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RECORD OF MEETINGS
OF THE
NEW YORK
ACADEMY OF SCIENCES

JANUARY TO DECEMBER, 1903

HENRY E. CRAMPTON

Recording Secretary

PRESS OF
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RECORD OF MEETINGS
OF THE
NEW YORK ACADEMY OF SCIENCES.

January to December, 1903.

HENRY E. CRAMPTON, *Recording Secretary*.

BUSINESS MEETING.

JANUARY 5, 1903.

The Academy met at 8:15 P. M., President Cattell presiding. In the absence of the Recording Secretary the reading of the minutes of the preceding business meeting was omitted.

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

Frederick J. E. Woodbridge, Columbia University.

Edward Phelps Allis, Jr., Mentone, France.

The Academy then adjourned.

J. McKEEN CATTELL,
Acting-Secretary, pro tem.

SECTION OF ASTRONOMY, PHYSICS AND
CHEMISTRY.

JANUARY 5, 1903.

Section met at 8:15 P. M., Professor Charles Lane Poor presiding.

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

The following program was then offered :

Harold Jacoby, COMPARISON OF ASTRO-PHOTOGRAPHIC MEASURES MADE WITH THE RÉSEAU AND WITHOUT IT.

C. C. Trowbridge, SOME FACTS REGARDING PERSISTENT METEOR TRAILS — THE SIGNIFICANCE OF SIZE, COLOR AND DRIFT.

SUMMARY OF PAPERS.

Professor Jacoby's paper was as follows :

The *réseau* method of measuring stellar photographs, as considered in the present paper, is similar to that in use in the observatories participating in the photographic survey of the heavens now in progress. The most important advantage of this method of measurement is that it avoids almost altogether the effects of possible contractions or expansions of the sensitive film during development; and to this advantage has been joined another of a practical character which was perhaps not foreseen by the originators of the *réseau* method. It is found most confusing to measure plates having nothing on their surfaces but star-images; in fact, in the case of close clusters, it is well-nigh impossible on such plates to make sure that the pairs of coördinates assigned to any star really belong to the same object. All this possibility of confusion disappears, however, with *réseau* plates, as it is easy to keep all measures in order by considering each little square by itself.

As usual, there are compensating disadvantages connected with using the *réseau*. It is necessary, for instance, to make certain assumptions, such as the following :

1. That the division errors of the original *réseau* can be determined as accurately as those of a scale.

2. That the photographic copy of the *résseau*, as it appears on the star-plate, really reproduces exactly the division errors of the original.

3. That the bisection of photographed *résseau* lines on a star-plate can be made with a microscope as accurately as the lines of a scale can be bisected.

It is of course possible to discuss each of these assumptions separately; but in the present note I shall consider one simple experiment only. This consisted in measuring a couple of Pleiades photographs twice, once by the *résseau* method, and once with a metallic scale. A simple comparison ought then to show how far the two methods of measurement differ in their results. Seventy-five stars were observed in each case, and the same stars were used. The first plate was made at Paris, 1901, January 14, and the "probable discordance" between the two methods of measurement was $\pm 0''.11$. No corrections were applied for possible division errors of the Paris *résseau*, as none have been published, though the MM. Henry have satisfied themselves that the Paris *résseau* errors are inappreciable. The second plate was made at Helsingfors, 1900, Dec. 12, and gave a probable discordance of $\pm 0''.22$. In this case the *résseau* measures were corrected with Donner's division errors; but these are not large enough to affect the result appreciably. In both cases, measures made with the metallic scale were corrected for the division errors determined at Columbia University. The larger discordance in the case of the Helsingfors plate is probably due to the less well defined character of the photographed *résseau* lines. In many cases it is impossible to bisect these lines under the microscope anywhere except at the corners of the squares, where two lines cross and form a point.

But when we consider that the above discordances involve the errors of both measurements, they do not appear unduly large. Divided by $\sqrt{2}$, they give for the probable error of a measurement by one method only $\pm 0''.08$ for Paris, and $\pm 0''.16$ for Helsingfors; and there is no evidence of a systematic arrangement of signs in the differences between the two methods.

We may conclude, therefore, that plates measured by the *réseau* method and without it give identical results within a very narrow margin ; nor does irregular distortion of the film appear to have affected appreciably the measures made without the *réseau*.

Mr. **Trowbridge's** paper was a continuation of the results read before the Academy at the meeting on March 3, 1902.

S. A. MITCHELL,
Secretary.

SECTION OF BIOLOGY.

JANUARY 12, 1903.

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 :

Gary N. Calkins, PROTOPLASMIC OLD AGE.

A. G. Mayer, THE DRY TORTUGAS AS A BIOLOGICAL STATION FOR RESEARCH.

SUMMARY OF PAPERS.

The paper by Dr. **Calkins** was based upon his studies of *Paramecium*, individuals of which were isolated in February, 1901, and their descendants kept under observation for 23 months when the series ended by the death of all individuals of the 742d generation. It was pointed out that in the course of the 742 generations there were four well-marked periods of depression or "old age" ; and the accompanying cytological changes, reproductive conditions, and the effects of stimuli were described and discussed.

The paper by Dr. **Mayer** showed the advantages of the Dry Tortugas for biological research. With the aid of lantern illustrations, Dr. Mayer described the favorable conditions with reference to geographical position in relation to ocean currents, the topography, and the nature of the fauna and flora. The complete paper has been prepared for publication in *Science*.

Dr. **Piffard** exhibited a set of X-ray photographs of gastropod shells, designed to obviate the sectioning of rare specimens.

M. A. BIGELOW,
Secretary.

SECTION OF GEOLOGY AND MINERALOGY.

JANUARY 19, 1903.

