (Nov. 15, 1899); John Duer Irving—"A Contribution to the Geology of the Northern Black Hills," pp. 187-340; pls. V-XVI, text figures 5-20 (Dec. 18, 1899). The following papers also to appear in Volume XII, are still in press; author's separates have not been issued. Walter C. Kretz—"The Positions and Proper Motions of the principal stars in the Cluster of *Coma Berenices*, as deduced from measurements of the Rutherford Photographs," about 150 printed pages; W. M. Rankin—"The Crustacea of the Bermuda Islands, with notes on the collections made by the N. Y. University Expedition in 1897 and 1898"; about 40 pages text and plate XVII. Louis H. Gray—"Contributions to Avestan Syntax, The Conditional Sentence"; 30 printed pages. William E. Ritter—"Some Ascidians from Puget Sound"; collections of 1896; 30 pages text and three colored lithographed plates, nos. XVIII-XX. Records, about 40 pages.

The edition of the ANNALS has been increased from 1000 to 1250, and during the year the mailing list has been extensively revised and straightened out. There is necessarily some delay in the issuing of the papers, owing to the necessary slowness in reading the proof of certain articles; some changes to be made in the mode of publication with intent toward insuring regular time of appearance of the parts of the ANNALS is absolutely necessary.

The work of the Editor has on the whole progressed satisfactorily.

Respectfully submitted,
GILBERT VAN INGEN.
Editor.

BUSINESS MEETING.

MARCH 5, 1900.

Academy met at 8 P. M., President Woodward presiding. The minutes of the last business meeting were read and approved.

The Secretary reported from the Council as follows:

That the delegates to the Scientific Alliance for next year were President Woodward, Mr. Cox and Professor Doremus.

That the Academy had voted to secure, if possible, photographs of the past presidents of the Academy, to be framed and hung in the Library.

That Professor Osborn had been elected a delegate to the International Congress of Geology.

The following candidate for resident membership, approved by the Council, was duly elected:

W. D. Matthew, American Museum of Natural History.

RICHARD E. DODGE,
Recording Secretary.

SECTION OF ASTRONOMY, PHYSICS AND CHEMISTRY.

MARCH 5, 1900.

Section met at 8:20 P. M., Professor M. I. Pupin presiding. The minutes of the last meeting of Section were read and approved.

The name of one candidate for resident membership was read and referred to the Council according to the By-Laws:

The following program was then offered:

R. S. Woodward, AN ACCOUNT OF THE JUBILEE OF SIR GEORGE G. STOKES.

A. C. Longden, RESISTANCE OF THIN FILMS DEPOSITED BY KATHODE RADIATION. SELENIUM RINGS.

SUMMARY OF PAPERS.

The Jubilee, described by Professor **Woodward**, was held on the 1st, 2d and 3d of June, 1899, on the fiftieth anniversary of the professorship of Sir George G. Stokes at Cambridge. Stokes' most important scientific work was done between 1842 and 1855. In fluid motion he showed that the conditions under which the equations of motion were integrable, were the conditions that the motion should be irrotational. He made researches concerning the elastic solid theory of light. He made advances in the theory of physical geodesy. He showed that the shape of the earth's surface should determine the law by which gravity varied from place to place. He cleared up a good many obscurities in the work of Fourier in regard to Fourier series.

The Jubilee began with the Rede lecture, delivered by Professor Cornu of the École Polytechnique, on the "Wave Theory of Light," and its influence on modern physics. Beside dinners, garden parties, etc., the most important ceremonies were the presentation of addresses by the delegates representing about seventy institutions, and the conferring of the honorary degree of Doctor of Science upon Messrs. Cornu, Darboux, Michelson, Mittag-Leffler, Quincke and Voigt. At the dinner which ended the celebration, Sir George Stokes made a speech in the course of which he said that he wished he had done more scientific work, but that if he had, he might not have been there to celebrate his jubilee.

Mr. **Longden**, in the second paper of the evening described his method of depositing thin metallic films on glass, and showed some specimens. These films can be used as high resistances instead of the very expensive wire resistances ordinarily used. Films of gold or platinum can be deposited, which have not the lack of durability of alloys. At the same time, unlike the metals in the form of wire, they have very low positive or even

negative temperature coefficients. The films are deposited from a kathode of the same material by the discharge of electricity through a vacuum, and can be deposited in any thickness desired, and of any metal, gold and platinum being however the most convenient. The speaker showed a gold film of varying thickness in different parts, the thickest part showing the green color like gold leaf when viewed by transmitted light, and the color varying through blue to violet as the film became thinner.

In the third paper the speaker stated that at the suggestion of Mr. C. C. Trowbridge, he had attempted to deposit a thin conducting film of selenium, but he was unsuccessful as the film deposited was non-conducting. He obtained, however, a film of varying thickness which exhibited the phenomenon of Newton's rings in a beautiful manner.

The section then proceeded to the election of sectional officers. The motion was made and passed to take an "informal" ballot. The informal ballot was taken. For Chairman, Professor Pupin received three votes, and Professor Hallock six votes. For Secretary, Dr. Day received nine votes. The motion was then made and passed that this ballot be regarded as the formal ballot. Professor Hallock was therefore declared elected Chairman and Dr. Day, Secretary.

The section then adjourned.

WM. S. DAY,
Secretary.

SECTION OF BIOLOGY.

MARCH 12, 1900.

Section met at 8:15 P. M., Professor F. S. Lee presiding.

The minutes of the last meeting of Section were read and approved.

The name of one candidate for resident membership was read and referred to the Council according to the By-Laws.

The following program was then offered :

E. L. Thorndike, MENTAL LIFE OF ANIMALS.

D. T. Macdonald, SYMBIOSIS OF ROOTS AND FUNGI.

R. Ellsworth Call, THE NEWBURG MASTODON AND ITS ASSOCIATED FAUNA.

SUMMARY OF PAPERS.

Dr. **Thorndike** described some of the features of the mental life of the monkeys, contrasting their behavior and abilities with those of other mammals. He presented evidence showing the importance of the use of the fore-limbs, delicate discrimination in vision, and incessant general activity as factors in the mental development of the monkeys. He also reported in detail some observations concerning their formation of various intelligent habits, which hint at a near relationship to the human methods of learning.

Mr. **Macdougall** stated that the roots of an extremely large number of plants form associations with fungi in such manner that a felt of hyphæ a millimeter or more in thickness covers the surface, or the fungus may penetrate the tissues and develop coils and clumps of hyphæ in the cortex, from which a number of tubes extend out into the soil.

Roots alone may absorb only minute quantities of the complex products of decomposition of organic matter, but fungi derive almost their entire supply from such sources. The union of the root and fungus result in the latter yielding some of the absorbed humous products to the higher plant. The fungus in turn receives more or less shelter and certain carbohydrates which it uses as food to advantage.

Associations of such symbiotic nature are followed by degenerations of the stele and of the general structure of the root stems, and leaves of the higher plant.

Dr. **Call** referred to the general geological structure of the region about Newburg, which is Hudson River group rock, for country rock, surmounted with a heavy deposit of glacial till. The remains of the mastodon which were under discussion were in the upper portion of the till, partially imbedded in it, and capped with from four to six feet of a black soil rich with vegetable debris. The locality is in a depression of con-

siderable extent, and had, at one time, been a beaver dam, as was indicated by the numerous remains of beaver-gnawed sticks and logs, which were found during the excavations.

Associated with the mastodon bones were a number of species of fresh-water mollusca, among which the following were recognized: *Limnæa stagnalis*, Linn.; *Limnophysa humilis*, Say; *Physa heterostropha*, Say; *Planorbella campanulata*, Say; *Gyraulus parvus*, Say; *Valvata tricarinata*, Say; *Valvata sincera*, Say; *Amnicola limosa*, Say; and *Pisidium æquilaterale*, Prime. All but the species of *Physa* were abundant. The *Limnæa stagnalis* were very large, larger than are now found in recent stations.

The shell-marl was a later deposit than that in which the mastodon remains were found. The place was a peat bog, but never one of great extent nor of great depth.

None of the large leg bones of the mastodon have been found, and the small ones of but a single foot. The animal was not found at the place where it died, but where it had likely floated after partial dismemberment.

At the close of the scientific program, Prof. Patrick Geddes, of the University of Dundee, was invited by the Chairman to present a plan for the formation of an International Association for the Advancement of Science, Arts, and Education, the first assembly of which is to meet at Paris, 1900.

On motion of Professor E. B. Wilson, the thanks of the section were extended to Professor Geddes for his exposition of the plan, with the request that he communicate the matter formally to the Council of the Academy.

The application of Dr. M. A. Howe for the Newberry Fund Grant was read, and referred to a committee consisting of Professor F. E. Lloyd, Professor C. L. Bristol, and Dr. G. N. Calkins.

The election of sectional officers was, on the motion of Dr. G. N. Calkins, postponed one month.

FRANCIS E. LLOYD,
Secretary.

SECTION OF GEOLOGY AND MINERALOGY.

MARCH 19, 1900.

Section met at 8:15 P. M., Mr. Geo. F. Kunz presiding.

The following program was offered :

Henry B. Kummel, THE PALISADES. Illustrated by lantern slides.

John O. Smock, ON THE PROTECTION OF THE PALISADES.

SUMMARY OF PAPERS.

A summary was read of the information thus far collected in regard to the Geology of the Palisades of the Hudson River, illustrated by numerous views, many of them taken by Mr. Prince, of Orange, N. J. Most of the details of the paper will be found in the 1897 Report of the State Geologist of New Jersey. Observers are nearly all agreed that the Palisades are an intrusive trap sheet, which has cooled at great depths. The basal contact is observable at 19 localities, in 15 of which the trap is unconformable upon the sandstone and shales beneath, and is penetrated by tongues of the latter, and in three is apparently conformable. The altitude of the lower contact increases from the south to the north, where it reaches 200 feet elevation. The upper contact is seen in six localities. At three of these, dikes penetrating the overlying shales occur at the contacts; in two the contact is unconformable, and in one conformable. In every instance the beds superjacent to the trap are metamorphosed. In no locality of the Palisades range proper does the upper contact of the trap show any of the characteristics of surface cooling. Well-borings at Fort Lee penetrate 875 feet of the trap, and the total thickness probably exceeds 950 feet, much erosion having taken place. Subsequent to deposition of the overlying sandstones the area was tilted, and the sandstone wasted away by erosion of many streams, the vacant channels of which are still present. The largest of these stream-gaps was one and a half miles wide, and is just north of the New Jersey State boundary. The cutting of gaps

throughout the dissected tilted peneplain which remains was very uniform, and indicates that the former land level was 220 feet lower than the present. If this is the case, we have an instance of rivers beheaded close to their mouths. In addition to the wild beauty of the Palisades escarpment, the timber of this tract is the most luxurious and valuable of the State of New Jersey, although its area is much less than that of the pine groves to the south.

