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RECORD OF MEETINGS
OF THE
NEW YORK
ACADEMY OF SCIENCES

JANUARY, 1901, TO DECEMBER, 1901

RICHARD E. DODGE

Recording Secretary

[ANNALS N. Y. ACADEMY OF SCIENCES, No. 5, pp. 85-163, March 4, 1902.]

RECORDS OF MEETINGS
OF THE
NEW YORK ACADEMY OF SCIENCES.

January, 1901, to December, 1901.

RICHARD E. DODGE, *Recording Secretary*.

BUSINESS MEETING.

JANUARY 7, 1901.

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:

That Volume XIII of the Annals would be very shortly completed, the larger part of the manuscript being already in press. Also that the Council had voted, beginning with Volume XIV, of the ANNALS, to send the *Transactions* of the Academy only to all members, but to send the rest of the publications to such members as may signify their desire to receive them, and to take steps to find out the will of the members in reference to this point.

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

RICHARD E. DODGE,
Recording Secretary.

SECTION OF ASTRONOMY, PHYSICS AND
CHEMISTRY.

JANUARY 7, 1901.

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 then offered :

Harold Jacoby, A NEW TELESCOPE FOR PHOTOGRAPHING
THE POLE OF THE HEAVENS. Illustrated.

Geo. B. Pegram, REFLECTION OF LIGHT FROM WHITE SUR-
FACES.

Professor **Jacoby** announced that this plan of photographing the close polar stars had made material progress. A special instrument has been constructed and mounted at the observatory at Helsingfors, Finland. Photographs of the actual instrument in position for use were exhibited. It is planned to make photographs with this instrument in which the close polar stars will trace out "trails" on the plate corresponding to their diurnal motion. The effects of refraction, etc., having been eliminated by computation, it is possible to obtain from such photographs the exact position of the celestial pole among the stars and on the date of observation. The intercomparison of results taken on dates six months apart should furnish a new determination of the constant of aberration, and photographs taken annually throughout a series of years should determine the constant of nutation and ultimately perhaps even that of precession.

The actual observing with the instrument will commence in the spring as soon as the Helsingfors astronomers have finished with the observations of Eros now in progress, and the plates will be sent to Columbia University, New York, for measurements and reductions. An outline of the method to be used, together with a preliminary trial of the same, has already been published by Professor Jacoby under the title "Photographic Researches near the Pole of the Heavens," *Bulletin of*

the Imperial Academy of Sciences of St. Petersburg, 5th Series, Vol. 9, p. 41, 1898, June.

The second paper presented the results of an experimental study of some white surfaces with regard to the relation between the intensity of the reflected ray and the angles of incidence and reflection. It was carried out by means of a special photometer allowing the use of any desired angles of incidence and reflection. Among the surfaces tested were plaster of Paris, several kinds of unglazed paper, compressed powders of several kinds, powders not compressed, but gently smoothed with a metal plate, and finally a surface made by allowing fine plaster dust to settle from suspension in the air on a suitable plate. These surfaces in the order named showed decreasing polarization of the reflected light, and less approach to specular reflection. The fine dust surface showed no polarization and almost no tendency to regular reflection. The results with this surface as shown by sets of curves, follow pretty closely the old Lambert's or cosine law.

$$\text{Intensity} = A \cos i \cos r.$$

with some departure when both angles were very large. With all the other surfaces the departure was very great for angles greater than 70° . Contrary to the results of Mr. Wright (*Phil. Mag.*, Feb., 1900) these experiments were quite in accord with the demand of theory that the intensity of the reflected ray should be expressed as a symmetric function of the angles of incidence and reflection.

WILLIAM S. DAY.

Secretary.

SECTION OF BIOLOGY.

JANUARY 14, 1901.

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

H. B. Torrey, A NEW SPECIES OF *Phoronis*.

J. H. McGregor, CHARACTERS AND RELATIONSHIPS OF THE
BELODONT REPTILES.

F. E. Lloyd, (1) NOTES ON *Chrysoma paucifasciata*. (2) ON
THE OCCURRENCE OF NECTARIES IN *Pteris aquilina*.

Prior to the reading of the minutes, Dr. H. E. Crampton was
elected Secretary of the Section, in place of Professor Lloyd,
resigned.

SUMMARY OF PAPERS.

Mr. **Torrey** described a new species of *Phoronis*, the first that
has been collected on the western coast of America. It is inter-
mediate in its characters between the European and eastern
American species, and those found in Australia and the Philip-
pines. In size it agrees with *P. Buskii*. The lophophore, though
spirally coiled—thus differing from that of the European spe-
cies—is less complex than that of *P. Buskii*, and the tentacles
are fewer in number (200). The longitudinal muscles are stouter
than those of *P. Buskii*, agreeing more nearly with the condition
in *P. architecta* of the east coast. The new species agrees with
the latter species in habit, in the possession of a longitudinal
ciliated ridge in the digestive tract, and in the possible separation
of the sexes.

Dr. **McGregor** presented the results of a recent study of the
Belodonts, a group of fossil reptiles occurring in the Triassic of
Germany and North America. The Belodonts have usually
been regarded as ancestral Crocodiles, though many students of
the group have admitted possible affinities with Rhynchocephalia
and Dinosauria. The material used in the present study, chiefly
from the genera *Mystriosuchus* and *Rhynodon*, yielded some
parts new to science, *e. g.*, the atlas and the clavicle. The pres-
ence of two cervical intercentra and a large clavicle tends to ally
the group more closely to the Rhynchocephalia. The hyoid
apparatus was found to be suspended from the skull as in *Hat-
teria*; and there is strong evidence that the carpals (and prob-
ably also the tarsals) remained cartilaginous throughout life.
Some doubt was expressed regarding the Belodont ancestry of

the Crocodiles, though it was admitted that the Belodonts stand near the Crocodilian stem. The suggestion was made that the Belodonts may belong on or very close to the line of descent of the Ichthyosauria, occupying a position midway between some Permian land-living Rhynchocephalian and the marine Ichthyosauria of the Jurassic. In support of this theory, many structures of the Belodonts were shown to be such as one would expect to find in an ancestor of the Ichthyosauria, *i. g.*, position of nares, elongated premaxillary, bicipital ribs, two or more cervical intercentra, abdominal ribs, form of shoulder-girdle, etc. Some other structures, apparently incompatible with this view, were shown to be in reality not inconsistent with it.

In discussion of Dr. McGregor's paper, Professor **Osborn** emphasized the importance of the Belodonts, and the conflicting nature of the opinions regarding them. Huxley placed them near the crocodiles as evidenced by his choice of the name *Parasuchia* for the group. The palæontologists of the Stuttgart school relate them to the Dinosaurs. Dr. McGregor is the first to bring out the idea of their relationship to the Ichthyosauria, and based as it is upon many new characters described for the first time, the theory is of great interest and importance.

Professor **Lloyd** stated that the chief point of interest in *Chrysoma pauciflosculosa*, a sub-tropical marine form, is in the structure of the leaves. The surface of these is sculptured in the form of a mosaic. This appearance is caused by deep and regularly-arranged involutions of the epidermis. At the bottom of each sulcus are to be found flagellated and glandular hairs, such as have been described by Vesque for the Compositæ. Transverse sections show that each element of the mosaic contains chlorenchyma, which, though packed densely around the edges, forms in the middle a large air-chamber, suggesting in appearance the air-chambers of certain Hepaticæ. The leaf, a bifacial one, is maintained in a vertical position.

In a second paper, Professor **Lloyd** drew attention to the occurrence, in *Pteris aquilina*, of nectaries near the bases of the pinnae. The activity of these glands reaches a maximum during the development of the frond in spring and early summer,

at which time large drops of syrupy nectar exude from the openings, which are modified stomata. The object of the speaker was to call the attention of teachers of general biology to the presence, in a much-used laboratory type, of organs which, though discovered by Francis Darwin in 1877, were very generally overlooked.

In discussion of Professor Lloyd's first paper, Professor **Britton** remarked that the author's results were of value as throwing light upon the vexed question of the relationship of *Chrysoma* to the golden-rods (*Solidago*). The two groups were probably distinct. It was also recalled that the late Dr. Gregory had worked extensively upon the problem, but her full results had never been published.

HENRY E. CRAMPTON,
Secretary.

SECTION OF GEOLOGY AND MINERALOGY.

JANUARY 21, 1901.

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 then offered:

Richard E. Dodge, THE LANDSLIDES OF THE ECHO AND VERNILION CLIFFS.

William Hallock, SOME PECULIAR MINERALOGICAL EFFECTS OF LIGHTNING DISCHARGE.

Alexis A. Julien, A PETROGRAPHIC STUDY OF THE SPECIMENS DESCRIBED BY PROFESSOR HALLOCK.

THEODORE G. WHITE,
Secretary.

SECTION OF ANTHROPOLOGY AND PSYCHOLOGY.

JANUARY 28, 1901.

Section met at 8:15 P. M., Dr. Franz Boas presiding.

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

The following program was then offered :

Dr. A. Hrdlicka, CERTAIN RACIAL CHARACTERISTICS OF THE
BASE OF THE SKULL.

Dr. L. Farrand, THE ALSEA INDIANS OF OREGON.

SUMMARY OF PAPERS.

The first paper dealt with the middle lacerated foramen, the petrous portions of the temporal bones, and the styloid. The author demonstrated the different stages of development of these parts in primates and at different stages of life in the whites, and the differences of those parts, fully developed, in the negroes, Indians and whites. In the adult whites the middle lacerated foramen is large, the petrous portions appear considerably sunken (bulging of surrounding parts), the styloid is well developed. In the Indian the foramen is but a moderate size, in the negro small, in apes absent; the petrous portions are less sunken in the Indian than in the white, on, or almost on, the level with the surrounding parts in the negro, bulging more or less beyond these in the primates; the styloid is in the majority of cases small in the negro and small to rudimentary in most of the Indians. Where the styloid is rudimentary the vaginal process often plays a compensatory part. In whites all the mentioned stages of the parts described may be observed at different periods of life. Brain development accounts for the differences in the size of the middle lacerated foramen and the relative position of the petrous portions.

The second paper reported observations made by the author on the language, customs, and traditions of the Alsea Indians of Oregon.

CHARLES H. JUDD,
Secretary.

BUSINESS MEETING.

FEBRUARY 4, 1901.

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 nomination of the following four candidates for honorary membership : Charles Vernon Boys, F.R.S., 66 Victoria St., London, S. W., England ; Emil Fischer, Professor of Chemistry, University of Berlin ; William Ramsay, Ph.D., LL.D., S.D., F.R.S., University College, London, England ; James Geikie, LL.D., D.C.L., F.R.S. (L. & E.), University of Edinburgh, Scotland.

That the Council had voted not to nominate any corresponding members.

That the Council nominated the following resident members to be promoted to Fellows : Dr. Henry E. Crampton, Dr. C. A. Herter, Prof. Graham Lusk, Dr. Charles Lane Poor, Mr. C. A. Post, Dr. E. L. Thorndike, Dr. R. S. Woodworth.

The Secretary also reported the list of officers to be nominated according to the by-laws.

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

Herman C. Bumpus, American Museum of Natural History.

RICHARD E. DODGE,
Recording Secretary.

SECTION OF ASTRONOMY, PHYSICS AND CHEMISTRY.

FEBRUARY 4, 1901.

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

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

The following program was then offered :

George E. Hale, ASTRONOMICAL PHOTOGRAPHY WITH A VISUAL TELESCOPE.

W. G. Levison, NOTE ON A CAUSE OF THE DETERIORATION OF GELATINE PHOTOGRAPHIC DRY PLATES.

SUMMARY OF PAPERS.

Photography was discovered in 1837 and the first astronomical photograph was taken in 1840 by Dr. Draper of New York. It was a photograph of the moon made on a daguerreotype plate and gave great promise for the future. Bond in 1850 made the first photographs of the stars. Rutherford of New York in 1858 made some remarkable photographs of the moon, and later some star photographs.

Photography has now become so valuable in astronomy that it is applied in every department. It is not true, however, that it will displace the eye. There are certain fields where the eye will be superior to the photographic plate, but in many other fields photography has led to results that never could have been obtained by visual observation. I shall speak to-night of work done at the Yerkes observatory with a telescope designed for visual observation. It is fortunate that this telescope was not designed for photography alone, for by the use of methods recently devised it has been possible to use it for photography and the results are not at all inferior to what they might have been in a telescope designed for photography alone.

The forty-inch telescope of the Yerkes Observatory can be considered as a long camera with a focal length of about sixty-four feet. Its field of view embraces a circle in the sky of only about five minutes of arc in diameter. In photographing groups and clusters of stars this long focal length makes it possible to separate stars which would have been run together into one mass with an instrument of shorter focal length. A means of counteracting the uncorrected chromatic aberration has been devised by Mr. Ritchie of the Yerkes Observatory. He employs a yellow collodion film in front of the photographic plate at the eye end of the instrument, by which the blue rays are cut off. Suitable isochromatic plates such as can be found in the market are used. This is a very inexpensive means of using the telescope for photography. A special form of guiding apparatus to keep the star image at the same point of the plate has to be employed. On account of the unavoidable flexure of the large telescope tube, an auxiliary telescope placed parallel to the

telescope tube cannot be used. The image of another star just outside of the photographic plate is made use of. By means of a little eye-piece with a fine pair of cross hairs, attached to the plate holder which is adjustable in two directions at right angles to each other, the image of the guide star is kept on the intersection of the cross-hairs during the entire time of exposure. The photographs taken at the Yerkes Observatory in this manner by Mr. Ritchie are much finer than those taken at Potsdam with a photographic telescope.

A most important application of photography with this telescope will be the determination of the parallax of stars, which has not yet been done to any extent by photographic means.

Photographs of small planetary nebulae taken with this telescope show more than can actually be seen with our eyes, in some cases for example, a radial structure.

The instrument can also be used to study stellar spectra and stellar evolution. We can pass by gradations from the types of hot and white stars like Sirius, to the more developed and colder ones like our sun, and then to the red stars. There are two types of red stars and by the aid of their spectra photographed with this telescope we have detected a relationship between the two types, through the presence of carbon bands. Even in the atmosphere of the sun there is a very thin layer of carbon vapor and above this the gases of the chromosphere. In the red stars we have this carbon vapor, which is very dense in one of the types.

Another important line of work is that of measuring the motion of stars in the line of sight. Professor Frost uses the titanium line for this purpose, and has just had a new spectrograph constructed for the work.

In photographing the spectrum of Saturn with its rings, we find a faint band in the red, indicating the presence of a comparatively dense absorbing atmosphere on the planet which is absent from the rings.

With the help of a spectroheliograph, we are able to photograph solar phenomena. These photographs show that the mottling of the sun's surface persists throughout the minimum

period of sun spots as well as through the maximum. Prominences can be photographed nearly as well with it as at times of total solar eclipse.