Professor **John O. Smock**, State Geologist of New Jersey, followed with an account of the efforts expended on the protection of the Palisades from devastation by quarrymen. Legislative prohibition of such destruction is retarded by (1) lack of interest in the matter on the part of residents in southern New Jersey; (2) prospects of the future commercial value of the riparian lands at the base of the cliffs, for purposes of shipping and manufacturing, which the removal of a portion of the cliffs would render available; (3) the present value to the State of its quarrying interests along the water front; (4) the income derived from riparian grants of these lands by the State to the quarrymen, which income is devoted to the maintenance of the public schools, the approximate value to the State for this purpose of the lands from Fort Lee to the State border being about one million dollars. This clash between the interests of the schools and the preservation of beautiful scenery is the most serious obstacle with which legislation against defacing the Palisades has to contend.

"In the face of these obstacles it is evident that the wholesale absorption of this territory for a purely sentimental object is impossible. The opposition to such a scheme could only be broken by years of fighting, and in the meantime the destruction of the cliffs and wooded slopes will continue with ever-increasing extent."

As a compromise, Professor Smock suggested that an interstate commission of New Jersey and New York lay out a driveway along the base of the Palisades, quarrying, manufacturing, and shipping interests to be confined to the water-side of the driveway, and the cliff side to be permanently preserved intact

after the drive is completed. Edinburgh, Quebec, and Sterling were cited as exhibiting rocky heights whose grandeur was enhanced by the fringe of manufactories at their base, such buildings lending a basis to the eye by which to measure the proportions of the cliffs. Cliff defacement is also in progress upon the New York Palisades, where are the grandest wooded slopes and highest peaks. There is no need of encroachment on the cliffs in either State, for there are many other places where as good road material exists in equally great quantities, and can be mined at practically the same expense.

"Whatever is done should be done at once, or else we shall have lost a great part of the scenery which we wish to preserve, and this must be done without destroying, or coming in contact with the large public and private business interests that are involved."

In discussion Mr. **Kuns** voiced the sentiment that the opposition to legislation arose more with officials at Trenton than with residents of southern New Jersey, and felt that smoke and other nuisances from factory settlements along the cliff would be seriously detrimental. Were a restricted park created, the value of residential property would in a few years benefit the State many times over the value of the riparian grants. Railroad tunnels might be permitted a distance of a few miles apart, with commercial villages at their water front terminals. The stone from such tunnels would defray the cost of quarrying.

Dr. **Levison** suggested that the removal of portions of the talus would increase the apparent height of the cliffs, if blasting of the latter could be prevented. Dr. **Hovey** described the similar trap formations of Connecticut.

The Secretary announced that this section and the Biological section had been requested to nominate candidates before April 20th, for the grant of the Newberry Research Fund, the grant this year being restricted to those working in botany and geology. Authority was granted to the chairman and secretary of the section to make such nominations to the Council.

The Chairman announced the course of lectures on "The

Principles of Geology," to be delivered at Johns Hopkins University in April, under the G. H. Williams Memorial lectureship, by Professor W. C. Brögger, of Christiania; also the receipt of the program of the International Geological Congress, at which the Academy will be represented by Professor J. J. Stevenson.

The chair also announced the death of Dr. Oliver P. Hubbard, one of the earliest members of the Academy.

On motion of Professor R. E. Dodge, a committee of three was appointed to draft resolutions on the death of Dr. Hubbard, and the chair appointed Dr. Julien, Professor Stevenson and Dr. Hovey such committee.

Professor **Stevenson** presented the following minute upon the life of Dr. H. B. Geinitz, whose death was announced at the February meeting:

"Professor Hans Bruno Geinitz, for many years an Honorary Member of this Academy, died January 23, 1900, in the 86th year of his age. His work as a geologist began very early, for in 1837, when only twenty years old, he published a paper on the Muschelkalk. From that time until within a few weeks of his death, brief notices, memoirs and volumes appeared in rapid succession. There seemed to be no limit to his capacity for hard work. He studied the Cretaceous, Triassic and Carboniferous in detail, and his works on the coal fields of Saxony and Germany were marvels, when published, half a century ago. His papers on palæontology—vertebrate and invertebrate—and palæobotany, are numerous and important.

He was put in charge of the Royal Mineralogical Cabinet in 1846, and retained the position until 1898. The collections increased rapidly, so that in 1857, the Royal Cabinet became the Royal Museum, which, in later years, was one of the chief attractions for foreign visitors. In addition to his other labors he was Professor of Mineralogy in the Royal Polytechnic School of Dresden, from 1850 to 1896, serving meanwhile upon numerous government commissions.

Professor Geinitz was a typical student, caring little for things of this world, devoted to geology and his family. He was genial, sincere, a tender father, a generous friend. By his death

German science has lost one of its most conscientious workers, and Saxony one of its most respected citizens."

Dr. Alexis A. Julien and Dr. Theodorè G. White were unanimously elected Chairman and Secretary, respectively, of the Section for the ensuing year.

After a vote of thanks to the lecturers of the evening, the meeting adjourned.

THEODORE G. WHITE,
Secretary.

SECTION OF ANTHROPOLOGY AND PSYCHOLOGY.

MARCH 26, 1900.

Section met at 8:15 P. M., Professor Cattell presiding.

The following program was offered :

A. L. Jones, THE SYMBOLIC CHARACTER OF GEOMETRICAL FORMS AS A PRINCIPLE OF EXPLANATION.

B. S. Woodworth, THE FATIGUE OF VOLUNTARY MOVEMENT.

E. L. Thorndike, WEBER'S LAW IN JUDGMENTS OF COMPARISON WITH A MENTAL STANDARD.

SUMMARY OF PAPERS.

Among the attempts to explain formal beauty that of Lipps in his *Raumästhetik* is the most striking. He maintains that the æsthetical value of beautiful geometrical forms is due to the fact that they symbolize the activity of mechanical forces working themselves out freely ; that we sympathize with the forces thus represented and receive pleasure when their action is unhindered ; that the forces and laws of their action are not consciously recognized but are merely *felt* or known unconsciously. His explanation involves some questionable metaphysics. The action of mechanical forces is no doubt an important element in many beautiful objects, but it remains to be proved that it is sufficient to explain all formal beauty in objects.

Dr. **Woodworth** stated that the fatigue movement may be studied in reference to the loss in force, in accuracy, or in speed. In each of these respects experiments show that a movement may be continually repeated for hundreds and even thousands of times with only a comparatively slight loss of efficiency. The ergographic curve given by Mosso for force of movement is to be abandoned absolutely as a true picture of the curve of fatigue. This fact has been of late recognized in some able articles by Treves, working in Mosso's own laboratory; but is best brought out by the use of Cattell's spring ergograph. One of the great causes of fatigue in force, and also in speed of movement is the failure of the muscles to relax completely between successive contractions. If care is taken to secure this relaxation, 1,000-1,500 maximal ergographic contractions can be made with a loss of only 10 per cent. of the initial force. From the slowness of fatigue of various modes of voluntary movement, the inference follows that the fatigue of nerve centres is not rapid, as Mosso and Lombard have supposed, but slow in progress. This view is confirmed by tests of prolonged, hard and monotonous work of a mental kind. The quick and overmastering fatigue of common experience is not so much actual inability and loss of function, as it is disinclination, resulting from disagreeable sensations and emotions, and from impulses to change.

The third paper by Dr. **Thorndike** presented the results of some experiments on the accuracy of discriminations of weight, length, and area, by subjects who judged by the aid of mental standards only. Within the limits chosen (40-12 gr., $\frac{1}{2}$ -12 ins., 20-60 sq. cm., and 2-12 sq. ins.), the accuracy of discrimination was found to decrease very slowly, very much more slowly than Weber's law or even the law of the combination of errors would allow. The theory proposed to account for this was that our judgments of amount or of difference are of complex origin, and may be made on various grounds. In so far as the ground is an accurate mental standard, the sensations corresponding to large amounts may be associated with the proper judgment nearly or quite as readily as small amounts. In so far as the

ground is a combination of feelings or judgment, the inaccuracy of judgment may vary, because of the combination of errors, as the square root of the amount. In so far as the ground is the mere mental shock of difference, the inaccuracy of the judgments may vary in some more direct relation to the amount.

CHARLES H. JUDD,
Secretary.

BUSINESS MEETING.

APRIL 2, 1900.

Academy met at 8:23 P. M., President Woodward presiding. The minutes of the last business meeting were read and approved.

In the absence of the Secretary of the Academy, the President requested Dr. W. S. Day to act as Secretary pro tem.

The following Candidates for resident membership, approved by the Council, were duly elected:

Charles Bergen Davis, 321 West 124 Street.

Miss Esther Byrnes, 85 Hancock Street, Brooklyn, N. Y.

WM. S. DAY,
Recording Secretary pro tem.

SECTION OF ASTRONOMY, PHYSICS AND CHEMISTRY.

APRIL 2, 1900.

Section met at 8:25 P. M., Professor W. Hallock presiding. The minutes of the last meeting of Section were read and approved.

The following program was then offered:

William Hallock, OVERTONES OF A TUNING FORK.

William Hallock, NOTE ON SPECIFIC GRAVITY WEIGHINGS.

M. I. Pupin, A NEW FARAD METER.

O. E. Furness, CATALOGUE OF STARS WITHIN ONE DEGREE OF THE NORTH POLE AND THE OPTICAL DISTORTION OF THE HELSINGFORS ASTROPHOTOGRAPHIC TELESCOPE.

SUMMARY OF PAPERS.

Professor **Hallock** stated that the first regular overtone of a tuning fork is about two and a half octaves above the fundamental, but Lord Rayleigh pointed out that when the amplitude of the vibration became so great that the restoring force was no longer proportional to the displacement, the octave appeared, as indicated by theory. Lord Rayleigh recognized the presence of the octave with his ear and by the use of a resonator. Professor Hallock obtained direct evidence of this effect by means of a photograph of a manometric flame, the capsule of which was resting against the prong of the fork.

In a paper on "Specific Gravity Weighings," Professor **Hallock** spoke of a number of points in which the ordinary operations could be improved. It is very convenient to use the principle of the Jolly balance in which there is a pan always immersed to hold the body when weighing it in water. The effect of capillarity on the supporting wire which at best lessens the sensibility of the balance, can be avoided by sending a series of little waves across the surface of the water while weighing. To get rid of bubbles in little corners of irregular bodies, these bodies may be held under the tap at the sink and moistened with water before immersion or, still better, they may be moistened with alcohol and then with water before immersion.

Professor **M. I. Pupin** described a new faradimeter, which he had devised, an instrument for measuring the capacity of a condenser. This instrument is essentially a Wheatstone's bridge, using alternating currents, in which one leg of the bridge consists of two resistances in series and the other leg consists of two capacities in series, one of the two being that of a standard condenser, the other being the unknown capacity to be measured. In the bridge connecting the two points, one between the two resistances, the other between the two capacities, is a telephone. If the two separate circuits, each containing one of the two capacities, are arranged so that the capacity reactance is by far the greatest part of the impedance in that circuit, then silence in the telephone will be obtained when the two resist-

ances are to each other inversely as the two corresponding capacities. The apparatus has been employed in the Columbia University laboratory and gave complete satisfaction. It is capable of a tolerably high degree of accuracy, but its principal merit is its convenience.

Professor **J. K. Rees** presented a paper by Miss C. E. Furness on "A Catalogue of Stars Within One Degree of the North Pole and the Optical Distortion of the Helsingfors Astrophotographic Telescope." The paper gave the results of measurements on 65 stars. By using stars near the Pole, the same group of stars can be taken at different angles with reference to the object glass of the telescope. At Helsingfors the Pole is sufficiently far from the horizon to avoid trouble with refraction. From the measurements, the distortion of the Helsingfors lens was found to be not appreciable.

WM. S. DAY,
Secretary.

SECTION OF BIOLOGY.

APRIL 9, 1900.

Section met at 8:15 P. M., Professor F. S. Lee presiding.

The minutes of the last meeting of Section were read and approved.

The following program was then offered:

M. A. Bigelow, EMBRYOLOGY OF *LEPAS*.

F. E. Lloyd, THE GENUS *LYCOPodium* IN NORTH AMERICA.

SUMMARY OF PAPERS.

Mr. **Bigelow's** paper was based upon the results of an investigation recently completed, which was undertaken with the view to applying the cell-lineage method in an accurate study of the cleavage and the formation of the germ layers in *Lepas* and other Cirripedes.

Four species have been studied, but the only complete series of embryonic stages was obtained from *Lepas anatifera*.

The cleavage of *Lepas* is totally unequal and regular. Stages of 2, 4, 8, 16, 32, and 64 cells are normally formed. Cells of a given generation may anticipate their fellows in division, but no second division of such cells takes place before all other cells have completed corresponding cleavages and become of the same generation.

The first cleavage is nearly parallel to the long axis of the ellipsoidal egg. The egg is divided into an anterior ectoblastic cell and a posterior yolk-bearing macromere. The second cleavage is at right angles to the first, both cells dividing, and from the yolk-macromere is cut off a second ectoblastic cell. The third cleavage is essentially perpendicular to the first two, dividing all of the cells, and a third ectoblastic cell is separated from the yolk-macromere, which is now mesentoblastic. Thus by the first, second and third cleavages three cells are separated from the yolk. These three cells contain all the ectoblast, and by repeated division they form the blastoderm. The fourth cleavage separates the mesoblast from the ectoblast, which is now represented by the yolk-macromere.

The 16-cell stage is composed of fourteen ectoblastic cells which largely surround the entoblastic yolk-cell. The single mesoblast cell lies in the blastoderm at the posterior edge of the blastopore, where the entoblastic yolk-cell is still exposed to the exterior. By the fifth cleavage all these cells are divided, the two mesoblastic cells still remaining on the surface. During the sixth cleavage the two mesoblastic cells sink beneath the blastoderm as it closes over the blastopore. At the same time four cells of the blastoderm, lying at the anterior and lateral edges of the blastopore, divide perpendicularly to the surface. Four cells are thus formed, beneath the blastoderm, and they are apparently added to the mesoblast. The entire mesoblast then originates from one cell which is separated from the entoblast in the fourth cleavage 16-cell stage, and from four other cells which are derived from the ectoblast in the sixth cleavage forming the 62-cell stage.

The course of the cleavage as sketched above has been determined to be quite constant. Cells of definite origin in the

early cleavage stages, are the ancestors of cells which occupy particular positions in later stages. Following Conklin's terminology ('97) the cleavage may be characterized as "determinate." This conclusion is completely opposed to the results of the earlier investigators of cirripede development.

Gastrulation is of the epibolic type, and is the result of the extension of the ectoblastic blastoderm over the entoblastic yolk-macromere. The blastoderm usually closes over the blastopore during the sixth cleavage (62 cells). The blastopore is identified as marking the ventral and posterior of the future embryo.

In the general features of the late development of the embryo the results of this investigation confirm those of some earlier workers.

On account of the discomfort caused by the low temperature of the room the second paper of the evening was omitted by general consent.

On motion of Professor F. E. Lloyd, a committee of one was appointed to communicate with the Recording Secretary in regard to the unsatisfactory heating arrangements, with a request that a complaint be lodged against the culpable parties.

Mr. Lloyd was asked to serve as the committee.

Adjournment followed.

FRANCIS E. LLOYD,
Secretary.

GEOLOGY AND MINERALOGY.

APRIL 16, 1900.

Section met at 8:20 P. M., Dr. A. A. Julien presiding.

The minutes of the last meeting of Section were read and approved.

The following program was then offered:

B. Ellsworth Oall, SOME PRELIMINARY NOTES ON CRYSTAL GROWTHS IN MAMMOTH CAVE. (Illustrated by Lantern Slides.)

E. O. Hovey, SCENERY OF THE HARNEY PEAK DISTRICT IN THE BLACK HILLS, S. D. (Illustrated by Lantern Slides.)

**E. O. Hovey, BIOGRAPHICAL NOTICE OF PROFESSOR OLIVER
P. HUBBARD.**

SUMMARY OF PAPERS.

Dr. **Oall's** mineralogical notes were preceded by a brief resumé of the geology of the vicinity of Mammoth Cave. The strata making the geologic section are nearly horizontal, and all the rocks forming the cavern are of sub-carboniferous age. The region of the cavern is capped with sandstones of the Chester Group, 500 feet thick. Under these are oolitic and other limestones, in which the cavern is excavated to a thickness of over 350 feet. The drainage level of the cavern is determined by the present level of Green River. Five different levels have existed during geologic time. No gypsiferous strata are known in the region. The overlying sandstone is usually quite ferruginous; but no pyrite occurs in either strata. Secondary crystallization has occurred in many of the stalactites, causing them to simulate the fibrous appearance sometimes assumed by aragonite. The stalactites of recent origin almost all have a downward-projecting tree root as their origin of fixation, or are beneath sink-holes. The chief objects of mineralogical interest are the gypsum crystals, which cover the sides and ceilings of certain avenues in the cavern, in the upper of the five levels only, and not in any levels now occupied by streams. These crystals are sometimes curiously and remarkably contorted, and the terminations of the crystal masses are often re-curved in a direction contrary to the direction of gravitation. Occasionally the gypsum assumes a botryoidal form, but is commonly found as needles or aggregated in loose masses of fibrous crystals. The gypsum crystals occur only along cracks, and are built up by increase from the base, while the calcium-carbonate stalactites are always built up by additions to their surface or terminations. It is difficult to account for the large amount of sulphur needed by assuming its origin in organic bodies, such as plants and the forests which are of abundant growth in the region, and have been abundant for geological ages. The origin of the carbon dioxide necessary for the great

work of solution which has been accomplished is likewise found in the decaying vegetation. The origin of the sulphuric acid required to produce these enormous quantities of gypsum crystals, which have fallen so abundantly as to fill up certain avenues, is still problematic. Only one other mineral is found—flocculent crystals of magnesium sulphate, pendant from the ceiling of two or three small rooms. There are no calcite or quartz crystals.

The paper was illustrated by lantern slides, showing the peculiarities of the stalactite and gypsum formations.

Professor **Kemp** in discussion, suggested that the small percentage of sulphur present in the limestones themselves might, after solution of the latter, aggregate sufficient sulphur to afford gypsum along the crevices. Dr. **Julien** and Professor **Stevenson** each cited cases in the Caribbean and Bermuda Islands where the amount of vegetation now or formerly growing on the surface was insufficient to accomplish the solution required for the great caves which exist in the coral limestones, both of Tertiary and recent growth in the islands.

Dr. **Hovey's** paper was read by Professor Kemp, owing to the former's unavoidable absence. After a brief resumé of the geology of the Black Hills District, a series of views was shown illustrative of the extraordinary erosion forms of the schists and pegmatites of the Harney Peak District. His views also showed the tin mines of the Black Hills, in which spodumene crystals of large size have recently been obtained as a valuable source of Lithium, as a commercial product. One spodumene crystal here obtained was thirty feet long. The granite veins have also been described by Van Hise.

Discussion followed concerning the occurrence of extraordinarily large crystals of other minerals.

The biographical notice of Professor Oliver P. Hubbard, prepared by Dr. Hovey, was read by the Secretary, and will be published with an accompanying list of Dr. Hubbard's publications, in the *American Geologist*.

Professor **Stevenson**, in behalf of the committee appointed to

prepare a minute respecting the late Professor Hubbard, offered the following :

"**Oliver Payson Hubbard** was born in Pomfret, Conn., March 31, 1809, and died in New York, March 9, 1900. After graduating at Yale College in 1828, he remained in that institution as assistant to Professor Silliman until he began his study of medicine, which he completed in 1837, when he received the degree of M.D. from the South Carolina Medical College at Charleston.

"Prior to his graduation in medicine, he was made Professor of Chemistry, Pharmacy, Geology, and Mineralogy in Dartmouth College. In 1871, the Chair was restricted to Chemistry and Pharmacy, and no longer required his full time, so that he was able soon afterwards to make New York his home during much of the year. In 1883, he felt that he has already passed the age when one should retire from a professorship, and resigned his position, becoming professor emeritus. Thereafter he remained in New York.

"His youthful love of science led him to Yale that he might study under Professor Silliman, then the prominent teacher of science in our country. His first publication, entitled 'Geological and Mineralogical Notices,' having reference to localities in Northern New York, appeared in the *American Journal of Science* in 1837, and was followed in 1838 by a somewhat more elaborate article upon the White Mountains. He attended the 1841 meeting of the Association of American Geologists and Naturalists and read a paper of capital importance upon the slates of Waterville, Maine, in which he discussed the markings upon the slates, and indicated their organic origin, which he regarded as proving their great age. He was present also at the third meeting, and took a prominent part in the discussion of the 'drift,' so that he was appointed member of the committee to prepare a report upon that subject for the next meeting. He was elected Secretary of the Association for 1833, and, with Benjamin Silliman, Jr., served in the same office for 1844. His duties at Dartmouth were exacting, so that for many years he published few extended papers; but he made many brief com-

munications to societies, all of which were characterized by *keen discrimination, and many of them were important contributions.*

"Dr. Hubbard joined this Academy in 1874, and at once became so active that when Mr. Browne, who had been Recording Secretary from 1839, resigned in 1875, Professor Hubbard was chosen as his successor. He retained this office until 1885, when he became Vice-President. At the death of Dr. Newberry in 1892, he was made President; but he served for only one term, declining reëlection because of his advanced years. From 1874 until 1893 he rarely failed to attend the meetings, when in the city, and he always presented something of interest bearing upon matters under consideration. His manner was courteous to the last degree, and he understood well how to discuss without disputing.