Mr. **Levison** in his note, suggests that there is some emanation, probably Becquerel rays, from the pasteboard of the boxes in which the plates are packed for the market, which causes their deterioration. He found that if he cut a star from the pasteboard of a plate box and laid it on the sensitive side of a plate, the whole then being enclosed in a box for a week, when he developed the plate he found an image of the star. This would explain the deterioration at the edges of plates where they come nearly in contact with the box, or the deterioration due to the pasteboard separators at the edges of the plates. The author's experiments led him to the suggestion that metal boxes would be better for the plates than the pasteboard boxes. Wrapping with paraffine paper might also have the same effect.

WM. S. DAY,

Secretary.

SECTION OF BIOLOGY.

FEBRUARY 11, 1901.

Section met at 8:15 P. M., Professor C. L. Bristol presiding. The minutes of the last meeting of Section were read and approved.

The following program was then offered:

D. T. MacDougal, THE CRITICAL POINTS IN THE RELATION OF LIGHT TO PLANTS.

A. G. Mayer, THE VARIATIONS OF A NEWLY-ARISEN SPECIES OF MEDUSA.

SUMMARY OF PAPERS.

Dr. **MacDougal** stated that an examination of all the data at hand shows no correspondence among the maxima, minima, and optima of intensities of light with regard to the various influences exerted upon the plant by light, and that the current conception of *phototaxis* is not based upon well-defined generalizations.

Etiolative phenomena of plants are irritable reactions, con-

sisting chiefly in the elongation of organs which would carry the chlorophyl screens and reproductive bodies up into the light. Light is not necessary to the motility of protoplasm or to the activity of the motor mechanisms of such plants as *Mimosa*; the condition known as *darkness-rigor* does not exist. Appearances commonly supposed to be due to rigor of darkness are pathological phenomena occasioned by the disintegration of chlorophyl and other substances.

Light may exert a direct chemical (disintegrative) effect upon the constructive material of the cell, but it does not retard growth; on the contrary, it accelerates growth among the algae. Evidence that light exercises a paratonic influence upon plants is not at hand, and no observations could be found by the speaker supporting the conclusion that a similar retarding influence of light upon growth occurs among animals.

In discussion of Dr. MacDougal's paper, Mr. **M. A. Bigelow** called attention to some experiments made by him, under the direction of Professor C. B. Davenport, to determine the influence of light upon embryonic development and post-embryonic growth in Amphibia. Light does not retard, but rather accelerates developmental processes, the effective rays being red in embryonic and blue during post-embryonic stages.

Dr. **Mayer** stated that in 1898 he had discovered a pentamerous Hydromedusa at the Tortugas, Florida, and had named it *Pseudoclytia pentata*. In this form there are five radial canals, five lips, and five gonads 72° apart, instead of four of these various organs at intervals of 90° , as in other Hydromedusæ. In its anatomy it is related to the genus *Epenthesis*, being very close to *E. foliata*, which also occurs at the Tortugas. It is probably the descendant of some *Epenthesis*, and seems to be a newly-arisen species. No studies have as yet been made by zoologists upon the variations of such forms.

The medusa is highly variable. Out of 1,000 individuals 703 are normal radially symmetrical medusæ, with five radial canals and five lips at intervals of 72° , while 297 are abnormal in some respect, having 4, 3, 2, or 6, 7, 8 canals or lips. It is remarkable that fully 50% of the abnormal individuals are radially

symmetrical. The greater the departure from the normal form the smaller is the ratio of radially symmetrical individuals. Thus only 11.2% of the medusæ having five canals are irregular, while 30-33% of those with four or six canals are irregular; in medusæ with seven or three canals 50% are irregular, while 100% of those with two or eight canals are so. The lips show a decided tendency to revert to the ancestral number of four, at intervals of 90°, but the canals, on the contrary, incline toward the higher numbers. We have here a medusa which is continually producing radially symmetrical sports, and is initiating, so to speak, what might become new species were conditions favorable.

On comparing the variations of *P. pentata* with those of *E. folcata* or *Eucopa*, one is struck with many remarkable family likenesses. This is especially true in the former comparison. Similarity of the variations, the likeness of their abnormalities, in these closely-related forms, indicates apparently a race kinship. The abnormal young of *P. pentata* appear to survive fully as well as normal individuals, and abnormal medusæ mature their gonads quite as commonly as the normal forms. The former are not weeded out by natural selection, yet they have not succeeded in establishing new types of medusæ.

In discussion of Dr. Mayer's paper, Dr. **MacDougal** spoke of a sport of *Populus tremuloides*, discovered by Dr. Britton, in which the irritability to gravity of the leaves had been reversed so that they now pointed downwards. The reversal appeared in the buds. New plants propagated by grafting retained the positive geotropism of the leaves. It was also stated that the "weeping" varieties of certain trees were usually produced in this way.

HENRY E. CRAMPTON,

Secretary.

SECTION OF ANTHROPOLOGY AND PSYCHOLOGY.

FEBRUARY 15, 1901.

Section met 8:15 P. M., Professor J. McK. Cattell presiding.
The following program was offered:

Dr. D. R. Major, PHYSICAL AND MENTAL TESTS OF SCHOOL CHILDREN.

A. E. Spitzka, THE BRAINS OF TWO DISTINGUISHED PHYSICIANS, DR. EDOUARD SEGUIN AND HIS SON DR. EDWARD SEGUIN.

SUMMARY OF PAPERS.

The first paper reported the results of physical and mental tests on school children of high and low class standing, the aim of these tests being to discover what relation, if any, exists between class standing and the ability shown in the particular tests used. The tests were as follows: visual and auditory memory for figures and words, striking out of A's, naming 100 words, copying columns of figures, weight discrimination, perception of size, sensation-area test as used in the Columbia laboratory, eyesight, age and talkativeness. The tests were made on 150 New York City school children, 68 having high class standing, 82 low. The results of the tests tend to show that the class standing bears a close relation to the ability to pronounce words, to carefulness or accuracy in striking out A's, to memory for words, to eyesight, to age (the average of the good pupils being less than the average age of the class) and to talkativeness (the good pupils being as a rule talkative). There is apparently little, if any, relation between class standing and the ability shown in the other tests mentioned. The study, however, is not completed and the opinions expressed here are subject to change. In addition to the use made of the standard psychological tests, an attempt is being made to devise tests to determine the presence, nature and quality or worth of apperception activities.

The second paper described with special reference to their similarities, the brains of two distinguished physicians, Dr. Edouard Seguin and his son Dr. Edward C. Seguin. The most striking similarity discoverable in these brains is the unusual development in the left insula. This similarity was attributed by the author to heredity, and was held to be the physical basis for the high type of ability shown by both the Seguins in the use of language.

CHARLES H. JUDD,
Secretary.

SECTION OF GEOLOGY AND MINERALOGY.

FEBRUARY 18, 1901.

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 then offered :

George I. Finlay, THE GRANITE OF BARRE, VERMONT.

A. A. Julien, NOTE ON A SAND FULGURITE FROM POLAND.

SUMMARY OF PAPERS.

Mr. Finlay described the occurrence of the Barre granite as a single intrusion through the country rock, which is a biotite-schist, in the southern portion of Barre township. Many inclusions of the schist are found in the granite, and this rock has almost surrounded other masses of the schist, which remain in place, with their original dip and strike unchanged. The speaker employed a series of original lantern views to illustrate the character of the jointing, the "onion structure," and the zones of shearing together with certain large systems of joints, standing at right angles to each other, resulting from pressure. Microscopic examination shows that the granite consists of microcline and orthoclase, plagioclase in very small amounts, quartz, biotite and muscovite, with occasional crystals of apatite and magnetite and rarely pyrite. Variations in the shade of the marketable granite, from very light to very dark gray, are due to the relative amount of biotite which it contains. The rock is of medium grain and its constituent minerals are but slightly weathered. Pegmatitic offshoots, traceable directly to the granite mass, were recorded by Mr. Finlay, and their dynamic effects on the enclosing schist were illustrated. The contact metamorphism of the schist is inconsiderable. It is chiefly shown in the greater abundance of biotite and quartz in the immediate vicinity of the granite. Two dikes of augite-camptomite were found; one in the granite, the other in the country-rock. They are noticeable for the manner in which they have weathered. At times sixteen successive shells may

be counted which are ready to break away from the main mass of the dike. Mention was also made, in discussing the glacial geology of the region, of sand plains and of two well-developed eskers.

The paper was discussed by Professor **Kemp** and Doctors **Julien** and **White**.

Doctor **Julien** exhibited a specimen of fulgurite formed from sand in Poland, with a series of photo-micrographs which he had made from the same. Some new features in fulgurites were pointed out in this specimen; pustules of glass on the inner lumen, glass fibres on the exterior and adhering sand-grains, two-thirds of which consisted of orthoclase. In the thin cross section, examination of the minute gas cavities showed the absence of condensed water-vapor, and this indicated a dilatation of both lumen and cavities by air, more than by steam. The radial arrangement of layer cavities, the horn-like projections on the outside of the tube, and the pustules along the lumen, were all shown to be connected with relief of intense pressure outwardly during the electric discharge, or inwardly, during the reaction after its passage. This fulgurite is of further interest in presenting the first instance yet observed of devitrification, the glass being generally filled with delicate crystallites, apparently of feldspar. All the bubbles, however, are enclosed in pellicles of homogeneous glass, and some of the larger within a coating of suddenly chilled glass, which is free from crystallites. The relation of these facts was discussed in reference to Lagorio's view as to the difficult saturation of a magma by the constituents of feldspar.

Other occurrences of fulgurites were discussed by Doctors **Kemp**, **Levison** and **White**.

THEODORE G. WHITE,
Secretary.

ANNUAL MEETING.

FEBRUARY 25, 1901.

Academy met for the Annual Meeting at 8:15, President Woodward in the chair.

Reports of the officers for the past year were called for and presented in the following order:

The accompanying report of the Corresponding Secretary was read by the Recording Secretary.

The report of the Recording Secretary, herewith filed, was read.

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

The accompanying report of the Librarian was read.

The following nominations for Honorary Members, selected by the Council according to the By-Laws, were read, and the Secretary was instructed to cast one ballot in each instance, which was done.

Charles Vernon Boys, F.R.S., 66 Victoria St., S. W., London, England.

Emil Fischer, Professor of Chemistry, University of Berlin, Germany.

William Ramsay, Ph.D., LL.D., D.Sc., F.R.S., F.C.S., Professor of Chemistry, University College, London, England.

James Geikie, LL.D., D.C.L., F.R.S. (L. & E.), Murchison Professor of Geology in the University of Edinburgh, Scotland.

The following list of Fellows, nominated by the Council according to the By-Laws, was read, and the Secretary was empowered to cast the affirmative ballot of the Academy therefor, which was done.

Dr. Henry E. Crampton;

Dr. C. A. Herter,

Dr. Charles Lane Poor,

Dr. E. L. Thorndike,

Dr. J. G. Curtis,

Professor Graham Lusk,

Mr. C. A. Post,

Dr. R. S. Woodworth.

The President then appointed as tellers Dr. Wiechmann and Mr. Tufts. Ballots were distributed, votes received and counted, and the following list of officers elected :

President, Robert S. Woodward.

First Vice-President, Nathaniel L. Britton.

Second Vice-President, J. McKeen Cattell.

Corresponding Secretary, Harold Jacoby.

Recording Secretary, Richard E. Dodge.

Treasurer, Charles F. Cox.

Librarian, Livingston Farrand.

Councillors: Franz Boas, Charles H. Judd, Charles A. Doremus, M. I. Pupin, Frederic S. Lee, L. M. Underwood.

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

Finance Committee: John H. Hinton, C. A. Post, Cornelius Van Brunt.

The President then delivered his Annual Address entitled, "Observation and Experiment."

At the close of the address a vote of thanks to the President was moved by ex-president Osborn, and carried.

Adjourned.

RICHARD E. DODGE,

Recording Secretary.

REPORT OF THE CORRESPONDING SECRETARY.

The number of honorary members now on the Academy lists is forty-one; corresponding members, two hundred and six.

There have been five losses by death in the last year, namely Professors Richard Ackerman, Silas Newcomb, Hugo Geinitz, P. S. Michie and Sir Joseph Hooker.

Respectfully submitted,

WILLIAM STRATFORD,

Corresponding Secretary.

REPORT OF RECORDING SECRETARY.

During the last Academy year the business of the Academy has progressed in the customary paths. The several sections have held their usual meetings, with ordinarily the same attendance as in former years. The Councils have held the meetings prescribed by the By-Laws, and have accomplished several important objects. On the whole, however, the year cannot be called a year of progress.

During the last year there have been eight meetings of the

Council, eight business meetings, thirty sectional meetings, one public lecture, and one public reception. At the sectional meetings there have been seventy-four papers presented, which may be classified as follows :

Anthropology 4.	Palæontology 2.
Astronomy 3.	Physics 15.
Botany 2.	Physiography 2.
Chemistry 1.	Physiology 2.
Geology 15.	Psychology 12.
Mineralogy 4.	Zoology 9.
Miscellaneous 3.	

There are at present a total of 321 Resident Members, and 96 Fellows.

The Annual Reception and Exhibition was held in April at the American Museum of Natural History, and proved as usual eminently successful. Owing, however, to financial stringency on the part of the Academy it has been voted to recommend to the succeeding Council that no Reception be held in the year 1901.

The accomplishments of the year leading to increased efficiency in the Academy work are first, the establishment of a series of publication rules that will make the future work of the Editor, and the cost of publication, much less than formerly ; secondly, the vote to establish a budget for the next fiscal year, within the limits of which each officer will be required to work ; thirdly, the hiring of the rooms of the Chemists' Club for the meetings of the next year, at a greatly reduced rental, with accommodations equal to those which we now enjoy ; and finally, a vote to send the *ANNALS* and *MEMOIRS* only to those members of the Academy signifying their desire to receive them.

The publications of the academy have been unfortunately delayed during the last year, owing to no fault of the Editor ; but the current volume will be very shortly completed and issued. Owing to the expense of the current volume the amount of publication possible by the Academy during the present year will be seriously reduced, unless a publication fund can be established.

It should also be recorded that the Council, in June, 1900, presented to President Morris K. Jesup, of the American Museum of Natural History, a letter of congratulation and good wishes on the occasion of his seventieth birthday.

RICHARD E. DODGE,
Recording Secretary.

REPORT OF THE TREASURER.

RECEIPTS.

Balance as per last Annual Report,	\$2,239.11	
Mortgage paid off, account Permanent Fund	\$1,202.75	
" " account Audubon Fund	1,797.25	3,000.00
Income, Permanent Fund	426.38	
" Audubon Fund	99.04	
" Publication Fund	90.00	615.42
Life Membership Fees		200.00
Initiation Fees		75.00
Annual Dues, 1897	10.00	
" 1898	30.00	
" 1899	170.00	
" 1900	2,395.00	
" 1901	50.00	2,655.00

DISBURSEMENTS.