"Professor Hubbard's individuality was very decided; though so gentle and considerate in his manner, he always held positive opinions, and, when necessary, did not hesitate to express them. His shrewd common sense made him a good counsel, and his advice was sought in many directions. He was a member of the New Hampshire legislature in 1863-4; but one year's experience in that kind of work sufficed, and he declined to be a candidate for reëlection. His quiet humor and his store of reminiscences made him a delightful companion. He retained his mental vigor to the last, and only two months ago he published an article correcting errors in a recently published work. When ninety years old, he attended the New York meeting of The Geological Society of America, and remained throughout an afternoon listening to severely abstract papers, with as much interest apparently, as though he were just beginning his work.

"Professor Hubbard was almost the last link binding our time with that of the early geologists. Hall and Dana died within the last half decade, and there remain only Boye and Lesley of those who attended the earlier meetings of the Association of American Geologists. He passed away in a ripe old age, his life full of good works, and his name absolutely un-

stained. This Academy owes him much, and here his name should be cherished.

"(Signed),

"J. J. STEVENSON,

"ALEXIS A. JULIEN."

THEODORE G. WHITE,
Secretary.

SECTION OF ANTHROPOLOGY AND PSYCHOLOGY.

APRIL 23, 1900.

Section met at 8:15 P. M., Prof. J. McK. Cattell presiding. The minutes of the last meeting of Section were read and approved.

The following program was then offered:

Dr. **Livingston Farrand**, RECENT RESEARCHES IN CENTRAL AUSTRALIA.

Dr. **Franz Boas**, THE ESKIMO OF CUMBERLAND SOUND.

SUMMARY OF PAPERS.

Dr. **Farrand's** paper called attention to certain points of particular significance in Messrs. Spencer and Gillen's book, "The Native Tribes of Central Australia," which appeared last year. Special emphasis was laid on the suggested origin of the religious side of totemism as indicated in the "Intichiuma" ceremonies of the Arunta tribe, which are directed apparently solely towards the end of increasing the supply of the totem animals and plants of the district, each totem group being charged with the treatment of its own totem object and its multiplication for the benefit of the other members of the tribe. The well-known prohibition against killing and eating the totem seems to hold in this region, but tradition and ceremony point to a time when this was not the case. This economic explanation of the custom is the first satisfactory one yet offered and is plausible for the tribes under discussion even though it may not hold for other

parts of the world. The social aspect of totemism with its marriage regulations still remains a problem.

The material on which Professor **Boas'** paper was based was collected by Captain James Mutch. A full version was given of the myth of the creation of land and sea animals, and a description of the beliefs of the people in regard to souls and in regard to a series of heaven and underground worlds which are the abodes of the deceased. A number of taboos were described, and their explanation as given by the Eskimos was stated. They believe that the transgression of a taboo prescribed after the death of an animal causes the transgression to become fastened to the soul of the animal, which goes down to the mistress of the lower world, where the transgressions make the hands of the deity sore. This enrages her, and she causes famine and misfortunes of all kinds.

CHARLES H. JUDD,
Secretary.

PUBLIC LECTURE.

APRIL 30, 1900.

Under auspices of Section of Astronomy, Physics and Chemistry.

Professor **William Hallock**, THE NATURE OF THE ATOM AS INDICATED BY RECENT SPECTRUM ANALYSIS.

This is the age of effects. Formerly people were discovering laws. The Zeeman effect is the one which has given most information recently on the subject of the nature of the atom. Chemical investigations brought us to the atomic theory. The complex nature of the atoms was shown by the spectrum analysis of Bunsen and Kirchhoff. They showed that in its number of modes of vibration, the atom was more complicated than a musical instrument. Faraday discovered the rotation of the plane of polarization of light by the magnetic field. He tried and failed to get any effect of the magnetic field on the source of light itself, the vibrating atom. Zeeman finally succeeded a few

years ago in obtaining this effect called after his name. It shows itself as a splitting up of the lines of the spectrum into double, triple and more complex lines, when the source of light is placed in a strong magnetic field. The Zeeman effect, together with J. J. Thomson's experiments and speculations, give us the idea of the atom being composed, in part at least, of corpuscles, one of which, being detached, forms the negative ion of the cathode rays and other phenomena, while the part left behind, having a much greater mass, forms the positive ion. In these corpuscles we may have the primeval material from which all other matter is composed.

The lecturer showed a number of lantern slides of photographs of the Zeeman effect and of the various kinds of apparatus by which it is investigated.

WM. S. DAY,
Secretary.

BUSINESS MEETING.

MAY 7, 1900.

Academy met at 8:15 P. M., Professor William Hallock presiding.

The minutes of the last business meeting were read and approved.

The Secretary reported from the Council as follows:

The appointment of Dr. Theodore G. White as Acting Editor.

The establishment of a series of rules for publication.

The vote of the Council to secure photographs of past presidents of the Academy, to be hung in the Library.

The vote of the Council to extend their thanks to Professor Kemp for his valuable services as Chairman of the Exhibition.

The vote of the Council to send the thanks of the Academy to President Morris K. Jesup for his courtesy and kindness in allowing us to use the Museum for the Annual Exhibition, and through President Jesup to the employees of the Museum, for their cordial assistance and good will.

The Secretary also announced that Professor Henry F. Osborn had been made a Life Member of the Academy.

The following candidates for resident membership, approved by the Council, were duly elected :

W. J. Gies, Ph.D., 437 West 59th Street.

Charles Henry Davis, 99 Cedar Street.

RICHARD E. DODGE,
Recording Secretary.

SECTION OF ASTRONOMY, PHYSICS AND CHEMISTRY.

MAY 7, 1900.

Section met at 8:30 P. M., Prof. Wm. Hallock presiding.

The minutes of the last meeting of Section were read and approved.

The following program was then offered.

Bergen Davis, THE BERNOULLI EFFECT IN STATIONARY SOUND WAVES.

R. W. Wood, COLOR PHOTOGRAPHS AND SOUND WAVE PHOTOGRAPHS, EXHIBITED BY PROFESSOR HALLOCK.

SUMMARY OF PAPERS.

The experiments described by Mr. **Davis** were in three groups, those with a sound wave anemometer, those with the use of empty gelatine medicine capsules instead of cork dust to show the Kundt figures, and those concerning the longitudinal motion of a cylinder closed at one end, across the stream lines in a stationary sound wave.

The stationary sound wave was that produced by a stopped organ pipe, provided with a glass panel for observation, when it was sounding its first overtone. A thin rubber diaphragm near the central node prevented air currents due to the blowing of the pipe. The cups of the miniature anemometer were made by

dividing No. 2 gelatine capsules longitudinally so as to form half cylinders and mounting them on card-board arms, the anemometer rotated with ten revolutions per second in the loop of the wave and came nearly to rest in the node. The rate of revolution at various positions along the wave varied approximately according to a sine curve. The maximum amplitude of the wave as calculated from the above rate was 0.57 cm.

The Kundt's figure experiment was performed by emptying a box of No. 5 gelatine capsules into the middle of the loop. They arranged themselves in rows across the pipe. Each capsule attracted its neighbor at the ends and repelled it at the sides. The experiment is quite striking.

The motion of a cylinder perpendicularly to the stream lines was obtained by using a capsule from which the cap had been removed. Such a capsule moved in the direction of the closed end with considerable force. This was also shown by making a small mill with a capsule at the end of each of four card-board arms. The rates of revolution in various parts of the wave made, when plotted, nearly a sine curve. The force acting normally to the closed ends of the cylinders was measured with a torsion balance. The square roots of the torsion deflection gave when plotted an approximate sine curve. The experiment was performed in air, illuminating gas, carbon dioxide, and hydrogen. The torsion deflections were directly proportioned to the densities of the gases. Prof. William Hallock first suggested the cause of this effect, showing that it was due to the principle of Bernoulli, that a gas in action is less dense than the same gas at rest. The vibrating air has considerable velocity while the air within the cylinders is nearly at rest. The force is due to the difference of density on the two sides of the closed end of the cylinder. The author used this principle to determine the amplitude of vibration. Prof. R. S. Woodward assisted him in applying the proper hydrodynamical principles, and he calculated that the change in density was such as to give a pressure of 21 dynes per square centimeter, while the amplitude was 0.33 cm. This agrees closely with the value obtained with the sound wave anemometer.

Professor **Hallock** exhibited some color photographs and some sound wave photographs taken by Prof. R. W. Wood, of the University of Wisconsin.

WM. S. DAY,
Secretary.

SECTION OF BIOLOGY.

MAY 14, 1900.

Section met at 8:20 P. M., Professor F. S. Lee presiding.

The minutes of the last meeting of the Section were read and approved.

The name of one candidate for resident membership was read and referred to the Council according to the By-Laws.

The following program was then offered :

J. E. Kirkwood and **W. J. Gies**, SOME CHEMICAL NOTES ON THE COMPOSITION OF THE COCOANUT.

Frederic S. Lee and **O. O. Harrold**, THE SIGNIFICANCE OF CARBOHYDRATES IN MUSCLE.

SUMMARY OF PAPERS.

The authors of the first paper have carried on qualitative work on the ungerminated nut, preparatory to a study of the digestive processes during germination. The chief constituents are cellulose and fat. Some soluble carbohydrate is present, besides globulin and proteose, but no albumin or pepton. Only amylolytic ferments have so far been found. The milk of the nut is normally acid, probably due to acid phosphate. It contains an earthy phosphate, reduces Fehling's solution, sours on standing, and acquires much the odor and physical appearance of soured cow's milk. It shows only small quantities of proteid and fat.

The meat of the average nut contains from two to three grains of globulin, which may be obtained in crystalline form. The authors have made three preparations by the usual methods. The nitrogen averages for these were 17.91%, 17.81%, 17.68%. The ash for the same, 0.13%, 0.41%, 1.05%.

From the meat of twelve nuts it was possible to separate a little more than three grains of proteose by the usual method. The average of three closely agreeing determinations of nitrogen was 18.57%; of the ash it was 1.71%.

The quantitative relationships of these and other constituents will be subjects of combined investigation.

Dr. **Curtis** drew attention to the irritation of the mucous membrane of the bladder and urethra caused by drinking too freely of cocoanut milk. Dr. **Gies** in answer to a question stated that the food content of the cocoanut is small.

The second paper was a continuation of the senior author's study of the nature and causes of muscle fatigue. Of the two supposed causes of fatigue, loss of substance necessary to contraction and poisoning by so-called fatigue products, the present work deals with the former. It is well known that the drug phlorhizin causes the removal of the carbohydrates from an organism to which it is administered. The authors find that it induces decided evidences of fatigue in the muscles of fasting cats. A well phlorhizinized muscle is comparable to a normal muscle in the late stages of fatigue. This effect seems to be due not to a specific action of the drug on the protoplasm of the muscle cells, but to the loss of carbohydrate from the muscle. This conclusion is rendered probable by the fact that when an animal has been put well under the influence of phlorhizin, the administration of sugar (dextrose) counteracts the effect of the drug, removes the evidences of fatigue and restores the muscle. It seems probable that the loss of carbohydrate is an important factor in the early stages of muscle fatigue.

Incidentally some observations on rigor mortis have been made. A muscle well under the influence of phlorhizin may begin to go into rigor five minutes after death and rigor is complete very early. This confirms the conclusions of others that there is a close connection between rigor and carbohydrate. A muscle irrigated with dextrose is capable of giving fully as many contractions as, or even more than a normal muscle without dextrose.

The election of sectional officers resulted in the election of

Prof. C. L. Bristol, of New York University, as Chairman, and Prof. F. E. Lloyd, of Teachers College, as Secretary for the ensuing year.

FRANCIS E. LLOYD,
Secretary.

SECTION OF GEOLOGY AND MINERALOGY.

MAY 21, 1900.

Section met at 8:15 P. M., Dr. Alexis A. Julien presiding.

The minutes of the last meeting of Section were read and approved.

The following program was offered :

George I. Finlay, A NEW OCCURRENCE OF NEPHALINE-SYENITE AND ASSOCIATED DIKES IN THE STATE OF TAMAULIPAS, MEXICO, WITH A REVIEW OF THE DISTRIBUTION OF THESE ROCKS IN NORTH AMERICA.

Benjamin F. Hill, A CONTRIBUTION TO THE GEOLOGY OF A PART OF SONORA, MEXICO.

SUMMARY OF PAPERS.

The rocks described by Mr. **Finlay** were sent by Mr. E. D. Self to Professor Kemp of Columbia University. The nepheline-syenite is a very light colored rock, containing, besides abundant nepheline and anorthoclase, small patches of the dark colored silicates. Under the microscope these are seen to be ægerine-augite intergrown with hornblende, and accompanied by magnetite and apatite. Titanite is abundant, with the faces (1-2-3) well developed and some zircon occurs. The tinguaitite associated with this syenite is a holocrystalline porphyritic dike rock with large phenocrysts of orthoclase, twinned on the Carlsbad law, tabular in habit, parallel to the clinopinicoïd. The ground mass, which gives the rock an even, dark green color, consists of a felt of tiny blades of ægerine and orthoclase. The ægerines are at times grouped together in bundles around small patches of biotite.

Mr. Finlay then briefly discussed the distribution of similar rocks in the various portions of the United States, and exhibited a very instructive series of comparative charts of the chemical composition of the rocks examined and those of allied groups, the charts being constructed on the principles of the graphic method devised by Professor Hobbs, as worked out by Mr. Finlay.

The second paper, that of Mr. Hill, also treated of Mexican rocks, and the same geographical maps were employed to illustrate both papers. Little has been written about the coal bearing rocks and their associated eruptives in the State of Sonora, Mexico. The work done by Professor Dumble and his associates has thrown considerable light on some of the problems.

In the district investigated are representatives of nearly all the formations from the Archæan granites to the Quarternary sands and gravels. The most important division, however, is the Triassic. The slates, sandstones, quartzites, etc., with coal seams, make up the lower or Bananca division of the Triassic, while an immense series of associated eruptives, including andesites, dacites, tuffs, andesitic conglomerates, etc., is considered the upper division. To the series of eruptives the name of Lista Blanca has been given. The Lista Blanca has hitherto been considered post-Cretaceous.

In addition to the pre-Cretaceous eruptives, there are numerous intrusives and flows of diorites, rhyolite and basalt, and in one instance, trachite. It is probable that these are mostly of Tertiary age. The diorites exert a very noticeable effect on the formation of the ore bodies of the region.

Specimens of all the eruptives were brought to New York and studied by Mr. Hill in thin section under the microscope. A series of chemical analyses of the type rocks was made and a very clear relation established between the magmas of the different flows. The remainder of the paper dealt with details of the petrographic characteristics of the rocks.

Both papers were discussed by Professor Stevenson, Professor Kemp, Dr. Julien, and Dr. White.

THEODORE G. WHITE,
Secretary.

SECTION OF ANTHROPOLOGY AND PSYCHOLOGY.

MAY 28, 1900.

Section met at 8:30 P. M., Prof. J. McK. Cattell presiding.

The minutes of the last meeting of Section were read and approved.

The following program was then offered:

Dr. **G. B. Germann**, THE ACQUIREMENT OF MOTOR HABITS.

Dr. **C. H. Judd**, STUDIES IN VOCAL EXPRESSION.

SUMMARY OF PAPERS.

The first paper reported some experiments in which the author measured the degree of perfection attained in rapid naming of one hundred color squares arranged in regular order, by the time required to read the whole series. Results were presented for the rapidity of reading at different stages of practice and after different intervals of discontinuance of practice.

The second paper reported changes in pitch during the articulation of single words. The pitch was determined by means of enlarged records of diaphragm vibrations which were compared with the tracings made by a standard tuning fork. Twenty records were reported. In general the accented syllable was higher in pitch than the unaccented syllables, though this was not true in such words as *abhorrent* and *abnormal*. The final syllable in the twenty records showed a very general tendency to fall off in pitch. The amount of change in such words as *educing* and *illusion* will appear from some cases of the former. The three syllables were as follows, case I, 161, 244, 171 (end of the syllable being at 131); case II, 157, 265, 185 (end of syllable 125); case III, 172, 248, 166 (end of syllable 123). Other records did not show such marked changes. One of the word abasement is as follows: 103, 130, 140.

CHAS. H. JUDD,
Secretary.

BUSINESS MEETING.

OCTOBER 1, 1900.

Academy met at 8:15 P. M., President Woodward presiding.

The minutes of the last business meeting were read and approved.

The Secretary reported from the Council as follows :

The resignation of Mr. Gilbert van Ingen as Editor, and the extension on the part of the Council of a cordial vote of thanks to Mr. van Ingen for his successful services as Editor.

The adoption of a time limit for all papers presented before the Academy, said time limit to be printed on the announcements in each case.

The following Candidate for resident membership, approved by the Council, was duly elected :

Richard H. Cunningham, M.D., 200 West 56th Street.

RICHARD E. DODGE,
Recording Secretary.

SECTION OF ASTRONOMY, PHYSICS, AND
CHEMISTRY.

OCTOBER 1, 1900.

Section met at 8:35 P. M., Prof. Wm. Hallock presiding.

The minutes of the last meeting of Section were read and approved.

The following program was then offered :

E. E. von Nardroff, ON THE APPLICATION OF FIZEAU'S METHOD TO THE DETERMINATION OF THE VELOCITY OF SOUND. (Illustrated.)

J. K. Rees, SCIENTIFIC INSTRUMENTS AT THE PARIS EXPOSITION. (Informal report.)

W. Hallock, A PECULIAR LIGHTNING DISCHARGE.

SUMMARY OF PAPERS.

Professor **von Nardroff** used as a source of sound a very shrill whistle giving sound of a short wave length beyond the limits of

hearing. He overcame the effect of irregular disturbing reflected and diffracted waves by using sound of considerable intensity and a flame only slightly sensitive. The sound after passing between the teeth of a rapidly revolving wheel, fell on a concave spherical mirror made of wood some distance away, and was reflected back through the teeth at the opposite end of a diameter of the wheel, and came to a focus on a sensitive flame just behind the wheel. The author gave a neat demonstration of the working of the apparatus and showed with great ease how with increasing speed of the revolving wheel the flame was alternately shielded from and exposed to the sound. The slightest disturbance of the adjustment of the mirror threw the flame away from the mirror in a marked manner. He stated that the method could probably not be used to compete with other accurate methods heretofore employed, but it supplied a beautiful illustration of Fizeau's method of measuring the velocity of light.

Prof. **J. K. Rees** gave an interesting account of some of the scientific instruments at the Paris Exposition. The great telescope was not finished, although this fact was not yet generally known, and it was impossible to tell yet whether it was to be a success or not. The German exhibit was superb. The Germans had a method, which ought to have been generally adopted, of arranging the instruments with one kind by the different makers in one case, instead of a complete line by each maker in a case by itself. An ingenious modification of Foucault's pendulum was seen at the Paris observatory. It was only one meter long, but it showed the fact of the rotation of the earth after the lapse of fifteen seconds.

Professor **Hallock** described a peculiar lightning discharge he had observed at Lake Champlain. The flash came unexpectedly from a cloud about two miles from where the main shower was falling. It struck on a mass of rock, and on examining this it was found that instead of there being one or a few places where the lightning had struck, it was covered with innumerable little spots, each one indicating where a part of the flash had struck.

WM. S. DAY,

Secretary.

SECTION OF BIOLOGY.

OCTOBER 8, 1900.

Section met at 8:15 P. M., Prof. C. L. Bristol presiding.

The minutes of the last meeting of Section were read and approved.

The evening was devoted to **REPORTS OF SUMMER WORK BY MEMBERS OF SECTION.**

SUMMARY OF PAPERS.

Prof. **E. B. Wilson** reported that he spent the summer at Beaufort, N. C., where he prosecuted experimental researches upon the eggs of *Toxopneustes*. Loco's experiments upon the eggs of *arbacia* were confirmed, and further facts of great interest were determined. Later in the season Professor Wilson visited Woods Holl, Mass., Mt. Desert, Me., and the Bay of Fundy. He drew attention to the very great difference between the Beaufort and Bay of Fundy faunas. The transparent pelagic annelid was collected in the latter locality.

Dr. **D. T. MacDougal** spent the summer in studying the flora of Priest Lake, which stands at an elevation of 3,000 feet in northern Idaho. He was especially concerned in studying the effect of air temperatures on the distribution of plants.

Prof. **H. F. Osborn** visited the British Museum and the Museum of Comparative Anatomy in the Jardin des Plantes, Paris. The latter has, under the hand of Dr. Filhol, reached a high degree of effectiveness. At the British Museum Professor Osborn examined the remains of the new Patagonian sloth *Neomylodon*, a form said by Ameghino to be still extant, though by some claimed to be extinct.

Mr. **F. B. Sumner** gave an account of experiments carried on at the Marine Laboratory at Naples. The work of Mr. Sumner was directed towards determining the validity of his confluence theory of the origin of the embryo in fishes. The results are regarded as confirmatory.

The work in the Bermuda Islands carried on in previous

summers by the expeditions from the New York University under the direction of Professor Bristol was continued this summer. Mr. **F. O. Waite** was this year a member of the party, and reported the finding of much valuable and interesting material not heretofore collected.

Dr. **M. A. Howe** also worked in the Bermudas during the first half of the summer, going later to Edgartown, Marthas Vineyard, and to Sequin Island, Maine. He was especially concerned with the collection of marine algæ. Dr. Howe reported the collection of a large number of algæ, and described the general floral features of the islands.