Cost of Publications	\$2,499.72	
Less Sales	30.06	2,469.66
Cost of Publications (paid by Audubon Fund)	309.72	
Rent of Rooms	510.00	
7th Annual Reception	329.68	
Dues to Scientific Alliance	32.58	
Lectures	20.00	
Expenses of Recording Secretary	291.44	
" Librarian	363.95	
" Treasurer	41.93	
General expenses	78.37	4,447.33
Balance on hand		\$4,337.20

BALANCE SHEET.

FEBRUARY 25, 1901.

	Dr.	Cr.
Permanent Fund.		\$10,426.43
Publication Fund.		1,823.69
Audubon Fund.		1,897.25
Income, Audubon Fund (unexpended balance)		81.90
Investments, Bonds and Mortgages.		
a/c Permanent Fund.	7,200.00	
a/c Publication Fund.	1,800.00	
General Income Account.	892.07	
Cash on hand.	4,337.20	
	\$14,229.27	14,229.27

Examined and found correct.

(Signed)

JOHN H. HINTON,

Chairman,

For Finance Committee.

REPORT OF THE LIBRARIAN.

The work of the Library during the past year has been mainly directed toward keeping the accessions catalogued and in order. This, it is believed, has been successfully carried out. The current numbers of the more prominent periodicals are placed upon accessible shelves and upon the completion of any volume are arranged permanently with their respective sets. In this connection it is desirable to call attention to the crying need of binding many of the accessions of late years. Hundreds of volumes are stored in their pamphlet form, and much injury and loss is the result. During the last year the Librarian was able to have some sixty volumes bound, but financial stringency has prevented any considerable work in this direction.

By arrangement with the authorities of the New York Botanical Garden, the bulk of the botanical portion of the library, which since the removal to Schermerhorn Hall at Columbia

University had been stored in boxes, has now been deposited in the library of the Garden at Bronx Park, and is thus more available than heretofore for general reference.

The Librarian takes pleasure in reporting a gift to the Academy from Professor D. S. Martin, of about a hundred volumes of miscellaneous scientific interest.

The statistics of the Library are at this date approximately as follows: Volumes (bound and unbound) at Columbia University, 9,000; Pamphlets at Columbia University, 2,000; Volumes and Pamphlets at Columbia University, 350.

Thanks to the activity of Messrs. Van Ingen and White, assisted by Mr. Graham, the files of the Academy's publications have been brought from a state of chaos to one of order, the exchange list has been revised, and the business of correspondence and exchanges is now carried on with promptness and regularity. The Librarian takes this opportunity to call the attention of the Academy to the absolute necessity of considering the disposition of the library in the immediate future. We have practically reached the limit of accommodations in the library room, and the department of exchanges is housed in the Gallery of the Museum of Fossil Plants and Vertebrates, in Schermerhorn Hall of Columbia University, solely by courtesy of the Department of Geology, and has already exceeded the space which that department can conveniently spare. Radical measures must be adopted in the near future or the library must close its doors.

Respectfully submitted,

LIVINGSTON FARRAND,

Librarian.

BUSINESS MEETING.

MARCH 4, 1901.

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:

That a budget had been adopted for the ensuing fiscal year; that the Academy had voted to subscribe to the 5th Inter-

national Congress of Zoölogists, and to appoint Professor E. B. Wilson delegate. That the meetings of the next year would be held at the rooms of the Chemists' Club, 108 West 55th Street. That the delegates to the Scientific Alliance would be President Woodward, *ex-officio*, Mr. Cox, and Professor H. F. Osborn.

RICHARD E. DODGE,
Recording Secretary.

SECTION OF ASTRONOMY, PHYSICS AND CHEMISTRY.

MARCH 4, 1901.

Section met at 8.25 P. M., Professor J. K. Rees presiding.

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

The following program was offered:

B. S. Woodward and **J. W. Miller, Jr.**, THE ELASTIC PROPERTIES OF HELICAL SPRINGS.

F. L. Tufts, A PHOTOGRAPHIC STUDY OF THE AIR MOVEMENTS NEAR THE MOUTH OF AN ORGAN PIPE.

Before the program of the evening, an election of officers of the Section was held, resulting in the election of Prof. William Hallock as Chairman and Dr. F. L. Tufts as Secretary of the Section for the ensuing year.

SUMMARY OF PAPERS.

In his paper, Dr. **Tufts** described preliminary experiments in which he applied the "method of striæ" similar to that used by Toepler, Boys, Wood, and others, to the study of the vibrations within an organ pipe. The pipe used had sides made of plane parallel glass plates. The tongue of air at the mouth of the pipe was made visible by using air mixed with alcohol vapor, which changed its optical density. The vibrations and air currents within the pipe were made visible by the introduction into the pipe of small jets of illuminating gas. The intermittent illumination used was the spark between magnesium ribbons from an induction coil. It was found quite easy to adjust the

rate of interruption of the coil so as to produce a stroboscopic effect, and thus the movements of the tongue of air in the mouth of the pipe and the vibrations and air currents in the pipe could be readily followed.

The same method was also applied by the author to study the behavior of unignited jets of illuminating gas when acted on by sound waves.

The paper was illustrated by a number of photographs of the phenomena observed.

W. S. DAY
Secretary.

SECTION OF BIOLOGY

MARCH 11, 1901.

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

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

The following program was then offered :

H. F. Osborn, SYSTEMATIC REVISION OF THE AMERICAN EOCENE PRIMATES AND OF THE RODENT FAMILY MYXODECTIDÆ.

O. P. Hay, THE COMPOSITION OF THE SHELLS OF TURTLES.

M. A. Bigelow, SOME COMPARISONS OF THE GERM-LAYERS IN ENTOMOSTRACA CRUSTACEA.

Prior to the reading of papers, a communication from the Secretary of the Academy was read, stating that a grant of \$100 from the John Strong Newberry Fund had been authorized by the Scientific Alliance, and as the subjects in which an award might be made this year were Geology and Palæontology, he would be pleased to receive a nomination from the Section of Biology. On motion of Professor Osborn the matter was referred to a committee consisting of the Chairman and two additional members. The Chair nominated Professor Osborn and the Secretary of the Section.

Professor Charles L. Bristol and Dr. Henry E. Crampton were re-elected Chairman and Secretary respectively.

SUMMARY OF PAPERS.

Professor **Osborn** stated that the only fossil Primates at present known are those in the Eocene. The supposed Oligocene genera described by Marsh and Cope have proved to belong to the Artiodactyla. Associated throughout with the discovery and literature of the primates is the family Mixodectidæ, including *Mixodectis* of the basal Eocene or Torrejon beds; Mathew has suggested that this animal is a rodent. Careful comparison of this type with the supposed primates *Cynodontomys* of the Middle Eocene and *Microcyops* of the Upper Eocene proves that these animals also belong probably with the Rodentia; they represent a primitive stock with strong affinities to the Tillodontia which are thus brought nearer to the ancestral rodents. This conclusion removes all these animals from the primates where they have hitherto been placed. This leaves three families of monkeys as follows: Hypsodontidæ including *Hypsodus* and *Sarcolemur*, animals of medium size retaining the typical series of 44 teeth; a second family, the Notharctidæ, including *Pelycodus* and *Notharctus*, animals of larger size, with teeth reduced to 40 by the loss of 4 incisors, and like the foregoing, comprising long-jawed types; and the third family, the famous Anaptomorphidæ of Cope, short-jawed, very progressive types, with 36 to 32 teeth, the premolar series being reduced. The identification of these families with the Eocene *Adapidis* or with *Necrolemur* of Europe is not sustained. The Hypsodontidæ and Notharctidæ are well distinguished by sextituberculate superior molars.

Dr. **Hay** called attention to the fact that for a long time there has been much discussion regarding the origin of the elements entering into the shell of turtles. As to the bones known as costal plates, the great majority of anatomists have held that they have resulted from the union of dermal bones with the underlying ribs; the neural plates from the union of dermal bones with the neural arches. Recently Goette has studied the development of the costals and neurals of the young of *Chelone squamata*. He finds that the whole cos-

tal plate develops continuously from bone which appears beneath the perichondrium of the cartilaginous ribs. No part of either the costal plates or of the neurals arises in the skin. While accepting Goette's results as established, the speaker did not accept his conclusion. Neither did he accept the other view that the costals and neurals are composed of dermal bones united with those of the internal skeleton. The speaker held that there were originally three strata of bones on the dorsal surface of turtles. One of these was in the skin, and is represented by the mosaic found in the skin of *Dermochelys*. Another layer was sub-dermal, and this united with elements of the third stratum, namely the ribs and neural arches. The union has become so complete that the bones arise from the same centres. These three strata of bones on the dorsal surface correspond to those which are found in the ventral wall of the Caiman, viz., true ribs, "abdominal ribs," and bony dermal scutes.

Mr. **M. A. Bigelow** compared the germ-layers of various Crustacea with especial reference to the Cirriped *Lepas*. It was pointed out that in the cleavage leading to the segregation of the germ-layers there are very many resemblances between *Lepas* and other Entomostraca. *Lepas* resembles most other Crustacea with respect to the position of the blastopore, and the extension of the entoblast and mesoblast from that region as a starting point. In *Lepas*, as in most other Crustacea, the mesoblast and entoblast originate from cells which, speaking in general terms, at first lie in the blastoderm and later migrate into the cleavage cavity. But among these immigrating mesentoblastic cells one can distinguish the individual cells of entoblast and two varieties of mesoblast—entomesoblast and ectoblast. There are observations indicating that similar conditions exist in other Crustacea.

HENRY E. CRAMPTON,
Secretary.

SECTION OF GEOLOGY AND MINERALOGY

MARCH 18, 1901.

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

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

Dr. A. A. Julien and Dr. Theodore G. White were re-elected Chairman and Secretary respectively.

The following program was then offered :

J. F. Kemp, THE CAMBRO-ORDOVICIAN OUTLIER AT WELLS-TOWN, HAMILTON COUNTY, NEW YORK.

G. van Ingen, A METHOD OF FACILITATING PHOTOGRAPHY OF FOSSILS.

SUMMARY OF PAPERS.

In introducing the main subject of the paper, Professor **Kemp** gave a brief account of the physiographic problems presented in the Adirondacks and of the significance of the smaller outliers of Paleozoic strata which occur within the crystalline area. He then discussed the Wellstown exposure and described it in much the same way as he has already done in print in the 18th Annual Report of the State Geologist of New York, page 145. The general conclusion favored the existence of land areas of ancient crystalline rocks in the vicinity of Wellstown, and it seemed to the speaker that the peculiar sediments could not be explained in any other way. Pebbles as large as one's fist, of gneiss similar to that found in the ancient hills, are imbedded in the Trenton limestone, and much sand is found in the limestones of both the Calciferous and the Trenton. It was admitted that the present valley is due to faulting, as has been previously claimed by Doctor R. Ruedemann, but the shores of the late Cambrian and early Ordovician could not have been far from the present outcrops of the Palæozoics at Wellstown.

Mr. **van Ingen**, and Doctors **Levison**, **Dodge**, **White** and **Julien** took part in the discussion of the paper.

Doctor **Julien** remarked, in regard to the sand found in the limestones to which Professor Kemp referred, that although the

smaller and angular portion of the sand, in which feldspar is common, and particles of garnet, epidote and menaccanite also occur, may possibly be residual, derived from decay of gneiss adjacent to the shores of the ancient basin, the predominant quartz grains, well-rounded and even perfectly spherical, could not possibly be of that origin. These Doctor Julien has already discussed before the Academy and elsewhere, pointing out that their sculpture indicates prolonged action during ages before they assumed spherical form and that although found in sediments, loose or consolidated, of all ages from the quartzites of the Laurentian down to the sea beaches of the present day, along river, lake and ocean, they represent in all cases ancient materials which have been worked up over and over again from period to period. In the Potsdam of the North American continent they have been accumulated in an extensive outer-beach deposit, the result of an enormous resorting of materials throughout the vast Cambrian time. These "paleospheres" were doubtless derived from the same Potsdam horizon which has yielded the oolitic quartz sand of the "singing beach" on the shores of Lake Champlain, near Plattsburg, not many miles from the Wellstown outcrop of the Ordovician limestones.

As to their method of transport, they had certainly not been swept into this limestone basin by currents, since the absence of sorting and the parallel disposition of their axes showed that they had been dropped down from the surface in a continuous gentle shower. The conditions which have favored this have been studied abroad as well as along our Atlantic coast and consist, first, of the coating of sand from the beaches along sheltered bays, such as Long Island Sound, on every quietly rising tide, then its seaward transport, often to hundreds of miles off the coast, commonly caught in the dredges of surveying steamers, as noted by Verrill and others, and its constant deposition over the bottom, as illustrated by soundings at great distances off Nantucket. Such a sand transport was plainly in progress over the quiet embayment occupied by this limestone, from surrounding beaches supplied from the decay and disintegration of an ancient shore of Potsdam and Calcareous sand-

stones. The various sands referred to in these remarks were illustrated by photomicrographs.

A Method of Facilitating Photography of Fossils was described by Mr. **Gilbert van Ingen**. The speaker noted the difficulties met by all investigators in the illustration of their specimens. All methods by which the published figure is derived from an original drawing produced by hand-work are dependent for their degree of correctness upon the accuracy of eye and skill of hand of the draughtsman. Such figures contain a variable percentage of the personal element which the artist unconsciously incorporates into his work. The majority of investigators find it difficult to produce a drawing of satisfactory excellence and at the same time have not at their disposal the means wherewith to engage the services of a trained artist. Photography, often employed as affording a correct and cheap method of illustration, has, up to the present time, yielded results of varying and uncertain degrees of accuracy. The difficulty of obtaining a satisfactory negative from the object has caused direct photography to be looked upon by disfavor by many palæontologists. This difficulty is due to the effect upon the photo-plate of the colors and reflected light emanating from the surface of the specimen to be photographed. A method of illuminating these disturbing elements was sought and, at the suggestion of Professor Kemp, the use of ammonium chloride was tried.

A simple apparatus has been devised by which a fossil of any size can be coated with a thin, opaque, white film which effectually illuminates under the influence of both color and reflected light. The necessary articles for construction of the apparatus are: a foot-blower, large wide-mouthed bottle of gallon capacity, with three-holed rubber stopper, two bottles of quart capacity, each with two-holed rubber stopper, glass tubing of one-eighth-inch bore and rubber tubing to fit same (three feet of each), two U-shaped calcium chloride tubes filled with chloride, strong ammonia water, strong HCl. To use: Air from the foot-blower is forced into the large bottle, which equalizes the pressure, and thence through the ammonia water and HCl into the smaller bottles. The air, mixed with the gases taken up, is

passed through the calcium chloride tubes, where the moisture is extracted, and escapes from the two glass tubes held in the hands at a short distance from the object to be coated. The union of the two gases escaping from the tubes forms ammonium chloride, which settles as an exceedingly fine powder upon the surface of the specimens. The coating thus obtained, when deposited slowly, is of a dead white, which effectually hides all coloration of the surface, and, instead of obliterating the finer modelling, renders the details of the topography with the utmost distinctness. Some surfaces take the coating more readily than others. Fine-grained black limestones and all other rocks that present a velvety surface, take the coating well. Porous rocks are difficult to cover. Specimens which have been handled must be washed with benzene. The coating of the salt is perfectly harmless, and may readily be removed by water, gentle heating, or the use of a soft brush. Photographs of such coated specimens fulfil more nearly the requirements of the work than do those taken by the ordinary methods. The coating is also of great assistance in the elucidation of the details of small species, as was found to advantage while studying the lobation of the heads of small trilobites. Since the above described method had been devised the speaker had learned of a similar method patented by Professor H. S. Williams. Claim 640,660 (Off. Gaz., 89, p. 2,602) is for "a photographic process consisting in the deposition by sublimation from vapor of a temporary film of extreme tenuity on surfaces of the object to be photographed, the film being of a character which removes itself by dissipation, or which may be manually removed without injury to the surface of the object." On the face of it this patent is different from the process described above, although the exact method employed has been guarded as a secret. The claim is for a method employing sublimation, which process, as known to chemists and assayers, does not enter in the least degree into the method described by the speaker.

The paper was discussed by Professors **Stevenson** and **Kemp** and Doctors **Levison**, **Julien** and **White**.

THEODORE G. WHITE,
Secretary.

SECTION OF ANTHROPOLOGY AND
PSYCHOLOGY.

MARCH 25, 1901.

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

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

The following program was then offered :

F. H. Giddings, THE USE OF THE TERM "RACE."

Stansbury Hager, THE WARDS OF CUZCO.

SUMMARY OF PAPERS.

Professor **F. H. Giddings** presented a paper on the use of the term "race." He spoke in part as follows: "The term 'race' as used by many different groups of investigators—anthropologists, ethnologists, philologists and historians—long since ceased to have a definite meaning. Efforts to establish a technical and conventional use of the word have thus far been unsuccessful. As one more attempt I suggest a combination of the word 'race' with various descriptive adjectives, denoting successive degrees of kinship. The narrowest degree of relationship is consanguinity, or the relationship (physiological, psychological and sociological) of father and mother and children, brothers and sisters, grandparents and grandchildren, uncles, aunts and cousins. Let us designate this degree of kinship by K_1 . The next degree of kinship, or K_2 is propinquity. The primary meaning of this word is 'nearness in place' and the secondary meaning is 'nearness in blood.' The word is thus perfectly descriptive of a state of facts which we find when a number of families live in the same neighborhood and, through intermarriage and association, become related (but less closely than the consanguinity of K_1) in blood, in type of mind, and in institutions. K_3 is nationality, that wide degree of kinship (physical, mental and social) which includes those who speak the same language, and, for many generations, have dwelt together under the same political organization. K_4 is potential nationality, or the degree

of relationship (physical, mental and social) of a heterogeneous people composed of many nationalities, undergoing assimilation, or blending, into a new nationality, as in the United States. Potential nationality includes the familiar census divisions, 'native born of native parents,' 'native born of foreign parents,' and 'foreign born.' K_5 is ethnic-race, a group of closely related nationalities, speaking closely related languages, and having well-marked psychological characteristics in common. Examples are, the Celtic ethnic-race, including the Welsh, the Irish, the Highland Scotch, some of the Cornish and the Bretons; the Teutonic ethnic-race, including Germans, Swedes, Norwegians, Danes and Dutch; and the Latin ethnic-race, including Italians, Spaniards and Greeks. K_6 is glottic race. This is that very broad relationship, to a slight extent physical, to a somewhat greater extent mental and social, of those related ethnic-races that speak languages derived from a common ancient tongue. Examples are, the Aryan glottic race, including the Celtic, Teutonic, Latin and other ethnic races; the Semitic glottic-race, and the Hamitic glottic-race. K_7 is chromatic race, that extremely wide and vague relationship, which includes related glottic-races marked by the same color. Examples are, the white chromatic-race, which includes the Aryan, Semitic and Hamitic glottic-races; the yellow chromatic-race, which includes the various glottic-races known as Mongolian or Turanian; the brown, the red and the black chromatic-races. K_8 is cephalic-race, or that widest relationship which includes chromatic-races of like cephalic index. The distinction about which I feel most doubt is this between chromatic- and cephalic-race. Remembering that, according to this scheme, variability and multiplicity of specific characteristics produced by differentiation, should increase as we proceed backward from K_8 to K_{11} , I think that probably cephalic index is rightly placed as K_8 and color as K_7 because, in the organic world in general, coloring seems to be a less stable characteristic than anatomical structure. The compound terms which I have here introduced are admittedly clumsy, but they have the advantage of conveying precise meanings. If a writer speaks of 'race' without a qualifying word, his reader

must guess at his meaning. If he says 'cephalic-race,' 'chromatic-race,' 'glottic-race,' the meaning cannot be mistaken."

In reply to a question Professor Giddings said that the clan is developed between K^1 and K^2 and the tribe between K^2 and K^3 .

The following paper was read by Mr. **Stansbury Hager**, on the "Wards of Cuzco." The speaker presented a portion of the evidence collected by him which tends to show that the twelve so-called wards of Cuzco, the ancient capital of the Inca Empire, were the terrestrial representatives of the signs of the Peruvian zodiac. The evidence bearing on this hypothesis is divided into four main classes. In the first place, the system of 'mamas' under which the Peruvians regarded every material object as merely a product of the real spiritual essence, of which it was the expression, gave rise to an attempt to imitate on earth the features of the world above as observed in the heavens. This system, in turn, resulted in the production of an elaborate ritual, the features of which, each month, corresponded with the supposed attributes of the mama which governed the corresponding sign through which the sun was passing during that month. The ideas associated with the 'mamas' are shown to correspond with the names of the Cuzco wards. Again these names correspond very definitely with the names of the zodiacal signs upon the native star map of Salcamayhua. And finally the names of one or two of the wards can be identified directly with definitely known native constellations situated in the zodiac. The nature of the evidence thus adduced is such as to indicate that the native Peruvians had made remarkable advance in astronomical knowledge in times long anterior to the arrival of the earliest Europeans known to history.

The annual election of Section officers was held, resulting in the choice of Professor Livingston Farrand as Chairman, and Dr. R. S. Woodworth as Secretary.

R. S. WOODWORTH,
Secretary.

BUSINESS MEETING.

APRIL 1, 1901.

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:

That Mr. Edward D. Adams had qualified as a Life Member.

Letters of thanks were read from Professor James Geikie, and Mr. C. V. Boys, elected Honorary Members at the Annual Meeting.

Adjourned.

RICHARD E. DODGE,
Recording Secretary.

SECTION OF ASTRONOMY, PHYSICS AND
CHEMISTRY.

APRIL 1, 1901.

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

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

The following program was then offered:

H. C. Parker, EXPERIMENTS ON STANDARDS OF HIGH ELECTRICAL RESISTANCES.

J. K. Rees, REMARKS ON TEMPORARY STARS, WITH ESPECIAL REFERENCE TO THE NEW STAR IN PERSEUS.

J. K. Rees, PHOTOGRAPHS OF NEBULAE TAKEN WITH THE CROSSLEY REFLECTOR OF THE LICK OBSERVATORY.

SUMMARY OF PAPERS.

The paper by Mr. **H. C. Parker** gave an outline of Professor Rood's electrometer method of measuring high resistances. This method has been described by Professor Rood in the

American Journal of Science for October, 1900. Mr. Parker stated that by this method it seemed possible to measure resistances as great as 1,000,000,000 megohms while by the methods at present in common use the practical limit was stated to be about 100,000 megohms. The author gave the results of a series of measurements made on a new form of standard high resistance devised by Professor Rood. This form of standard consists of oxide of manganese on cobalt glass. It gives a convenient means for obtaining resistances of from one to ten thousand megohms. Most of the measurements were for the purpose of determining the best protective insulating material with which to coat the above resistances. The author stated that the work was still in progress.

The first paper by Professor **J. K. Rees** gave an outline of the present classification of variable stars and a history of the discovery of the new star in Perseus. A number of the theories to account for the phenomena was given and commented upon.

In the discussion of the paper, Mr. **C. A. Post** inquired concerning the evidently rapid transformations of energy taking place in the temporary star. Dr. **W. S. Day** suggested as a possible explanation the retransformation of much of the kinetic energy of the vibrating atoms into gravitational potential energy by the sudden expansion of the matter after collision.

The second paper by Professor **Rees** consisted of an exhibition of some very beautiful photographs of nebulae which the Columbia Observatory had lately received from Mr. W. Campbell, the director of the Lick Observatory.

The photographs were taken by the late Dr. J. E. Keeler and an enthusiastic tribute was paid to him for his remarkably successful work in this field.

The photographs exhibited were:

1. Orion nebula, taken November 16, 1898; exposure 40 minutes.
2. Orion nebula, taken December 11, 1899; exposure 1 hour.
3. 51, M, Cannea Venaticarum, taken May 10, 1899.
4. Dumb-bell nebula in Velpecula taken July 31, 1899; exposure 3 hours.

5. Trifid nebula in Sagittarius; exposure 3 hours.
6. The Pleiades, showing nebulosity.
7. Ring nebula in Lyra.
8. Crab nebula in Taurus.
9. Small nebula in Andromeda.
10. Spiral nebula M, 74, in Pisces.
11. " " in Pegasus.
12. " " in Triangulum.
13. " " in Ursa Major.
14. Net-work nebula in Cygnus.
15. M, 13, in Hercules—star cluster.

Reference was made to Keeler's determination of the radial velocities of nebulae and to the distances of these masses.

After a brief discussion of the paper the Section adjourned.

F. L. TUFTS,
Secretary.

SECTION OF BIOLOGY

APRIL 8, 1901.

Section met at 8:15 P. M., Mr. M. A. Bigelow presiding.

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

The following program was then offered:

E. B. Wilson, THE HISTORY OF THE CENTROSOMES IN ARTIFICIAL PARTHENOGENESIS, AND ITS RELATION TO THE PHENOMENA OF NORMAL FERTILIZATION.

F. S. Lee, SOME OBSERVATIONS ON RIGOR MORTIS.

SUMMARY OF PAPERS.

In continuation of his communication given at the December meeting, Professor **E. B. Wilson** presented the results of further studies on the development of the unfertilized eggs of *Toxopneustes* when treated by Loeb's magnesium chloride method. The principal points considered were the origin and history of the centrosomes and the general relation of the phenomena to those occurring in normal fertilization. Evidence

was brought forward that the cleavage centrosomes of the primary division figure arise by the division of a single primary centrosome that is formed outside, but immediately upon, the nuclear membrane. As regards the chromatic transformation of the nucleus, two types of chromosome formation were described. In both cases a large nucleolus is formed, which attains a much greater size than in the fertilized eggs. In one type this nucleolus remains a plasmosome, or true nucleolus, which fades away at the time of division, the chromosomes arising nearly in the usual manner from the chromatin network. In the second type, the entire chromatic content of the nucleus is gradually accumulated in the nucleolus, which thus forms a chromatin-nucleolus from which the chromosomes are afterwards derived nearly in the same manner as in *Spirogyra*.

In regard to the accessory asters, or cytasters, it was shown that they contain central bodies often indistinguishable in sections from the centrosomes of the nuclear figure, though in many cases less well developed. Sections demonstrate that the division of the cytasters is preceded by division of the central body, which draws out to form a central spindle in a manner similar to that described by MacFarland in the eggs of gasteropods. This fact, taken in connection with the physiological activities of the cytasters seems to remove every doubt regarding the identification of the central bodies as true centrosomes.

In comparing the phenomena in the magnesium eggs with those of normal fertilization, it was pointed out that the formation of accessory asters at the time of fertilization or cell division, is a widespread phenomenon. In normal fertilization or division, the accessory asters are of a very transient character. In the magnesium eggs they attain a much greater development both structurally and functionally, but they are probably to be regarded as differing only in degree from those which appear during the normal process. In all cases their disappearance is probably due to a concentration of the protoplasmic activities about the more active centres, connected with the nucleus, which alone survive to perform the normal functions of division. Evidence was adduced that the nuclear transformation occurring

in normal fertilization is not primarily due to the union of the sperm-nucleus, or sperm-centrosome, with the egg-nucleus, but to a general stimulus of the ovum effected by the entrance of the spermatozoon. Apart from the different character of the stimulus, this transformation of the egg-nucleus does not differ essentially from that taking place in the magnesium eggs. This is proved by the fact that in etherized eggs the egg-nucleus may undergo the karyokinetic transformation *without union with the sperm-nucleus or centrosome*—an observation which agrees with the much earlier results of O. and R. Hertwig on eggs treated with chloral hydrate. In normal fertilization this activity of the egg-nucleus is modified through its union with an active individualized sperm-centrosome, the presence of which inhibits the formation of an egg-centrosome such as occurs in the magnesium eggs.

The paper was discussed by Mr. **Bigelow**, Dr. **Calkins**, and Dr. **Linville**.

Professor **F. S. Lee** stated that rigor mortis is characterized by a shortening of the muscles of the body, accompanied by a coagulation of the contents of the muscle cells. The nature of the phenomenon is disputed. Hermann has long insisted that it is analogous to muscular contraction and is the final vital act of the dying muscle cell.

In connection with the studies of muscle fatigue, the author, with Mr. C. C. Harrold, has made some observations on cat's muscle, which seem to contradict Hermann's conclusion. Fasting, which is characterized especially by a diminution of the free carbohydrates in muscle, hastens the oncoming of rigor mortis. The administration of the peculiar drug, phlorhizin, which eliminates both the free and the combined carbohydrates, has a similar but much more pronounced effect. On the other hand the ingestion of grape-sugar by a phlorhizinized animal, delays rigor. Hence the conclusion seems justified that the absence of carbohydrates is favorable, and their presence unfavorable to the development of rigor mortis. As regards the ability of the muscle to contract, carbohydrates have exactly the opposite effect, their absence being unfavorable and their presence favor-

able. Hence, in this respect, contraction and rigor mortis are not analogous processes.

HENRY E. CRAMPTON,
Secretary

SECTION OF GEOLOGY AND MINERALOGY

APRIL 15, 1901.

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 then offered :

Gilbert van Ingen, THE SILURIAN FAUNA OF BATESVILLE
ARKANSAS.

Heinrich Ries, THE IRON MINES OF BILBAO, SPAIN. Illustrated.

THEODORE G. WHITE,
Secretary.

SECTION OF ANTHROPOLOGY AND PSYCHOLOGY

APRIL 22, 1901.

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

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

The following program was then offered :

A. L. Kroeber, NOTES ON THE ARAPAHOE INDIANS.

C. H. Judd, PRACTICE IN VISUAL PERCEPTION.

E. L. Thorndike, ORIGIN OF HUMAN INTELLECT.

R. S. Woodworth, VOLUNTARY CONTROL OF THE FORCE OF
MOVEMENT.

Professor Eberhardt Fraas, of Stuttgart, a corresponding member of the Academy, was introduced by Professor Osborn and briefly addressed the meeting.