Dr. **H. E. Crampton** stated that the summer session at Woods Holl had been a successful one.

Mr. **M. A. Bigelow**, while at Woods Holl, confirmed his results on *Lepas* and added a number of new observations. He, with Dr. Crampton, carried on a study of the ponds along the southern shore of Marthas Vineyard, with a view to studying the variation in their fauna.

Prof. **F. E. Lloyd** spent six weeks in company with Prof. S. M. Tracy in a preliminary study of the flora of the Mississippi sound, islands, and delta. A full series of plants was collected. Professor Lloyd described the leading features of the vegetation of that region.

FRANCIS E. LLOYD,
Secretary.

SECTION OF GEOLOGY AND MINERALOGY.

OCTOBER 15, 1900.

Section met at 8:15 P. M., Dr. A. A. Julien presiding.

The minutes of the last meeting of Section were read and approved.

The names of two candidates for resident membership were read and referred to the Council according to the By-Laws.

The following program was then offered:

Gilbert van Ingen, PALEOZOIC FAUNAS OF NORTHWESTERN NEW JERSEY.

Theodore G. White, THE GLENS FALLS, N. Y. SECTION OF THE LOWER ORDOVICIAN.

Henry S. Washington, THE ROCKS OF LAKE WINNEPESAUKEE, N. H.

Daniel S. Martin, MINERALS FOUND AT HADDAM, MAINE.

Alexis A. Julien, THE GEOLOGY OF CENTRAL CAPE COD.

Richard E. Dodge, PHYSIOGRAPHY OF THE REGION OF THE COLORADO CAÑON.

Also notes by **J. J. Stevenson** and **E. O. Hovey**.

SUMMARY OF PAPERS.

Mr. **van Ingen** described the work of the party belonging to the Geological Survey of New Jersey, which, during the past two summers has been engaged in tracing the outcrops of the Paleozoic formations, and collecting fossils. Of this party, Mr. Kümmel, the assistant State geologist, traces the boundaries and works out the tectonics, while Dr. Weller, of the University of Chicago, collects fossils at localities indicated by Mr. Kümmel. During July, Mr. van Ingen spent a week with this party in the field at Newton. Newton is situated on the shales of the Trenton Group, there extensively quarried for slates. To the east is a low ridge of limestone which presents the same appearance as the Barnegat limestone along the Hudson river.

The upper part of this limestone has yielded trilobites, probably *Dikellocephalus*, indicating that this portion is of upper Cambrian age. At other localities a trilobite described by Weller as *Lios-tracus Jerseyensis*, shows that the rock there is also Cambrian, probably of the middle or upper division. In the vicinity of Franklin Furnace good specimens of *Olenellus cf. thompsoni* were found at localities described by Foerste. Further to the east of Newton, on the other side of the Cambrian ridge, is a wide belt of Ordovician rocks, Trenton limestone overlaid by a thick series of shales. The limestone contains the typical Trenton fauna, *Rafinesquina*, *Plectambonites*, *Pterygometopus*, etc., and is very like that found at Rosetown, Ulster county, and at Rochdale, Dutchess county, N. Y. The shale has few fossiliferous beds, but occasionally one of the more sandy layers contains *Dal-*

manella testudinaria, *Plectambonites* and *Rafinesquina*, the same combination found in the Hudson shales at Poughkeepsie and at Rondout. At one locality was found a fauna with *Ampyx* and *Harpes*. In eastern New York these genera of trilobites are found only in the Chazy limestone, and the discovery is of great interest in that it indicates the presence of this formation at a distance of almost 250 miles south of what has hitherto been recognized as its southern limit. Further to the northwest, along the Delaware river, were found the Silurian and lower Devonian formations. The finest section is seen in the face of the cliff of the old Nearpass quarry, about five miles south of Tri-States, where all the formations from the upper Ordovician to the Esopus shale of the lower Devonian appear, with numerous fossils. At Otisville the Shawangunk grit is finely exposed in a large quarry. All the evidence at hand points to the conclusion that this formation, of a thickness of at least a thousand feet, was formed as a flood plain deposit. Its characteristics, except color, are the same as the New Jersey and Connecticut valley Triassic sandstones. Ripple-marks, sun-cracks, cross-bedding, channel-fillings, etc., are abundant. In the railroad cut west of Otisville the grit lies upon the Hudson shales, with coincident dip. On the contact there occurs a few inches of clay, which next the shale is quite free of pebbles, while next the grit it is filled with quartz pebbles. This was interpreted to be residual clay caused by the decomposition of the shale, through subaërial agencies, before it became covered by the grit. The old notions regarding rock-formation required the presence of a body of water in which the sediments might be deposited. Several of the geological subdivisions showed characters which would not have been present had these formations been laid down under water, for this mode of origin results in a sorting of the rock-forming materials, and no sorting is detected in these grits. Flood plain deposits are very irregular, both as to stratification and sorting of materials, and these features are well exhibited in the grits. Other formations that are probably flood-plain deposits are parts of the Potsdam sandstone in eastern New York, the Medina sandstone, the sandstones of the Cats-

kill group, and many of the sandstones of the coal measures of Pennsylvania and the Mississippi valley, in fact the greater part of the "barren Measures."

Dr. **White** described his recent detailed study of the faunas of successive strata at Glens Falls, and their relations to similar studies along the lake Champlain valley to the north, and the Mohawk and Black River valleys to the west. The section forms a low anticline along the shore of the Hudson. At the base is seen the Calciferous sandrock, containing *Ophileta* and fucoids. Conformable upon this is a layer a few inches thick, of barren black shale, which is very much crushed, and then the same beds of the *ostracod-Liperditia*, and their associated corals and peculiar forms of *Strophomena*, as have been found in the lowest Black River zones on Button Island in Lake Champlain. The zones of *Parastrophia* and *Triplexia* occurring near this portion of the series in localities to the north and west, were not found here. The succeeding coral beds of *Columnaria* were well developed. Above these are the cross bedded gray beds, which in some recent reports have been considered to represent the Birdseye limestone, which seems to be lacking in this locality, unless met with at this unexpectedly high position. The upper portion of the section, which is of lower Trenton age, shows no unusual forms. The tendency of the lowest and uppermost portions of the Ordovician sections in the region to wear away and appear wanting, owing to their prevailing softness, was commented on.

The remarks of Dr. **Washington** were in the nature of a preliminary report on work done by Professor Pirsson and himself on Mount Belknap and Red Hill, near Lake Winnebepesaukee, N. H. The rocks of Mount Belknap are shown to be prominently a quite uniform alkali syenite, which is cut by many dikes of camptonite and allied rocks, and of bostonites, aptites, and syenite porphyries. These dikes also cut the surrounding porphyritic gneiss. At one place, near the border, is a mass of basic hornblende-gabbro, with large, poikilitic phenocrysts of brown hornblende. A syenite breccia also occurs. At Red Hill similar syenite, formerly described by W. S. Bayley, occurs on

the summit, while toward the periphery, nepheline appears as a constituent, and a true foyaite is developed. The mass is also cut by dikes, both camptonitic and syenitic. The region is to form the subject of a petrographic study by the two geologists in the near future.

Professor **Martin** described a visit which he paid during the summer to the noted mineral locality at Haddam, Maine, and the manner in which the choicest specimens occur there, in veins of albitic pegmatite, with tourmaline, muscovite, and quartz along the contact with the wall of gneiss. The mica plates along the contact are often two feet in diameter.

Dr. **Julien** briefly reviewed the observations and opinions of Mitchell, Davis, Shaler, and others on the geology of Cape Ann, with especial reference to the district from Chatham to Yarmouth. In the stratified deposits of sands and gravels which underlie the plain south of the morainal "backbone" of the cape, the more frequent intercallation of clays was pointed out, and their occasional disturbance and flexure. Striated pebbles, although much water worn, are quite largely interspersed. The discovery of true glacial silt at some depth, in one locality, indicates that the ice sheet rested there; instead of floating. The kettle-shaped hollows and pond basins were shown by the speaker to be largely connected with the damming of surface streams, and some observations on the pre-glacial drainage valleys and topography were discussed. The identification of certain transported fragments of quartz-porphyry with outcrops of the same near Marblehead indicate a pre-glacial movement from N.N.W. to S.S.E. To the fifteen changes of level which have been recorded, a final small elevation probably should be added, judging from the low terrace along this part of the coast. Examples of the faceted pebbles were exhibited and provoked considerable discussion among those present, as to the origin of such pebbles.

Professor **Dodge** recounted his pleasure in visiting the region of the Grand Cañon, in company with a party during the past summer, and in finding the physiography so graphically illustrated in the drawings in Powell's reports to be a most faithful

and non-diagrammatic portrayal of the features themselves. He then described the striking examples of gigantic geo-physical results seen in the Great Kaibab monocline. He also described the appearance of the great basin of "Lake Bonneville."

Remarks on foreign localities visited by them during the last summer were made by Professor **Stevenson** and Dr. **Hovey**.

THEODORE G. WHITE,
Secretary.

SECTION OF ANTHROPOLOGY AND PSYCHOLOGY.

OCTOBER 22, 1900.

Section met at 8:15 P. M., Prof. J. McK. Cattell presiding.

The evening was devoted to reports of summer work by Dr. **Franz Boas**, Dr. **Livingston Farrand**, Dr. **A. Hrdlicka**, Dr. **F. W. Putnam** and Prof. **R. E. Dodge**.

SUMMARY OF PAPERS.

The papers gave accounts of anthropological investigations made during the summer in the Vancouver Islands, Oregon, New Mexico, Arizona and California.

CHARLES H. JUDD,
Secretary.

BUSINESS MEETING.

NOVEMBER 5, 1900.

Academy met at 8:15 P. M., Professor Hallock presiding.

The minutes of the last business meeting were read and approved.

The Secretary reported from the Council as follows:

The appointment by the Council of Prof. Charles Lane Poor as Editor of the Academy publications, in place of Mr. van Ingen, resigned.

That the Council had voted to formulate a budget for the ensuing fiscal year, and to recommend to the succeeding Council that there be no annual reception in 1901.

The following candidates for resident membership, approved by the Council, were duly elected: Prof. Charles Lane Poor, 4 East 48th street; Riccardo Bertelli, 409-415 Forsyth street.

RICHARD E. DODGE,
Recording Secretary.

SECTION OF ASTRONOMY, PHYSICS AND CHEMISTRY.

NOVEMBER 5, 1900.

Section met at 8:30 P. M., Prof. Wm. Hallock presiding.

The minutes of the last meeting of Section were read and approved.

The following program was offered:

F. L. Tufts, FLOW OF AIR AT DIFFERENT PRESSURES THROUGH GRANULAR MATERIALS.

SUMMARY OF PAPER.