In Mr. **Kroeber's** paper the social and ceremonial organiza-

tion of the Arapahoe Indians was compared with that of other Plains Indians. On superficial examination various tribes appear to be organized according to identical principles, but fuller knowledge generally reveals differences among the similarities. From this it was concluded that such terms as gens, band, age-fraternity, and dance-society have no stable or exact meaning, and hence little descriptive value, detailed information being the great desideratum.

Professor **C. H. Judd** reported an experimental study in PRACTICE IN VISUAL PERCEPTION. It is a generally recognized fact that an illusion grows weaker as the observer becomes more familiar with it. A quantitative determination of the disappearance of the illusion seen in the Muller-Lyer figure was the subject of the paper. Two series of results were reported, one from an observer who did not know that the illusion would disappear, and did not discover that it was disappearing. In both cases the illusion disappeared in about 1,000 observations. The curves of practice differ in form and show many details of effects of pauses. In the case of the first observer the effects of the practice gained in the first series was easily marked in all the additional series which were performed with other figures, and with other positions of the first figure. In the case of the second observer the effect of the practice was in some cases positive, but in one case it was so decidedly negative that it exaggerated the illusion and prevented any disappearance of it through a series of 1,500 observations.

Professor **E. L. Thorndike**, in a paper discussing the ORIGIN OF HUMAN INTELLECT, proposed as a working hypothesis that the development of ideation and rational thinking in the human species was but an extension of the typical animal form of intellect. He defended this hypothesis by showing that mere increase in the number, delicacy, and complexity of associations between sense-impressions and impulses might give concepts, feelings of relationship and association by similarity as secondary results, that in the human infant this seems to occur, and that down through the vertebrate phylum a clear evolution of the associative processes along these lines could be traced.

The last report of the evening was by Dr. **R. S. Woodworth**, on the VOLUNTARY CONTROL OF THE FORCE OF MOVEMENT. By recording simultaneously the force of a blow struck by the hand and the extent of the movement preliminary to the blow, it is possible to see how far the force is dependent on the extent. The results showed a certain degree of correlation between the two, but comparatively a slight degree. The inference was that the force of the movement was only partially and loosely dependent on the extent, and that the control and perception of the force of a movement were in some measure direct and independent functions.

R. S. WOODWORTH,
Secretary.

BUSINESS MEETING.

MAY 6, 1901.

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

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

In the absence of the Recording Secretary Dr. F. L. Tufts was appointed Recording Secretary *pro tem*.

The Recording Secretary was authorized to cast a favorable ballot for the Academy in reference to the following recommendation from the Council:

"Voted to recommend to the Academy the election of Franz von Leydig, of Würzburg, Germany, as an Honorary Member of the Academy."

Voted, on motion of Professor Wilson, that the Academy send the following message of congratulation to Professor Leydig:

"The New York Academy of Sciences extends to Professor Franz von Leydig many hearty congratulations on the occasion of his eightieth birthday. In offering to Professor Leydig an election to Honorary Membership the members of this Academy desire to express their appreciation of his long-continued

services to science and of the profound and lasting influence that his memorable researches have exerted on the progress of zoology. With all best wishes they send him a cordial greeting from America."

President Woodward presented the accompanying minute respecting the death of Professor Henry A. Rowland, which was adopted and ordered incorporated in the minutes of the Academy.

Adjourned.

F. L. TUFTS,
Recording Secretary,
pro tem.

PROFESSOR HENRY A. ROWLAND.

The committee appointed to prepare a minute respecting the death of Professor Henry A. Rowland, would respectfully submit the following report :

The last half of the nineteenth century is remarkable as a period of great discoveries and advances in the mathematico-physical sciences. It is especially noteworthy for extraordinary progress in the theories of light, electricity, magnetism and thermodynamics. Soon after 1850 the phenomena of these intimately related theories were seen to unify themselves under the recently established doctrine of energy ; and almost every application of this doctrine in the fields of those theories yielded a rich harvest of results.

Many distinguished names fall in the list of those who contributed to the advances of this period. Naturally, most of the pioneers, like Helmholtz, Joule, Clausius, Henry and Kirchhoff, have passed over to the silent majority. But a singular fatality has attended the most eminent followers of the earlier workers. Thus, within less than a quarter of a century, science has not only lost the distinguished Maxwell and his brilliant disciple Hertz, but is now called upon to deplore the untimely deaths, within a few weeks of one another, of the equally eminent physicists Fitzgerald and Rowland.

Professor Henry Augustus Rowland, an Honorary Member of the New York Academy of Sciences since 1900, was born at Honesdale, Pa., November 27, 1848. His death occurred at

Baltimore, Md., April 16, 1901. His early academic studies were pursued at the Rensselaer Polytechnic Institute, from which he was graduated with the degree of Civil Engineer in 1870. After a brief career as a teacher at Wooster College and at Rensselaer Institute he became connected with the Johns Hopkins University. Appointed professor of physics in that institution in 1876, he devoted the remainder of his life to the work of instruction and investigation in mathematical physics. In both lines of work he set and maintained a high standard. His laboratory speedily came to be recognized as a source of fundamental knowledge; and a number of the researches carried out therein by him and his pupils are amongst the most noteworthy of the nineteenth century. Of these, especially important are his determination of the mechanical equivalent of heat, and his analysis of the solar spectrum by aid of his incomparable concave diffraction gratings. The skill and success with which he executed these investigations give him rank along with the ablest experimenters and theorists of his time.

Professor Rowland was devoted to science with rare fidelity and tenacity of purpose. No baffling obstacles discouraged him in the pursuit of truth. He was animated by a high ideal. "But for myself," he said in one of his addresses, "I value in a scientific mind most of all that love of truth, that care in its pursuit, and that humility of mind which makes the possibility of error always present, more than any other quality. This is the mind which has built up modern science to its present perfection. . . . It is the only mind which appreciates the imperfections of the human reason and is thus careful to guard against them. It is the only mind that values truth as it should be valued and ignores all personal feeling in its pursuit." These words explain at once his personal character and his course in life. With unflagging industry he consecrated his talents and his strength to the attainment of his ideal of the scientific mind.

R. S. WOODWARD,
Chairman.

SECTION OF ASTRONOMY PHYSICS AND
CHEMISTRY

MAY 6, 1901.

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

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

The following program was then offered :

C. B. Warring, WHAT THEOLOGY OWES TO MODERN SCIENCE.

C. C. Trowbridge, A DIFFERENTIAL ASTATIC MAGNETOMETER SUGGESTED BY PROFESSOR ROOD.

SUMMARY OF PAPERS.

The paper by Mr. **C. B. Warring** was a very interesting interpretation of the story of the creation, as found in Genesis, in the light of modern scientific theories. The author defended the thesis that the order of events given in the first chapter of Genesis did not necessarily contradict the order assumed by modern science.

The paper was followed by a very interesting discussion.

The essential part of the magnetometer described by Dr. **C. C. Trowbridge**, is the suspension system, which consists of two groups of small magnets set 23 cm. apart, and rigidly connected by a fine glass fibre. The system is suspended by a single raw silk fibre 10 cm. long. By making the polarity of the two groups of magnets opposite, a system that is approximately astatic is obtained.

The object of the arrangement employed is partly to annul the effects of distant magnetic disturbing influences, such as those that arise from trolley-car motors, etc., and partly to obtain a sensitive system, acting on the differential principle.

A magnet placed within a meter of the instrument and outside the neutral plane between the two groups of magnets acts strongly on the nearest group, producing a deflection of the system. The instrument was used in relative determinations of magnetic movements.

Mr. Trowbridge also gave a preliminary note on some experiments conducted by him on the influence of liquid air temperatures on the magnetization of steel and iron.

Adjourned.

F. L. TUFTS,
Secretary.

SECTION OF BIOLOGY

MAY 13, 1901.

Section met at 8:15 P. M., Professor C. L. Bristol presiding. The minutes of the last meeting of Section were read and approved.

The following program was then offered:

R. Weil, A CONTRIBUTION TO THE PROBLEM OF THE EAR-BONES.

A. G. Mayer, ON THE VARIATION OF SNAILS OF THE GENUS *Partula* IN THE VALLEYS OF TAHITI.

O. S. Strong and **C. E. Doran**, A CASE OF UNILATERAL ATROPHY OF THE CEREBELLUM

SUMMARY OF PAPERS.

Dr. **Weil's** paper was a critical discussion of the theory of the ear-bones, as embodied in the recent articles of Gaupp and Kingsley. Two main contentions were considered: First, that the malleus and incus of mammalia were homologous with the quadrate and articular of lower forms, while the temporo-maxillary articulation is a new formation; second, that the ossicles of mammalia cannot possibly have descended from those of Sauropsida. The first contention is based upon the embryonic connection of malleus and incus with the Meckelian bar, upon the embryonic situation of the last anterior to the Eustachian tube, and upon the innervation of the muscle of the malleus by a branch of the trigeminus. Embryonically, however, the malleo-incudal complex, in addition to its continuity with the Meckelian bar, arises from the auditory capsule, which contributes to both malleus and incus, the stroma of the tympanic cavity, con-

tributing to the manubrium mallei, and a membrane bone which forms the Fallopian process. Furthermore, as Gegenbaur points out, the continuity of malleus and incus, if they be the quadrate and articular, is itself in contradiction to the independent embryonic origin of these elements in the lower forms. The pretrematic origin of the ossicles in the pig, as described by Kingsley, is contrasted with their posttrematic, or hyoidean, origin in lower forms. Dr. Weil stated that his studies of a full series of pig and opossum embryos did not enable him to decide whether the malleus, and still more, the incus, lay primarily in front or behind the tube. The bones cross the anlage of the tube in a transverse direction, lying above it; by the gradual absorption of the intervening stroma they come to occupy the cavity of the tympanum. Finally, the innervation of the tensor tympani muscle of the malleus by a branch from the otic ganglion of the trigeminus is taken to indicate the relation of the malleus to the mandibular arch. But lesions of the trigeminus at its root do not involve hearing, while the contrary is true of lesions of the facial. This fact would point to the origin of the above-mentioned nerve from the seventh nerve, and would make the malleus a part of the second arch. The second contention is supported, first, by the difference in the embryonic relations of the bones to the Eustachian canal, an argument already considered, and second, by the differences in the relations of the chorda tympani nerve, which in Sauropsida crosses *above* the chain, and in mammalia *below* it. The speaker showed that the pathologists, from a comparison of a large number of lesions of the trigeminus and of the facial at the base of the brain, had demonstrated the exit of the chorda tympani in man with the roots of the former. But since it leaves the brain in lower forms with the seventh, its relations to bony structures are evidently not sufficiently constant to constitute a criterion of homologies. From these facts, it would appear that the homology of malleus and incus with the quadrate and articular has not yet been demonstrated.

Dr. **Mayer** showed that the snails in question are subjected to conditions of isolation very similar to those affecting the Achatinellidae of Oahu in the Hawaiian Islands, occurring in

valleys which are separated by comparatively barren ridges. The farther apart the valleys, the less intimate is the relationship beneath their snails. Although geographical isolation is probably the chief factor in determining the establishment of definite varieties, yet the differing environmental conditions obtaining in each valley may exert considerable influence.

Dr. **Strong** presented a preliminary report, illustrated by lantern slides, upon a case of unilateral atrophy of the cerebellum in a child which lived to the age of three years and four months. The principal external anomalies noted were the following: the left hemisphere of the cerebellum was almost entirely absent; the right olive was wanting and the transverse pontile fibres on the left side were deficient; the left half of the pons protruded more than the right; the right crus cerebri was much narrower than the left; the left restiform body was smaller than the right, and the superior cerebellar peduncle of the left side was deficient; the posterior corpora quadrigemina were asymmetrical, while the left anterior corpus quadrigeminum was apparently lacking; the median line of the fourth ventricle was curved with its convexity toward the left, and such structures of the medulla as the clava, cuneus, ala cinerea, and eminentia teres were located or extended further cephalad on the left side than on the right. Preliminary transverse sections cut at various levels through the medulla, pons, isthmus, and posterior corpus quadrigeminum showed the following points: only small parts of the right olive and left corpus restiforme were present, and there was a corresponding deficiency of the cerebello-olivary fibres; the transverse pontile fibres on the left side were reduced, but the nuclei pontis were larger on the left side; the longitudinal pontile fibres were deficient on the right, as shown by the smaller crus cerebri of this side; the left lemniscus was the smaller, and the left superior cerebellar peduncle was reduced. Other deficiencies were noted, which, however, require further study. Full discussion of the case was postponed, as the research is as yet uncompleted.

HENRY E. CRAMPTON,
Secretary.

SECTION OF GEOLOGY AND MINERALOGY

MAY 20, 1901.

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 then offered :

William D. Matthew, CONDITIONS OF DEPOSITION OF THE FOSSIL MAMMAL BEDS OF THE WEST.

Richard E. Dodge, THE TOROWEAP VALLEY IN ARIZONA.

THEODORE G. WHITE,
Secretary

BUSINESS MEETING.

OCTOBER 7, 1901.

Academy met at 8:25 P. M., President Woodward presiding.

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

The President, in welcoming the Academy to its new quarters, and its new year's work, emphasized particularly the necessity of increasing the number of our members, and suggested the possibility of holding joint meetings of the several sections occasionally, for the purposes of discussing subjects of mutual interest.

The Secretary reported from the Council that a letter of congratulation had been sent to Professor Rudolf Virchow, of Berlin, on the occasion of his eightieth birthday.

Adjourned.

RICHARD E. DODGE,
Recording Secretary.

SECTION OF ASTRONOMY, PHYSICS AND CHEMISTRY.

OCTOBER 7, 1901.

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

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

The meeting was devoted to the presentation of reports of summer work by members.

SUMMARY OF PAPERS.

Professor **William Hallock** reported that he had tried and failed to secure permission of the Calumet and Hecla Company to make measurements of underground temperatures in their shaft at Keweenaw Point. He gave a brief review of the report upon underground temperatures rendered to the British Association at their Glasgow meeting (1901)

Professor Hallock also described a new and very simple form of wired musical instrument which he found on sale at the Buffalo Exposition. The instrument was operated by blowing through the nose, and the mouth cavity of the operator acted as the resonance chamber. The tone quality of the instrument was very similar to that of a flute. One of the instruments was exhibited before the Section.

Professor **J. K. Rees** reported that the Astronomical Department of Columbia University had recently received from the Lick Observatory a number of star photographs which were to be measured for the determination of parallax.

Professor **Harold Jacoby** reported upon some photographs of stars near the celestial poles, which had been received by the Astronomical Department of Columbia.