The experiments described by Mr. **Tufts** were made in connection with others on the transmission of sound through the same materials. Three different materials were experimented on, composed of lead shot of three sizes, the diameters of the shot being respectively 4.37 mm., 2.79 mm., and 1.22 mm. The shot was placed in a tube and air was forced through at different pressures, the rate of flow of air being measured by a gas meter, and the pressure differences by a water manometer. It was found that for a given size of shot and a given pressure gradient, the rate of flow was independent of the length of the column of shot through which the air flowed. The rate of flow, however, in the three cases experimented with did not increase as rapidly as the pressure gradient. This was more noticeable with the coarse shot than with the finer. For pressure gradients of about 0.01 cm. water pressure per centimeter of length of material, the rate of flow through the coarsest shot was ten times the rate through the finest, while for a pressure gradient fifty times as great, the rate of flow was a little less than three times as great in the

coarsest as in the finest. With each size of shot the space occupied by air was about 39 per cent. of the total space occupied by the shot.

WM. S. DAY,
Secretary.

SECTION OF BIOLOGY.

NOVEMBER 12, 1900.

Section met at 8:15 P. M., Prof. C. L. Bristol presiding.

The minutes of the last meeting of Section were read and approved.

The name of one candidate for resident membership was read and referred to the Council according to the By-Laws.

The following program was then offered:

P. O. Waite, THE BERMUDA TOAD.

H. F. Osborn, THE PHYLOGENY OF THE RHINOCEROSES IN EUROPE.

H. L. Clark, FURTHER NOTES ON BERMUDA ECHINODERMS.

SUMMARY OF PAPERS.

Bufo agua was introduced into the Bermudas from British Guiana about 1885, and is now common throughout the colony. This is the largest Anuran known, specimens 155 mm. in length having been taken in Bermuda. It breeds there in brackish marshes; elsewhere in fresh-water pools. The spawning time in Bermuda is not known, but young were found in July.

Bermuda is the northern limit of its range, which includes many of the Lesser Antilles (introduced), southern Mexico, Central America, and South America south to Ecuador on the west coast, and to Argentina (38° S.) on the east coast.

There is a general belief that it is venomous. The secretion of its cutaneous glands causes ulceration of mucous membrane, and opaqueness of the cornea. Subcutaneous injections cause convulsions, followed by death in frog, fowls and dog.

During the discussion which followed, the facts were brought out that this toad is a clumsy animal, jumps high rather than

far, and is very active at night. It is destructive to insects, and is a pest in Bermuda, where it attacks cats and dogs fatally.

Professor **Osborn** reported a continuation of his investigations upon the PHYLOGENY OF THE RHINOCEROSSES OF EUROPE. These animals appear to fall under the law of early divergence, and to constitute at least six separate series or phyla which, so far as known at present, are not genetically related to each other, but undergo a more or less parallel development as follows: *Diceratheriinae*, *Aceratheriinae*, *Brachypodinae*, *Ceratorhinae*, *Atelodinae*, *Rhinocerotinae*. The chief criteria in distinguishing rhinoceroses are the proportions of the skull, whether dolichocephalic or brachycephalic, the proportions of the limb in reference to cursorial or aquatic habits and the position of the horns; subsidiary to these features are the types of tooth structure. The origin of the rhinoceroses is still obscure, although it appears to be possible to derive the *Diceratheriinae* from certain Eocene Hyracodontidæ. This study will be published in full in the *Bulletin of the American Museum of Natural History*, and it constitutes a part of the continuation of the author's memoir on the extinct rhinoceroses.

Mr. H. L. **Clark's** paper was read by Professor C. L. Bristol. In this paper Mr. Clark gave an account of the Echinoderms collected by the party of zoölogists from the New York University in the summer of 1899, together with a summary of his own observations during April of that year. It is to be concluded from an abundance of observations that the distinctions hitherto thought to exist between *Stichopus diaboli* and *Acanthomela* are not to be regarded as valid, and the forms described under these names must be referred to *S. Mobii*. Twenty-nine species are listed.

Mr. **Waite** called attention to the fact that the madreporic body in *Asterias tenuispina* branches forming 1-4 bodies in each animal, thereby making orientation difficult.

FRANCIS E. LLOYD,
Secretary.

SECTION OF GEOLOGY AND MINERALOGY.

NOVEMBER 19, 1900.

Section met at 8:15 P. M., Dr. A. A. Julien presiding.

The following program was offered:

J. F. Kemp, RECENT PROGRESS IN INVESTIGATION OF THE GEOLOGY OF THE ADIRONDACK REGION. Illustrated with specimens and diagrams.

A. A. Julien, NOTES ON THE ORIGIN OF THE PEGMATITES FROM MANHATTAN ISLAND AND FROM NORTH CAROLINA. Illustrated with specimens and diagrams.

SUMMARY OF PAPERS.

Professor **Kemp** outlined the area of crystalline rocks in the northern part of New York State and illustrated its distribution by means of maps. Three principal classes of rocks are present. First, those certainly igneous in their nature, including the labradorite rocks, the basic gabbros and the trap dikes. Second, those certainly sedimentary, best illustrated by the crystalline limestones. Third, great areas of gneiss of uncertain origin. Regarding the first class, we now know quite accurately their distribution and the results obtained by the speaker, by H. P. Cushing and C. H. Smyth were briefly reviewed. A short description was given of the augite-syenite first discovered by Cushing near Loon Lake, but which has since been found to be widely distributed in the regions further south. Some notes were also given regarding the ages of the trap dikes and their distribution.

Recent additions to the knowledge of the sedimentary rocks, involve the recognition of quite large amounts of quartzites in a considerable number of new localities. Besides these, small beds of limestone have been discovered in the southern areas, especially in Warren and Washington counties, which are thoroughly interstratified with the gneisses and which leave no escape from concluding that the gneisses are also sedimentary in their origin and that a regularly stratified series of rocks is present.

This conclusion removes many of the gneisses from the group of uncertainties.

The speaker also briefly enumerated the discovery of new outliers of Cambrian and Ordovician strata in the midst of the crystallines; taking up the small but early discovered area at Wellstown, Hamilton county, he added some new and important facts and interpretations. He also noted the distribution of the glacial striations throughout the eastern mountains and noted their nearly uniform bearing to the northeast. In conclusion, he described the physiography as being due chiefly to a series of faulted blocks which afford a very characteristic saw-toothed sky-line.

Dr. Julien opened his paper with a discussion of several of the later theories of the origin of pegmatites in common acceptance. That of igneous intrusion, urged by Brögger, seems to cover facts which are not met with in the pegmatites of Manhattan Island, western Massachusetts nor western North Carolina. Brögger's theory and the pneumatolytic theory of Lehmann, Williams and Crosby, explain but imperfectly the most important occurrences of pegmatite occurrences in schists, especially evidences of their development *in loco*. Dr. Julien then summarized his own theory of metasomatic aggregation which he originally advanced at the meeting of the American Association for the Advancement of Science in June, 1900. In this he attributed the origin of the pegmatites of Manhattan Island entirely to molecular rearrangement of the material of the schists by the action of mineralizers in the vicinity of lamination planes and of fissures.

After a description of the main features of the pegmatites of Manhattan Island, with the help of specimens and diagrammatic drawings of outcrops and cross-sections, the speaker advanced the following chief conclusions:

1. The existence of a certain series of pegmatite development, at least two, but probably indefinite in number, marked by a succession of intersections. Of these the oldest is by far the most extensive, intercalated among the pliation-seams, and co-incident with the strike. These pliation-seams cut the schists in

all directions and inclinations, but their courses are mostly comprised in the northeast quadrant. A few, which are gathered in partially concentric groups of curved planes, also present their convexity toward the northeast.

2. Every pegmatite occurrence on the Island, without exception, retains more or less structural evidence of having begun its existence as a vein, segregated from a magma or igneo-agueous emulsion. Even the notable dike near 205th Street, crossing the dolomite, retains the vein structure, perfectly in places and imperfectly throughout.

3. Contact-phenomena are confined mainly to the earlier alteration along seams, to projection of veinlets rather than intrusion apophyses, and, at one dolomite intersection, to a thin selvage of phlogopite and tremolite.

4. The vein-structure, often well preserved, presents distinct lamination, correspondent deposits on the two walls, comb-structure, passage from less to more acid minerals toward the centre, and final concentration of minerals of the rarer elements in association with the significant matrix, smoky quartz, along lenticular bands, often near a central suture.

5. Some of the most prominent features, and those by which the simplicity of the problem has been disguised, are the results of pressure upon the original veins through organic movements of the stratum of schists, viz., fissuring, faulting, crushing, shearing with development of mica (aptite), re-fusion and development of new phenocrysts (granite-porphyry), and generation of reaction borders outside of each wall of a vein. When flowage has taken place and some transference of the crushed vein material along the plane of the vein, the appearances of a dike begin. Many of these results may be distinguished along the course of the same vein at intervals of a few yards or rods, but in the most characteristic dikes the vein structure is rarely, if ever, completely obliterated.

Both of the papers presented were discussed by Professor Martin, Dr. Hovey, and others.

THEODORE G. WHITE,
Secretary.

SECTION OF ANTHROPOLOGY AND PSYCHOLOGY.

NOVEMBER 26, 1900.

Section met at 8:15 P. M., Prof. J. McK. Cattell presiding.

The minutes of the last meeting of Section was read and approved.

The name of one candidate for resident membership was read and referred to the Council according to the By-laws.

The following program was then offered :

R. S. Woodworth, PARIS CONGRESS OF PSYCHOLOGY.

Clark Wissler, CORRELATION OF ANTHROPOMETRIC TESTS.

E. L. Thorndike and **R. S. Woodworth**, EFFECTS OF SPECIAL TRAINING ON GENERAL ABILITY.

C. H. Judd, MOVEMENTS OF WRITING.

SUMMARY OF PAPERS.

The report of the Paris Congress presented by Dr. **Woodworth** was more detailed than the published accounts, and also suggested certain questions in regard to the enlargement and control of American representation at similar congresses in the future.

... The paper by Mr. **Wissler** reported some results of a series of mental and physical tests upon students in Columbia and Barnard College. The young women of Barnard College were found to be superior to Columbia freshmen in the tests for time of perception, naming of colors and resistance to pressure ; they were equal to the freshmen in rate of fatigue, perception of weights, sensation areas, perception of size and logical memory ; they were inferior in size of head, strength of hand, reaction time, association time and auditory memory. There is some probability that the young women are superior in perception of pitch and inferior in movement time. With the freshmen who repeated the test in their senior year an improvement was found in all except sensation areas and perception of size, though the difference in some cases is slight. It was also found that the seniors showed a decided tendency to hold the same relative

rank as when freshmen, thus indicating a general advancement of the group during college life. In correlations it appeared that logical memory and length of head are related characteristics, but length of head also correlates with lung capacity and strength of hand. The work has not gone far enough to say which of these has the most weight. Attempts to correlate reaction time and the other tests of quickness gave no results.