Professor **R. S. Woodward** reported the results of an investigation he had carried on upon the effects of secular cooling and meteoric dust on the length of the terrestrial day. His investigation showed that, due to secular cooling, the length of the day will not change or has not changed as the case may be, by so much as a half second in the first ten million years after the initial epoch, and that the total effect from secular cooling will accrue before the effect from meteoric dust will begin to be appreciable.

Professor **Doremus** gave a brief account of the research laboratory in chemistry which had been lately established at Schenectady, N. Y.

Adjourned.

F. L. TUFTS,
Secretary.

SECTION OF BIOLOGY

OCTOBER 14, 1901.

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

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

The evening was devoted to the presentation of reports on summer work by members.

SUMMARY OF PAPERS.

Professor **E. B. Wilson** described his work carried during the early part of the summer at Beaufort, N. C., where he had been successful in making further observations upon the fertilization phenomena in living sea-urchin eggs treated with various chemicals. Professor Wilson spoke also of the meeting of the International Congress of Zoologists at Berlin, which he had attended as a representative of the Academy, and where he had acted as Chairman of the Section on Experimental Biology. It was before this section that papers of the greatest interest were presented by Driesch, Bütschli, Roux, Ziegler, and many others.

Professor **Bashford Dean** told of some of the results he had obtained during his work in Japan of more than a year. Special endeavors were made to obtain embryological material of the important shark-types *Cestracion*, and *Chlamydosclachus*. In eggs of the former, there appeared to be a series of cleavage planes in the yolk, extending out from the blastoderm proper. Some *Chlamydosclachus* material was obtained. A new hag-fish, intermediate in gill-characters between *Bdellostoma* and *Myxine*, together with a new *Chimæra*, was found in deep water.

Professor **F. S. Lee** reported briefly upon a research recently made in his laboratory by Dr. William Salant upon the action of alcohol on muscle. The details of this work will be communicated by the Academy later. Professor Lee then gave an account of the Fifth International Physiological Congress which was held at Turin in September.

Dr. **H. R. Linville** described the location and work during the

summer of the Dominion of Canada laboratory at Canso, Nova Scotia, which is under the direction of Professor Prince. Many investigators were in attendance, among them Professor Ramsay Wright, of Toronto. Dr. Linville's work, upon the natural history of annelids, was continued later at Woods Holl.

Dr. **G. N. Calkins** reported upon the work at the Woods Holl station of the United States Fish Commission, in charge of the Scientific Director, Dr. Hugh M. Smith. Dr. Calkins' work consisted of a survey of the protozoa of the waters of the station, and also included a continuation of his experiments upon senile degeneration in *Paramecium*. A paper on this subject will be presented at an early date.

Professor **F. E. Lloyd** spoke of his cytological studies carried on during the spring in Strasburger's laboratory at Bonn. A series of botanizing trips in Germany and Switzerland was also described, as well as the meeting of the International Congress of Botanists at Geneva.

Mr. **J. C. Torrey**, who spent the summer at the Beaufort, N. C., station of the U. S. Fish Commission, reported a successful season. He obtained a further series of the eggs of *Thalassoma*, enabling him to carry forward his work upon the cytogeny of this form.

Dr. **A. G. Mayer** described the results of dredgings in the waters of Massachusetts Bay carried on by him, with Dr. Gerould of Dartmouth. Besides collecting considerable museum material for the Brooklyn Institute, he obtained extensive data bearing upon variation in star fishes.

Mr. **W. E. Kellicott** spoke of the summer's work at the Cold Spring Harbor laboratory, where he had been a John D. Jones scholar. A good attendance was reported.

Professor **C. L. Bristol**, who had again conducted the work of the N. Y. University Laboratory at Bermuda, described an interesting change in the distribution of many species as the result of a protracted winter's storm. Forms previously scarce or absent from the shores of the bay near the laboratory appeared this summer in profusion, while large areas of the exposed reefs, or "flats" were swept bare.

Professor **Crampton** reported a good season at the Marine Biological Laboratory at Woods Holl. The classes were well attended, and a goodly number of investigators were present. A brief statement was made regarding the survey of the invertebrate fauna of Long Island, carried on during the spring and summer by the Columbia Department of Zoology, with funds given by an anonymous donor for the purpose. A station was established at Bay Shore, favorably situated on Great [South Bay opposite the Fire Island Inlet from the open ocean. Among the numerous forms obtained, a large *Balanoglossus* and a fine *Clymenellid* were of special note.

Mr. **C. W. Beebe** described his attempts to rear various birds at the Bronx Zoological Garden. Many interesting observations were made on the length of time which might elapse after egg-laying without rendering the eggs incapable of incubation, with a view to the possible importation of eggs of rare foreign birds.

HENRY E. CRAMPTON,

Secretary.

SECTION OF GEOLOGY AND MINERALOGY.

OCTOBER 21, 1901.

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.

In calling the meeting to order the Chairman spoke of the sudden death during the summer of Dr. T. G. White, Secretary of the Section, and of the death of Professor Joseph LeConte, Corresponding Member of the Academy.

Dr. E. O. Hovey was elected Secretary of the Section and Professor R. E. Dodge, Secretary *pro tem.*, owing to the absence of Dr. Hovey.

A committee consisting of Professor Stevenson and Professor Kemp was appointed to draw up suitable minutes in reference to the deaths of Dr. White and Professor LeConte.

PROGRAM.

A. W. Grabau, RECENT CONTRIBUTIONS TO THE PROBLEM OF NIAGARA. Illustrated.

J. F. Kemp, A NEW ASBESTOS REGION IN NORTHERN VERMONT. NOTES ON THE PHYSIOGRAPHY OF LAKE GEORGE.

SUMMARY OF PAPERS.

Mr. **Grabau** said that Davis has shown that the topography of the Niagara region conforms to the type generally found in ancient coastal plains, the original features of which have been more or less modified by subsequent warpings, and by glacial erosion and deposition.

The Niagara escarpment is the inflexure of the Niagara cuesta, traceable through the Indian peninsula and Grand Manitoulin Island. The Ontario lowland is continued in the Georgian Bay lowland. A second cuesta—the Onondaga—has its inflexure slightly developed north of Buffalo, but becomes prominent in the Lake Huron valley, where its inner lowland forms the deeper part of the lake. The third cuesta and lowland (the Erie) occurs north of the second.

The Tertiary drainage is supposed to have been to the southwest, instead of the northeast, as Spencer holds. The principal streams of that time are supposed to have been (1) the Saginaw—whose path is indicated in part by Saginaw Bay and the deep channel between the Indian peninsula and Grand Manitoulin Island; (2) the Dundas, breaching the Niagara cuesta at Hamilton, Ont., and crossing the Erie lowland near Fort Stanley, and (3) for a time, at least, the Genesee, though this may later have had a northward course. The subsequent streams tributary to these consequents carved the various lowlands. St. David's Channel is regarded as an obsequent stream, which was accidentally discovered by the Niagara. The whirlpool gorge was probably, in part, the southward continuation of this stream, and not wholly postglacial.

Mr. Grabau's paper was discussed by Professor **Dodge** and Dr. **Julien**.

In speaking of the new asbestos region in northern Vermont,¹ Professor **Kemp** said that asbestos had recently opened up on a commercial scale in the towns of Eden, Lamoille county, and Lowell, Orleans county, Vt. The towns are adjacent, though in different counties. The asbestos lies from 15 to 25 miles north of Hyde Park, a station on the St. Johnsbury and Lake Champlain R. R. As is quite invariably the case, it occurs in serpentine, either in veins, or in matted aggregates along slickensided blocks. The serpentine where the best fibre is found lies on the south shoulder of Belvedere mountain, and forms an east and west belt. It is bounded on the north and west by hornblende schist, which forms the summit of the mountain. The contact on the west is a visibly faulted one, and that on the north is probably also of the same sort, because the hornblende-schist rises in a steep escarpment.

The serpentine seems to have been derived from enstatite, since unaltered nuclei of this mineral are found in it. The vein of asbestos ranges from a fibre of microscopic length up to $\frac{3}{4}$ of an inch as thus far exposed. It is fine and silky and of excellent grade. It would, however, be classed as second grade according to the Canadian practice, which makes a first grade of fibre above $\frac{3}{4}$ of an inch (about $2\frac{1}{2}$ in. being the maximum), and a second grade of $\frac{3}{8}$ in. to $\frac{3}{4}$ in. All below this and all fibre not vein-fibre goes to the mill and is mechanically separated, as the third grade. In the Vermont localities the slip fibre is exposed on the property of the New England Co., and of its neighbor the American Co. The vein fibre is limited, so far as yet opened up, to the property of Mr. M. E. Tucker and associates.

It is difficult with the data in hand, which were gathered under the direction of Dr. C. W. Hayes, of the U. S. Geological Survey, to trace the geological history of the serpentine, but it must have been originally either an igneous pyroxenite, or a richly magnesian siliceous limestone. There are such slight traces of calcium-bearing minerals, however, that the former supposition has the greater weight. The hornblende schist con-

¹ Communicated by permission of the Director of the U. S. Geological Survey.

sists of common green hornblende and of an unusual amount of titanite, there being little less than those two present.

Physiography of Lake George.—Observations extending over several years have suggested the following conclusions. Lake George occupies a submerged valley very similar to many others in the Adirondacks, which are not submerged. The valley has been largely produced by faulting, and the fault-scarps still remain in precipitous cliffs, whose sharpness has not been much affected by weathering and erosion. Before the Pleistocene, the valley was probably a low pass with both a north and a south discharge. The portion rich in islands near Pearl Point, and the Hundred Island House, was probably the divide, and the islands represent the old hillocks near the top of the divide. At the south the water is backed up by sands and morainal matter in the valleys on each side of French Mountain, viz., at the head of Kattskill Bay, and at Caldwell. On the north they are held in by Champlain clays and syenitic gneiss at the Ticonderoga outlet, and probably by morainal material at the low pass just south of Rogers Rock and leading out to the very depressed Trout brook valley, just west of Rogers Rock and Cook Mountains. Trout brook is now as much as a hundred feet lower than Lake George at points south of the Ticonderoga barrier. The northern barrier is rock because the Ticonderoga river passes through a narrow and shallow channel in the exposed ledges a mile south of its actual first waterfall. There is a broad flat valley buried in clays, however, beneath which an old channel may lie submerged. At the same time, the marked depth of the Trout brook valley to the west makes this the natural outlet and there is reason to believe from the general topography that the discharge passed north into the Champlain valley near the south boundary of Crown Point. It is also not to be overlooked that a valley with much drift leads eastward to Lake Champlain, from the head of Mason's Bay.

A curious feature that is common to both shores of the lake north of Sabbath Day point (and perhaps also south of it), is the presence of pot holes of great perfection and as high at times as 30 feet above the present level of the lake. These are best

developed on Indian Kettles point, about two miles north of Hague. They were doubtless excavated by lateral or subglacial streams when the ice filled the lake valley, because in no other conceivable way could flowing water be forced into such unnatural situations.

There is great need of a good hydrographic survey of the lake, and of detailed pilot charts, with soundings. They would be of great service, not alone to navigators, but to science as well. So far as could be learned from local fishermen, whose deep trolling for lake trout gives them familiarity with the bottom, there appear to be channels whose general trend is parallel with the long dimension of the lake, and which have precipitous sides, precisely like the valleys and gulches now visible. The lake is relatively shallow as compared with Lake Champlain. In Lake George the greatest depth is believed to be near Anthony's Nose, and to reach 190 feet. Elsewhere the deep parts are placed at about 100 feet, more or less. All this, however, requires confirmation by soundings and with regard to the physiography one cannot say to what extent the bottom of the valley has been filled by drift, but the islands to which physiographic importance has been given by the speaker are rock.

Professor Kemp's first paper was discussed by Dr. **Julien** and Dr. **Martin**; the second by Dr. W. P. **Northrup**, Professor **Dodge** and Dr. **Julien**.

Adjourned.

RICHARD E. DODGE,
Secretary, pro tem.

SECTION OF ANTHROPOLOGY AND PSYCHOLOGY.

OCTOBER 28, 1901.

Section met at 8:25 P. M., Professor Livingston Farrand 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 :

J. McK. Cattell, PSYCHOLOGY AT THE DENVER MEETING.

G. G. McCurdy (Yale), ANTHROPOLOGY AT THE DENVER MEETING.

Franz Boas, ANTHROPOLOGY IN BERLIN.

H. H. St. Clair, 2nd, REPORT OF FIELD WORK IN WYOMING AND OREGON.

William Jones, REPORT OF FIELD WORK IN IOWA AND OKLAHOMA.

SUMMARY OF PAPERS.

Professor **J. McK. Cattell** made a brief report regarding psychology at the Denver meeting of the A. A. A. S.

Professor **G. G. MacCurdy**, of Yale University, reported on anthropology at that meeting, and in addition described the explorations that are being carried on in the Mesa Verde of southwestern Colorado by the Colorado Cliff Dwellings Association.

Professor **Franz Boas** described the facilities for anthropological study in Berlin, as observed by him in a recent visit. Within the last 20 or 30 years, the anthropological equipment of Berlin has progressed enormously. The museum now contains better East Indian collections than can be found in England; and it is strong in nearly all departments, notably so in American and especially South and Central American anthropology. Fifty scientific workers are engaged on these collections, and 16 of these are at work on American subjects. Besides the museum, there are several other institutions in Berlin, such as the Anatomical Institute of Waldeyer and the Pathological Institute of Virchow, in which anthropological work is done.

The leader of German anthropology is Virchow. He disbelieves in the study of the variation of the whole body, and insists that only the study of the variation in the individual cells of the body can lead to fruitful results.

H. H. St. Clair, 2d, reported observations made last summer among certain Indian tribes in Wyoming and Oregon.

William Jones also reported observations made during the past summer. The work of Mr. Jones was carried on among

the Sauks and Foxes, a people of Algonquin stock. One band of this people is located in central Iowa, and another in Oklahoma. Both bands practice similar customs, live in much the same way, wear the same kind of dress, show similar physical types, and, with the exception of certain differences in idiom, and with the exception that the Iowa band have a slower, more deliberate pronunciation, they speak the same tongue. The Iowa band is the more conservative, and among them the law of the clans still holds. The education of the children is accomplished not by instruction but by imitation. The older boys imitate the men, and the younger boys imitate the older ones; and similarly with the girls. The life of the children is but a smaller edition of the life of the older people.

Adjourned.

R. S. WOODWORTH,
Secretary.

BUSINESS MEETING.

NOVEMBER 4, 1901.

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

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

Dr. F. L. Tufts was elected Secretary *pro tem*.

The Secretary reported from the Council as follows

1. That in accordance with the Constitution, notice is given that at the December meeting there will be an election of a Councilor to fill the vacancy caused by the resignation of Professor Judd.

2. That the Council had voted to cooperate with the Ethnological Society in extending a cordial invitation to Professor A. C. Haddon, of Cambridge University, England, to deliver a lecture before the Academy and the Ethnological Society at some early date in December.

3. That Professor Franz Boas has been appointed representative of the Academy on the general committee for the 13th International Congress of Americanists.

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

Amadeus W. Grabau, Ph.D., Columbia University

Charles Holt, 255 West 45th Street.

Professor E. A. Lough, School of Pedagogy, N. Y. University

Professor Robert MacDougal, School of Pedagogy, N. Y. University.

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

F. L. TUFTS,

Recording Secretary,

pro tem.

SECTION OF ASTRONOMY, PHYSICS AND CHEMISTRY.

NOVEMBER 4, 1901.

Section meets at 8:15 P. M., Professor William Hallock presiding.

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

The following program was then offered :

S. A. Mitchell, REPORT OF THE RECENT ECLIPSE EXPEDITION TO SUMATRA.

William Hallock, A REVIEW OF THE REPORT OF THE BRITISH ASSOCIATION COMMITTEE ON UNDERGROUND TEMPERATURES.

L. Boroscsek and **F. L. Tufts**, A STUDY OF THE ABSORPTION OF LIGHT BY DYES OF THE FLUORESCEN GROUP.

SUMMARY OF PAPERS.

The account of the Eclipse Expedition to Sumatra was illustrated by lantern slides showing the arrangement of apparatus at the several stations. The paper is published in full in a current number of *Science*.

Professor **Hallock** gave an account of some of the recent determinations of underground temperatures. This paper is also published in full in *Science*.

Dr. **L. Boroschek** gave an account of some work he had undertaken in connection with Dr. **Tufts** on the absorption of light by some dyes of the fluorescein group. The dyes studied were fluorescein and a number of its nitro-derivatives.

It was stated that Hewitt and Perkins (*Journal Chem. Soc.*, 1900, page 1324) claim that a double symmetrical tautomerism furnishes a satisfactory explanation for the fluorescence of Fluorescein, and that in the case of dinitro and tetranitro fluorescein this tautomerism is inhibited by a secondary tautomerism between the nitro and hydroxyl groups when in ortho position to each other. It was found that the mono-nitro-fluoresceins, obtained by us by condensing the 3-nitro and the 4-nitro-phthalic anhydrides with resorcin, in which the nitro group is on a different benzol nucleus from the hydroxyl groups show no fluorescence in alkaline solutions. According to the theory of Hewitt and Perkins alkaline solutions of such dyes should fluoresce.

Photographs of the absorption spectra of alkaline solutions of the dyes were taken and it was found that the substitution of nitro groups displaces the prominent absorption band of fluorescein toward the red end of the spectrum and increases the absorption in the ultra violet.

The absorption of light in the visible spectrum was studied by means of the flicker photometer. The amount of light transmitted by equal thicknesses of solutions of different concentrations was measured for the various dyes. A relation was thus obtained between the absorption of light and the concentration of the dye. The work is still in progress.

F. L. TUFTS,
Secretary.

SECTION OF BIOLOGY

NOVEMBER 11, 1901.

Section met at 8.15 P. M., Professor C. L. Bristol presiding.

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

The following program was then offered :

H. F. Osborn, DOLICHOCEPHALY AND BRACHYCEPHALY AS
DOMINANT FACTORS IN THE SKULLS OF MAMMALS.

F. E. Lloyd, TETRAD-FORMATION IN THE RUBIACEAE.

SUMMARY OF PAPERS.

Professor **Osborn** stated that the proportions of the skull in the lower mammals are no less distinctive than in the races of men. Although confined to the cranium in anthropology, the principles of dolichocephaly, mesaticephaly, and brachycephaly could be applied to the skull (*i. e.*, cranium plus face), and are found to illuminate the whole morphology of the skull and teeth, and in many cases the correlation with other parts of the skeleton. Dolichopodal and dolichocephalic, brachypodal and brachycephalic types are frequently but not invariably correlated, the numerous instances of non-correlation being due to exceptional adaptations in feeding. Apart from its relation to foot structure, skull proportion is, in evolution, progressively in one direction or the other, and is the underlying cause of hundreds of cranial and dental characters which have hitherto been described by comparative anatomists without appreciation of their true significance. The generalization was first made by the speaker among the rhinoceroses, was subsequently found to apply with equal force to the Titanotheres, and many other ungulates, ungululates, and primates.

Professor **Lloyd** gave an account of the so-called tetrad divisions of the mother cells of the pollen and embryo-sac, in *Crucianella* (2 species), and *Asperula* (1 species). Briefly stated, these divisions are heterotypic and homotypic in the sense of Flemming and Strasburger. The pollen and embryo-sac divisions are homologous. In *Crucianella* all the megaspores undergo the first embryo-sac mitosis.

HENRY E. CRAMPTON,
Secretary

SECTION OF GEOLOGY AND MINERALOGY

NOVEMBER 18, 1901.

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

The following program was offered :

J. F. Kemp, THEODORE G. WHITE (Obituary).

J. J. Stevenson, JOSEPH LE CONTE (Obituary).

E. O. Hovey, NOTES ON THE TRIASSIC AND JURASSIC STRATA OF THE BLACK HILLS OF SOUTH DAKOTA AND WYOMING.

A. A. Julien, EROSION BY FLYING SAND ON THE BEACHES OF CAPE COD.

On motion it was unanimously voted by the Section that the obituary notices of Messrs. White and LeConte be referred to the Council for printing in the *Records* of the Academy.

SUMMARY OF PAPERS.

Theodore Greeley White, Secretary of the Section of Geology and Mineralogy, in this Academy, passed away after a brief illness on the seventh of July, 1901. The announcement that one who was just entering upon the full exercise of his powers had fallen came to his friends with all the shock of a sudden bereavement. It is difficult to realize, even at this day, that one who had long been a faithful worker in this Academy is no more.

Mr. White was born in New York, August 6, 1872, and therefore lacked just a month of completing his twenty-ninth year. He was the only child of his parents, both of whom he had but recently lost. He fitted for college at the Columbia Grammar School, entered the School of Mines in the course in geology and palæontology in October, 1890, and received his degree of Ph.B. in June, 1894. He immediately registered for graduate work at Columbia, as a candidate for M.A., and received the degree in 1895. He continued his studies for Ph.D., and obtained it in 1898. He was appointed assistant in the Department of Physics in 1896, and held the position until 1900, being especially in charge of the experimental work in

optics. The organization of this particular laboratory at the new site of Columbia largely fell to him, and in the work he displayed administrative abilities which won for him the warm commendation of his superiors.

As a boy Dr. White early manifested a special interest in natural science, and was an earnest worker in a chapter of the Agassiz society, which made its headquarters in the parish house of Dr. Mottet's church, and from which have been recruited several of our vigorous younger workers in science. While an undergraduate, he began investigations both geological and botanical. His Ph.B. thesis was a description of the geology of Essex and Willsboro, towns on Lake Champlain, and was published in our *Transactions*, XIII., p. 214. His work led him to take up the study of the faunas of the Trenton in the Champlain valley for his doctorate. In the end he studied them not alone in this district, but all around the Adirondack crystalline area. He also carried on work for the State Museum under the direction of Dr. F. J. H. Merrill. In association with Professor Crosby, of the Massachusetts Institute of Technology, he described the petrographical characters of the Quincy granite. His complete work upon the Trenton remains to be issued as a posthumous paper.

Dr. White was a man of indefatigable industry and of great perseverance. Besides his efforts in geology, he had a number of additional undertakings in hand. He was especially interested in the parish work of the church with which he was connected (Church of the Holy Communion, Rev. Dr. Mottet, Rector, 6th Avenue and 20th St.), and the past spring he made up his mind to devote himself to a life-work among its young men. He was largely instrumental in founding Gordon House, a club house and centre of interest for them, and to it he has bequeathed his estate. Indeed, during an excursion to the neighboring seashore with his young men friends in the club, he became exhausted while bathing in the salt water, and took a cold, which developed into pneumonia, and caused his death after a brief illness. He has left a large circle of sincere and devoted friends, who can with difficulty reconcile themselves to his loss.

Joseph LeConte was born in Liberty County, Georgia, February 26, 1823, and died in Yosemite Valley, California, June 6, 1901. He was descended from Guilleaume LeConte, a Huguenot, who left Rouen, France, in 1685, and settled near New York City. Louis LeConte was a distinguished naturalist who was graduated from Columbia College, New York, in 1800, and soon afterward went to Georgia to take charge of a plantation inherited from his father. There he married. Of his seven children, John was the fourth and Joseph the youngest. The latter, after graduating at the University of Georgia, came to New York and studied medicine, receiving his degree in 1845. He practiced medicine for only three or four years, and then went to Harvard as a special student in zoology and geology, receiving in 1851 the degree of B.S.

His original purpose was to become a zoologist, but in 1850 he accompanied Professors Hall and Agassiz on a geological excursion through the Helderberg mountains of New York. In his own words, "It was my first lesson in field-geology. The intense interest developed in my mind by the rambles, the observations, and especially the discussions between these two men, definitely determined my chief scientific work in the field of geology rather than zoology."

After graduating at Harvard, Professor LeConte accompanied Professor Agassiz during the 1851 study of the Florida reefs, and upon his return was chosen Professor of Natural Science in Oglethorpe University, Georgia. From 1852 to 1856 he was Professor of Geology and Natural History in Franklin College, and from 1857 to 1869, of Geology and Chemistry in South Carolina College. During the Civil War he was chemist of the Confederate Medical Laboratory at Columbia, S. C., as well as of the Nitre and Mining Bureau. In 1869 he was called to the chair of Geology in the University of California, which he retained until his death. A singular proof of his reputation throughout the South at the close of the war was the outburst of a Charleston journal in 1869, asserting that the election of the LeConte brothers to positions in the University of California was proof of the suspected conspiracy to cripple the South intellectually as it had been crippled materially.

Professor LeConte loved nature, he loved to wander where civilization had not destroyed its charms. In 1844, with his cousin, John L. LeConte, the entomologist, he journeyed in the northwest, travelling along the upper Mississippi more than one thousand miles in a birchbark canoe, and afterwards visited Lake Superior, piercing a region inhabited then almost wholly by Indians. In later years he spent his vacations in the Sierras, camping where he might make studies of structure. His life closed amid the scenes which had been so dear to him for more than thirty years.

Professor LeConte was a prolific writer. His early training, both as a student and as teacher, had given him a breadth of culture, which in this day of specialization is becoming too rare. He wrote upon physics, geology and psychology, making to each of these sciences contributions of capital importance. A vein of poetry runs through his papers, making his style almost unique in the scientific literature of our time. The excellence of his work was recognized at an early date, and he was elected to the American Philosophical Society before the Civil War. He was made member of the National Academy of Sciences shortly after the close of that war. He was president of the American Association for the Advancement of Science in 1892, and of the Geological Society of America in 1896.

Professor LeConte was a man of positive convictions, which were always expressed in clear-cut language, admitting of no misunderstanding. But there is reason to believe that he had not a personal enemy in the world. Of singular sweetness of disposition, unfailingly courteous in his manner, he was a welcome and honored guest wherever he went. His wholesome integrity, his conscientious devotion to accuracy, his keenness as an observer always gained for him a more than respectful hearing in discussion, even from those who remained unwilling to accept his conclusions. He is dead; but his memory will be cherished affectionately by those who were his associates in science—still more by the students of fifty graduating classes, who were privileged to listen to his lectures, and to find in him one who cared for them as for his own children.

Dr. **E. O. Hovey** gave a brief summary of the chief facts known in regard to the formation of the Black Hills, describing first the most striking features of the great Red valley; which has been formed by the comparatively rapid erosion of the Triassic beds, which are softer than the Permian limestone on the one side, and the Jurassic sandstones on the other. The Triassic beds are very variable in texture, consisting of clay-, sand- and gravel-rock; they show much strong cross-bedding, being evidently a shore deposit. They seem to have suffered much from local slipping, making a close estimate of their thickness hard to give. They are entirely destitute of animal remains. The Jurassic beds are separated from the Red beds by an unconformity due to erosion. They consist of argillaceous and calcareous shales, limestones and sandstones, but they are very variable in composition. Some of the layers contain abundant fossils, forty-six species having been reported from the formation. Apparently there are ten or twelve new species in the material collected by the author for the American Museum last summer (1901). The upper boundary of the Jurassic is still a mooted question, the beds running conformably up into undoubtedly Cretaceous, with no invertebrate fossils for hundreds of feet. The paper was discussed by Professors **Stevenson** and **Dodge** and Dr. **Grabau**.

Dr. **Julien**, in his paper on *EROSION BY FLYING SAND ON THE BEACHES OF CAPE COD*, described the physical characteristics of the beach sand of Cape Cod, and showed them to be in general derived from the Tertiary formation and from the glacial sands and gravels. The motion of the sands is from the west along the south shore, and from the north down the east and west sides of the "forearm" of the cape. The sand movement under the influence of the wind is extensive, and many results of erosion by moving sand are seen in the wearing of cliffs and in the pitted surfaces of the pebbles on the beaches.

The author showed also that the sand grains suspended in the air are subjected to rapid erosion from mutual impact, and thus that sand particles too small to be eroded in water are much comminuted when dry and set in motion in the air. The fine

resulting silt is carried and deposited as fine mud. This paper was discussed by Dr. **Grabau**.

Dr. **W. S. Yeates**, State Geologist of Georgia, being present as a visitor, the chair called upon him for remarks. In response he gave a brief outline of the State Geological Surveys of Georgia, and made a short statement of the work now in hand. Remarks appreciative of the difficulties under which state geological surveyors often labor were made by Professors **Stevenson** and **Kemp**, and Mr. **G. F. Kunz**.

The Section adjourned at 9:30 o'clock.

EDMUND O. HOVEY,
Secretary.

SECTION OF ANTHROPOLOGY AND PSYCHOLOGY.

NOVEMBER 25, 1901.

Section met at 8:20 P. M., Professor Livingston Farrand presiding.

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

The following program was then offered:

Robert MacDougal, COMBINATION OF SIMPLE RHYTHM GROUPS IN HIGHER SYNTHESSES, AND THEIR EQUIVALENCES.

E. L. Thorndike, THE CORRELATION OF MENTAL ABILITIES.

J. Franklin Messenger, AN EXPERIMENTAL STUDY OF NUMBER PERCEPTION.

SUMMARY OF PAPERS.

Professor **MacDougal** has found that the simplest rhythmic units are always combined into larger groups, provided only the units succeed each other with sufficient rapidity. And these larger groups may be combined into others still larger—a process to which no definite limits can be set. The simplest group of rhythmic units is the pair or dipody, which appears in every rhythmic series that admits of such grouping. The means by which this coupling of the units is accomplished in poetry are: Subordination of the accent of one unit to the accent of the

other differentiation in the intervals, introduction of mid-line and final pauses, catalexis and rhyme. In any sort of rhythm that is objectively expressed, the first unit of a dipody receives the major accent, and also occupies more time than the second unit. Even in a long rhythmic series there is properly no mere reduplication of units, but each unit fulfils a unique function in the series, in virtue of which it is differentiated from all the other units, in emphasis and duration and also in its internal configuration

Professor **Edward L. Thorndike** spoke of some general aspects of the investigation which he is at present carrying on in the correlations amongst mental abilities. He found that regular correlation, where each degree of one function involves a similar degree of the other is by no means the rule in the case of mental abilities. The relationships are often extremely irregular. For instance a high degree of one ability may go with a high degree of another but all other grades may involve no similarity in the other. A single coefficient of correlation in such cases is of course an absurdity. Correlations seem more marked between complex than between simple abilities. A variation of the Pearson method was outlined, which is well adapted to work with mental correlations and especially with studies involving few cases.