Dr. **Thorndike** presented the results of certain experiments on the EFFECTS OF SPECIAL TRAINING ON GENERAL ABILITY. These experiments were performed jointly by Drs. Woodworth and Thorndike. The results of a number of experiments show that when any mental function is trained in connection with certain data, the improvement is not of the function in general. If different data are used there will be less or even no improvement shown. The general theory that the mind equals a number of special abilities, independent to a degree hitherto unsuspected, was supported further by the great variability in our judgments of slightly differing magnitudes.

The fourth paper was on the Movements of Writing. These movements were analyzed by means of tracers attached to the hand, back of the fingers, and to the arm, back of the wrist. The written words give the sum of all the movements of arm, hand, and fingers. The hand tracer gives only arm and hand movements, omitting finger movements. The arm tracer shows arm movements only. The general result of this analysis shows that the arm carries the hand forward and participates only to a very small degree in the formation of the letters and words. The gross movements, especially those which are upward and forward, in the formation of the letters, are performed by the hand. All the finer curves and more delicate lines of the letters are formed by the fingers. The muscular coördinations of the different individuals tested, while differing greatly in detail characteristics, all show this general type of movement. No results were presented from subjects who write naturally with a full arm movement.

CHARLES H. JUDD,
Secretary.

BUSINESS MEETING.

DECEMBER 3, 1900.

Academy met at 8:15 P. M., Professor Wm. Hallock presiding.

The minutes of the last business meeting were read and approved.

The Secretary reported from the Council as follows :

That Professor Poor had taken active charge of the editorial work of the Academy ; also that the Council had appointed a committee to secure, if possible, a publication fund.

The following Candidates for resident membership, approved by the Council, were duly elected :

O. P. Hay, American Museum of Natural History.

E. O. Hovey, American Museum of Natural History.

(Dr. Hovey to become a life member.)

RICHARD E. DODGE,
Recording Secretary.

ASTRONOMY, PHYSICS AND CHEMISTRY.

DECEMBER 3, 1900.

Section met at 8:20 P. M., Professor William Hallock presiding.

The minutes of the last meeting of Section were read and approved.

The following program was offered :

E. B. von Nardroff, DETERMINATION OF THE WAVE LENGTH OF SOUND BY THE GRATING METHOD. (Illustrated.)

W. G. Levison, A METHOD OF PHOTOGRAPHING THE ENTIRE CORONA ON ONE PLATE, EMPLOYED AT NEWBERRY, S. C., FOR THE TOTAL SOLAR ECLIPSE OF MAY 23, 1900. (Illustrated.)

W. G. Levison, THE ACTION OF CANADA BALSAM ON PHOTOGRAPHIC GELATINE PLATES.

SUMMARY OF PAPERS.

As a source of sound the author of the first paper used a miniature steam whistle made of brass and operated by a current

of air from a tank of compressed air. The sound produced in this way was inaudible on account of its high pitch, the wave length being only about three-eighths of an inch. The whistle was placed at one of the conjugate foci of a parabolic metallic mirror, a sensitive flame being placed at the other conjugate focus. A transmission grating made of wood and resembling somewhat a portion of a picket fence was then interposed in the path of the reflected sound waves, and it was found that when the sensitive flame was shifted to one side, as many as four positions of maximum effect were obtained on each side of the central beam of sound. With this apparatus, the wave length of sound, when the waves were short like those used, could be measured within one per cent.

Mr. **Levinson's** method consisted in the use of a specially constructed color screen most dense at the centre and fading off to clear glass at the edges, which was placed close to the photographic plate. The size and density of the screen was adjusted as nearly as possible so that the image of the inner corona made by a suitable lens fell on the part of the plate covered by the screen while the image of the outer corona passed through the clear glass. The color screen was made from a lens of colored glass with sharp edges, which was cemented into a recess in a plate of clear glass ground to receive it. Two screens were made, one of orange-yellow glass and one of dark greenish-blue glass. In testing these screens at the time of the eclipse, an arrangement of telephoto-lenses was used, but unfortunately the exposure was not long enough to give any image at all of the outer corona through the clear glass, although a considerable impression of the inner corona was produced through the orange-yellow glass, but none through the bluish-green glass. This should give some idea of the relative actinometric intensity of the light from the inner and from the outer corona.

Mr. **Levinson** also presented a short note on the action of Canada balsam on photographic plates. In making the experiments with color screens he noticed that Canada balsam that had been baked hard, when placed in contact with a sensitive plate, or separated from it by a layer of carefully selected

black paper and allowed to remain a week or more, affected the plate in the same manner as light, the part affected developing black. He verified this effect by a number of experiments. In the author's opinion, this effect seemed likely to be caused by true Becquerel rays, as it passed through the black paper which is perfectly opaque to ordinary light.

WILLIAM S. DAY,
Secretary.

SECTION OF BIOLOGY.

DECEMBER 10, 1900.

Section met at 8:15 P. M., Professor C. L. Bristol presiding.

The minutes of the last meeting of Section were read and approved.

Professor **Lloyd** offered his resignation as Secretary of the Section, because he is soon to leave for Europe on a leave of absence from Teachers College. On the motion of Professor Wilson, seconded by Dr. Calkins, a vote of thanks was tendered to the secretary for his interest in furthering the work of the Section.

The following program was then offered :

G. N. Calkins, SOME INTERESTING PROTOZOA FROM VAN CORTLANDT PARK.

H. E. Crampton, ELIMINATION IN LEPIDOPTERA.

E. B. Wilson, THE CHEMICAL FERTILIZATION OF SEA-URCHIN EGGS.

SUMMARY OF PAPERS.

Four genera of Protozoa which are usually regarded as intermediate forms between the classes of Protozoa were considered. These were: *Nuclearia*, intermediate between the Rhizopoda and the Heliozoa; *Mastigomaba*, intermediate between Mastigophora and the Rhizopoda; *Multicilia*, intermediate between the Mastigophora and Ciliata, and *Actinobolus*, intermediate between the Ciliata and the Suctoria. The method of feeding in the latter form was also described for the first time. All of these

forms, together with 54 other genera and a great many species (100 to 150) were found in the waters of Van Cortlandt Park during the past fall.

The second paper was designed to be the first of a series dealing with the problems of variation and selection in Lepidoptera, and especially in the Saturnid moths. The particular questions here considered are as to the relative variability of eliminated and surviving pupæ and moths of *Philosamia cynthia*, and as to the relative variability of males and females. From a lot of 1,090 cocoons from a restricted locality, 310 living and 632 dead pupæ were obtained, the remainder being shrivelled or abnormal larvæ and pupæ. The living pupæ were compared with an equal number of dead pupæ with reference to certain body-characters (length, length of bust, width, depth, frontal stature and sagittal stature of bust), and to certain characters of a typical organ, the left antenna (length, breadth and stature). It appears that the surviving males are slightly less variable than the eliminated males, and that the surviving females are far less variable. From the living pupæ but 180 perfect moths were obtained. The males were from pupæ which were far less variable than pupæ producing abnormal moths; but the females were from relatively more variable pupæ, though the latter were much less variable than eliminated female pupæ of the preceding group. The paper will be published in full.

Professor **Wilson** presented the results of a study of the phenomena of development in the unfertilized eggs of *Terepneustes* when treated with solutions of magnesium chloride by Loeb's method. The results confirm Loeb's conclusion that the embryos arising from these eggs are produced without fertilization by spermatozoa, conclusive proof being given in the fact that during cleavage the number of chromosomes is half the usual number, namely, 18 instead of 36. The mitotic phenomena differ in many details from those occurring in fertilized eggs, but show a striking general parallelism to them. The asters may be only two in number (cleavage asters), but as a rule there are many other asters (cytasters) that have no connection with the nucleus. Like the nuclear asters, however, the cytas-

ters contain centrosomes and may progressively multiply by division. Cytasters and centrosomes are formed also in enucleated fragments obtained by shaking unfertilized eggs to pieces before treatment by the magnesium solution, and these asters may likewise multiply by division.

These facts seem to leave no doubt of the formation of functional centrosomes *de novo* and independently of the nucleus. Evidence was adduced to show that the asters may operate as centres of cytoplasmic division, independently of the nucleus. It was also shown that the magnesium eggs show numerous gradation in the mitotic process between complete division and partial mitosis.

FRANCIS E. LLOYD,
Secretary.

GEOLOGY AND MINERALOGY.

DECEMBER 17, 1900.

Section met at 8:15 P. M., Dr. A. A. Julien presiding.

The minutes of the last meeting of Section were read and approved.

The following program was offered:

E. O. Hovey, EXHIBITION OF LANTERN SLIDES ILLUSTRATING SOME OF THE QUATERNARY DEPOSITS OF THE HUDSON RIVER VALLEY, AND SOME MISCELLANEOUS SUBJECTS.

D. S. Martin, NOTES ON THE GEOLOGY AND MINERALOGY OF THE VICINITY OF BALTIMORE, MARYLAND.

W. G. Levison, MINERALS FROM THE JONES' FALL QUARRIES, NEAR BALTIMORE, MARYLAND.

SUMMARY OF PAPERS.

Dr. **E. O. Hovey** exhibited several series of slides on geological subjects recently prepared by him for Professor Bickmore. The first series illustrated the clay deposits of the Hudson River Valley, and the process of manufacturing those clays into bricks; the second series comprised the outcrops of the Cortland series

of rocks along the Hudson, the included schists, and the Tompkins Cove Limestone quarries. The third series illustrated the character of the sand dunes of Newburyport and Plum Island,—the dissected drumlin at Great Boar's Head, New Hampshire, and the gneissoid granite with dikes at Isle of Shoals.

The slides were further discussed by Professor Kemp, Dr. Julien, and Dr. Levison.

Professor **Martin** discussed the geology of the Jones' Falls valley, north of Baltimore, Md. The rocks are principally white hornblendic gneiss, cut by pegmatite dikes,—the latter containing many minerals. The crystallines decomposed with great rapidity, forming a reddish soil. Professor Martin also commented on the excellent museum of local geology maintained by the Maryland Academy of Sciences, which illustrates all the formations of the State from the base of the Archean to the Catskill. The use of the term Catskill in describing the rocks called by that name in Maryland was called to question, and was discussed by Drs. Call, Hovey, Julien, Kemp, White, and Professor Stevenson, the latter defining the Catskill as a condition arising at the closing period of the Chemung in certain localities, and not marked by characteristic fossils nor worthy of a position as a division of the geological time scale.

Dr. **Levison** exhibited a number of minerals from the pegmatitic development in the Jones' Falls quarries near Baltimore, Md. Among them were albite, laumontite, garnet, epidote, thulite, and zoisite.

The meeting adjourned at 10 P. M.

THEODORE G. WHITE,
Secretary.