As samples of his results, Dr. Thorndike demonstrated the absence of correlation between certain motor and mental tests the pronounced correlation between ability to spell and ability to notice the structure of words, the pronounced correlations between school marks in different subjects and the lesser degrees of correlation in the case of objective tests in the same subjects

Mr. **J. Franklin Messenger** outlined an **EXPERIMENTAL STUDY OF NUMBER PERCEPTION**. His experiments had reference to the so-called space threshold in tactile sensations, to the fusion of touch sensations, and to the perception of number through touch. The validity of a threshold determined only by the distance apart of the two points applied to the skin was denied, because distance is only one of the elements on which the perception is based, and often not the most important ele-

ment. The fusion of two tactile sensations was also denied because of such facts as the following, that two points, *one on each hand*, may be perceived as one point when the hands are close together.

The speaker offered a theory of the tactile perception of number. Number is not directly sensed by touch, but is inferred from various peculiarities of the tactile sensations, such as the geometrical arrangement of the stimulating objects, the distance apart of these objects, the contour of the surface stimulated—and also from the preceding sensation and the attitude of the subject.

R. S. WOODWORTH,
Secretary.

BUSINESS MEETING.

DECEMBER 2, 1901.

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 nomination of Dr. Henry E. Crampton as Councillor, to fill in the unexpired term of Professor Judd, resigned. It was voted that the Secretary be authorized to cast the ballot of the Academy for Dr. Crampton as Councillor, which was duly done.

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

Mrs. Alfred Pell, Pellwood, Highland Falls, Orange Co., New York.

Adjourned,

RICHARD E. DODGE,
Recording Secretary.

SECTION OF ASTRONOMY, PHYSICS AND
CHEMISTRY

DECEMBER 2 1901

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

The following program was then offered :

Prof. **M. I. Pupin**, ENERGY DISSIPATION IN A WEAK MAGNETIC FIELD.

Prof. **J. K. Rees** and **C. A. Post**, OBSERVATIONS OF LEONIDS
MADE AT BAYPORT L. I., from Nov. 13th to 16th inclusive.

SUMMARY OF PAPERS.

Prof. **Pupin** described an experimental investigation of the dissipation of energy in a weak magnetic field. The substance experimented on was a toroid of square cross section made up of iron plates .010 of an inch thick. The magnetizing force was supplied by a helix uniformly distributed over the core. The force applied was a simple harmonic of 1800 periods per second and its amplitude could be varied from 0 to .1 C. G. S. units. The inductance and resistance of the helix was determined in a Wheatstone bridge. The results were compared with the theory worked out by the author.

It was found that up to about .05 C. G. S. units of the magnetizing force the permeability of the iron was constant and equal to about 80, in the samples of iron employed: there was no hysteresis and the theory agreed very well with experiment. Beyond the above limit both the inductance (L) and the Foucault resistance (R) increased. The increase of R was very rapid on account of hysteresis.

When the core was magnetized by a steady force, and after the removal of the force L and R were measured, it was found that both were changed on account of the change of permeability, but within the above limits their values still agreed with the theory. Hence weak magnetizations are not accompanied by

hysteresis both when the iron is neutral and when it is already, even strongly, magnetized.

It was found that an increase in the permanent magnetization diminished the permeability and vice versa. The maximum change in permeability thus obtained was 22 per cent.

The observations of Leonids were made at Mr Post's observatory. For the purpose of photographing meteor trails four cameras were fastened to the equatorial. Exposures for known times were made on identical parts of the sky. The results showed meteor trails on the plates taken between midnight and sunrise of November 15th. A photograph was obtained of quite a remarkable meteor which appeared at 3:58 A. M. near the radiant point and exhibited a fine head and trail which remained visible for a minute or more. A lantern slide of this meteor was thrown on the screen and attention called to the peculiar details of the head and trail.

During the night of November 14th and 15th an attempt was made to count the meteors. Miss Edith Post and Miss Grenough watched the northeastern and southeastern sky; 418 meteors, of which all but a very few were well-defined Leonids were counted. Of these the greatest number was seen between 4:30 and 5:30 A. M., on November 15th, when 273 were counted.

The notes on individual meteors show that many bright Leonids fell showing trails which lasted many seconds, and extended 10 to 20 degrees.

Section adjourned,

F. L. TUFTS,
Secretary.

SECTION OF BIOLOGY.

DECEMBER 9, 1901.

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

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

The following program was then offered :

F. S. Lee and **W. Salant**, THE ACTION OF ALCOHOL ON MUSCLE.

A. G. Mayer, INSTINCTS OF LEPIDOPTERA.

H. B. Linville, THE NATURAL HISTORY OF SOME TUBE-FORMING ANNELIDS.

SUMMARY OF PAPERS.

The first paper was presented by Professor **Lee**, and consisted of an account of an investigation by the two authors jointly. The study had been carried on by very exact methods, pure ethyl alcohol being used, and isolated muscles of the frog in the normal and in the alcoholized condition being compared. It is found that the muscle which has absorbed a moderate quantity of pure alcohol will contract more quickly, relax more slowly, perform a greater number of contractions in a given time, and become fatigued more slowly than a muscle without alcohol. The effect is most pronounced in from one-half to three quarters of an hour after the liquid has begun to be absorbed, and later diminishes. Whether the alcohol exerts this beneficial action on the muscle substance itself, or on the nerves within the muscle is not yet certain. The results allow no conclusion regarding the question whether the alcohol acts as a food or in some other manner. In larger quantities its presence is detrimental, diminishing the whole number of contractions, inducing early fatigue, and diminishing the total amount of work that the muscle is capable of performing, even to the extent of abolishing the contractile power entirely. In such quantities the action is distinctly poisonous. The after-effects of either small or large doses have not yet been studied.

Dr. **Mayer** reported upon a number of experiments designed to determine the nature and duration of associative memory in lepidopterous larvæ. In one series the larvæ were placed in a wooden box divided into two compartments by means of a central partition which was pierced by a small opening. On one side of the partition was placed moist earth containing growing food plants, while on the other side of the partition there was a

barren chamber. The larvæ were placed in the latter and found their way through the opening to the food-chamber. Apparently they never learned the path to the food, but always wandered aimlessly about and never shortened their paths to the food. When the food was removed, however, they rarely entered this side of the box, showing that it was the presence of food which attracted them. Individual temperament is very well shown by the larvæ, for some quickly find the food, while others are much slower. This quickness is not due to superior intelligence, however, but is owing to the fact that these larvæ remain quiet for shorter periods of time than the slower ones. A number of experiments was made upon larvæ which devour only certain special kinds of leaves. These larvæ can be induced to eat sparingly of previously uneatable food, however, if the sap of their proper food plant be rubbed into the previously distasteful leaves. Similarly they can be prevented from devouring their proper food plant if the juices of uneatable plants be rubbed into the substance of the leaves. However, they can always be induced to bite at or devour any foreign substance if one allows the larva to commence eating its proper food plant and then slides up in front of it a distasteful leaf, sheet of paper, tinfoil, etc. The larva will take a few bites of the foreign substance but will soon draw back its head, snapping its mandibles with apparent disgust or aversion. Very soon, however, it recommences to devour its proper food in a normal manner. If the foreign substance or distasteful leaf be presented to the larva at intervals of one and one-half minutes or more, about the same number of bites is taken at each presentation, thus showing that the larva does not remember its disagreeable experience for the interval. If, however, the interval be about thirty seconds the larvæ will take fewer and fewer bites of the disagreeable leaf, and will soon refuse it altogether. Individual temperament is very apparent in the reaction of larvæ in these respects. Also when spinning their cocoons the larvæ of *Samia cynthia* and *C. promethea* are geotropic, for if the cocoon be turned upside down soon after the completion of the outer envelope, the pupæ are sometimes found reversed also, and may

thus be imprisoned in the cocoon; for the densely woven (normally lower) end of the cocoon is probably impenetrable to the issuing moth. A series of experiments are now being tried to determine whether the peculiar coloration of male moths in dimorphic species is due to sexual selection on the part of the female. In the case of *Callosamia prometha* there appears to be none, for males are accepted even when female wings are pasted upon them, or when their wings or scales are entirely removed. In the case of *O. dispar*, however, there is a decided selection against males whose wings have been cut off; 57 per cent. of the perfect males succeed in mating with the females, whereas only 19 per cent. of the wingless males are successful. The peculiar coloration of the males in these cases has probably not been brought about through the agency of sexual selection on the part of the female, but may be due to race tendency toward variation in a definite direction unchecked by natural selection.

This paper was discussed by Professors **Dean, Crampton**, and others.

Dr. **Linville**, in his paper, showed that the investigation of the habits of *Amphitrite ornata* and *Diopatra cuprea* brings to light many interesting adaptations. The first named lives in U-shaped tubes in sand and mud, access to water and food being possible at either end. Additions to the tube are made at the ends by the tentacles, which are continually drawing in small masses of sand. However, there is every indication that in this animal, where no occasion exists for a protecting tube, continued tube-building is merely incidental to food getting. Food is brought to the mouth, which is always concealed, in the masses of sand and in water currents created by the inward lashing cilia which thickly covers the tentacles.

Diopatra lives in a tough, mucus-covered lined tube, with its deeper end bare, and serving as an anchor, while its outer free end is studded with bits of shell and gravel. The animal may expose its anterior portion while searching for food and for suitable material to add to its tube. Observations made in the laboratory indicate that the animal chooses these materials

by tactile sense organs in the cephalic cirri. The particle is grasped between the palps or by the mandibles, or by both, and is then conveyed with a fair degree of precision to a place at the edge of the tube. During the construction *Diopatra* periodically ceases to build in order to "glue" the gravel and shell together. The mucous-secreting organs are pads upon the ventral surface near the head. These organs are brought in contact with the inner surface of the tube by long and vigorous contractions and expansions of the trunk-segments. All or nearly all of the newly-constructed portions are gone over in this way before the animal renews its search for bits of gravel and shell.

HENRY E. CRAMPTON,
Secretary.

SECTION OF GEOLOGY AND MINERALOGY.

DECEMBER 16, 1901.

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 then offered:

D. W. Johnson, NOTES ON THE GEOLOGY OF THE SALINE BASINS OF CENTRAL NEW MEXICO. Illustrated by diagrams.

D. S. Martin, GEOLOGICAL NOTES ON THE NEIGHBORHOOD OF BUFFALO.

A. J. Queneau, THE GRAIN OF IGNEOUS ROCKS.

On motion, Professor Richard E. Dodge was made Secretary *pro tem.*, owing to the necessary absence of Dr. Hovey.

SUMMARY OF PAPERS.

In the Antonio Sandoval Grant, near the centre of the Territory of New Mexico, are noted saline deposits which have served as important sources of a very pure salt in past years. The character of these basins was discussed in some detail, and points concerning their historical interest briefly touched upon.

The general geology of the central portion of the Territory was then briefly reviewed, while the local geology of the Antonio Sandoval Grant was presented more in detail. It was shown that the saline lakes occur in the Red Beds of Jura-triassic or Permian age. These Beds are separable, on lithological grounds, into three divisions, designated as the Red Series, the Chocolate Series, and the Vermilion Series. Lenticular deposits of salt and gypsum are frequently found at the top of the lower or Red Series, and evidence was produced to show that the Saline Basins under consideration occur at this horizon. The facts were noted that Triassic types have been described from some part of the Red Beds (presumably the upper), while a characteristic Permian fauna has been recently found near the base of the Red Series. In view of these facts, and since no horizon of marked transition other than the salt and gypsum deposits occurs, it was suggested that these deposits might possibly mark the boundary line between the Jura-triassic and Permian in central New Mexico. This paper was discussed by Professor **Kemp** and Dr. **Grabau**.

Dr. **Martin**, in his paper, presented some geological notes on the neighborhood of Buffalo, N. Y., in the summer of 1901. He did not claim any special novelty for the data presented, but judged that they might be of interest to any members not acquainted with that region. Dr. Martin first outlined roughly the distribution of the series from the Medina to the Corniferous Limestone, and then mentioned in detail certain special features. He particularly noted certain joint seams in the Niagara Limestone near Lockport, New York, which have been much eroded and decomposed, and which are now filled with a dark brown clay-like material containing numbers of half-decayed modern land shells, such as *Helix albolabris*. He then described the series of rocks exposed in the quarries found on N. Main Street, Buffalo, which are the source of the famous *Eurypterus* specimens. This series extends from the Corniferous Limestone to the Saline series, and is divisible into five members, known as the Corniferous Limestone, the Blue Limestone, the Bullhead Rock, the Water Limestone and the Salina. Dr. Martin par-

ticularly emphasized the contact between the Bullhead Rock and the overlying Blue Limestone, and noted the occurrence of a sandstone dike extending to the top of the Bullhead series. The paper was discussed by Dr. **Julien**.

Mr. **Queneau** in his paper said that a general observation might be made in regard to intrusive dikes. Near the margin the rock is dense, often glassy, without any appreciable grain, whereas the grain begins to grow coarse according to some definite law, progressively as the distance from the wall increases. The present paper is based on the study of the laws governing such increase. It appears that the loss of heat is of paramount importance.¹ The problem taken up is very analogous to the one presented by the cooling of a slab of finite thickness and of great length and depth with respect to the first dimension, viz., the thickness. The method followed rests on the *Théorie de la Chaleur*, of Fourrier, and on the general theory of cooling by Professor R. S. Woodward.² The following laws have been deducted: (1) The zone of varying grain will vary indirectly as the initial temperature. From this follows that: (a) Plutonic rocks very deeply seated will not present a zone of varying grain to any extent. (b) Rocks which come to rest at a temperature nearing their consolidation point will present a wide zone of varying grain. (2) The time of cooling, other conditions being the same, varies as the square of the thickness of the dike.³

From this last law it is assumed that the size of the crystals vary as the square of their distances from the nearest margin; then the square root of their area which can be measured varies directly as the distances from the margin. Thus we have a simple law of easy application.

The paper was discussed by Professors **Kemp** and **Dodge**, and Dr. **Julien**.

Adjourned.

RICHARD E. DODGE,
Secretary pro tem.

¹ Alfred C. Lane, Geol. Surv. of Michigan, Vol. VI.

² Annals of Mathematics, Vol. III.

³ Kiemann, "Partielle Differential Gleichungen."