The section met at 8:15, Vice-President Kemp presiding. The minutes of the last meeting were read and approved.

Mr. **George B. Hollister** gave a description of "THE HYDROGRAPHIC WORK OF THE UNITED STATES GEOLOGICAL SURVEY," illustrated by lantern-slides and apparatus. After a short discussion of the paper, the thanks of the section were offered Mr. Hollister and the section adjourned.

ALEXIS A. JULIEN,
Secretary, pro tem.

SECTION OF ANTHROPOLOGY AND PSYCHOLOGY.

JANUARY 26, 1903.

The section met in conjunction with the American Ethnological Association, Professor Thorndike presiding.

The following program was offered:

Maurice Fishberg, THE ANCIENT SEMITES AND THE MODERN JEWS.

H. H. St. Clair, 2d, INVESTIGATIONS AMONG THE COMANCHE AND UTE INDIANS.

SUMMARY OF PAPERS.

Dr. **Fishberg's** paper was as follows:

The somatic characteristics of the ancient and the modern Semites were discussed in detail, the purest representatives of the latter being the Arabian Bedouins. Their anthropological type is distinctly African. The bas-reliefs of the ancient Semites, as represented on the Assyrian and Egyptian monuments, are of the same type. The modern Jews are, on the other hand, a distinctly Asiatic type physically; they are brachycephalic — cephalic index 82 with less than five per cent. of heads having an index of 75 or less. Their head form shows very little variability, but one important feature is that in countries where the non-Jewish population is round-headed the Jews are also round-headed. In Caucasia their cephalic index is 87; in eastern Europe, where the cephalic index of the

non-Jews ranges between 80 and 84, that of the Jews is about the same. In Africa, among the long-headed Gentile population, the Jews are also dolichocephalic. The same is observed to be the case with stature. The Jews are taller in countries where the general population is tall. The type of the Jew is dark, but 12 per cent. of pure-blood types, having fair hair and blue eyes, are to be found. The nose of the modern Jew is not as frequently hooked as is generally supposed. Statistics show that only 12 per cent. are of this variety. The only characteristic which often betrays a Jew is the "Ghetto eye." But such Jews who have lived outside of the pale of the Ghetto for a few generations do not present this phenomenon. Physically there are two types of Jews — one derived from Asia, commonly called *Ashkenasim*, and constituting more than 90 per cent. of the modern Jewery. It has no relation at all with the second type, of African origin, commonly referred to as *Sephardim*. These, constituting less than 10 per cent. of the Jews, alone are more or less related to the ancient Semites, although they have not everywhere preserved themselves as pure as in Africa. Besides these there are to be discerned other subtypes, in which Teutonic, Slavonic and Mongolian blood appears most prominent. From the standpoint of physical anthropology, the view that all the modern Jews are descendants of Abraham, Isaac and Jacob, cannot be seriously considered. The only thing which binds the modern Jews together is their religion. In blood there is no more relation between the Jews than there is between the people who profess the Protestant, Methodist or Unitarian religion.

Mr. St. Clair's paper was as follows: The investigations were made during the summer of 1902 upon the Comanches on the Kiowa-Comanche Reservation, Oklahoma, and the Utes of the Uintah Reservation, Utah. Both tribes belong to the great Shoshonean family. These tribes have a very loose social organization and no elaborate religious ceremonial. There are no calendar-records nor any traces of heraldry among the Comanches. The designs painted on rawhide bags or woven in beads have no meaning as with the Shoshones, but are

merely ornamental, and there is lack of the symbolic conversationalism found among such people as the Arapahoes and Sioux. In their stories the coyote figures as the most frequent character representing the fool and schemer. There are striking similarities between the Shoshone and Nahuatl languages of Mexico, each using the same grammatical processes in its pronoun, noun, preposition and verb, and the order of words and structure of the sentence being practically the same in both.

JAMES E. LOUGH,
Secretary.

BUSINESS MEETING.

FEBRUARY 2, 1903.

The Academy met at 8:15 P. M., Professor William Hallock presiding. The reading of the minutes of the previous business meeting was dispensed with.

No business was presented by the Council.
Adjourned.

HENRY E. CRAMPTON,
Recording Secretary.

SECTION OF ASTRONOMY, PHYSICS AND CHEMISTRY.

FEBRUARY 2, 1903.

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

The following program was then offered:

Herschel C. Parker, EXPERIMENTS CONCERNING VERY BRIEF ELECTRICAL CONTACTS.

Marston T. Bogert, SOME PRODUCTS DERIVED FROM COAL (illustrated by samples).

SUMMARY OF PAPERS.

Mr. **Parker's** paper was as follows: A series of electrical contacts giving a fairly accurate range of adjustment from 0.1 second to 0.00001 second would furnish a valuable means of

investigation. A gravity contact key devised by Dr. Charles Forbes gives promise of fulfilling the above conditions. Many determinations were made of the times of contact given by the various devices employed on this key, and also investigations carried out on the times of contact of several forms of pendulum.

The method employed was as follows: A condenser of known capacity (F farads) was charged during the time of contact (T), and the deflection on discharging noted. The condenser is again charged through a resistance (R) and the deflection (Q) observed.

Then;

$$Q = EF \times (1 - e^{-T/RF})$$

and,

$$T = -RF \times \log e(1 - Q/EF).$$

The "gravity key" consists essentially of a rectangular weight falling on metal guides, the key being furnished with a scale divided in fractions of a second, according to the law of falling bodies, and the weight actuating the various forms of switches employed. If two switches are used, one to make the contact and the other to break the contact, by placing them at different distances apart on the scale, times of contact varying from 0.4 second to 0.001 second may be obtained. For shorter times a single switch that makes and breaks the contact is made use of, and the time made faster or slower by placing in different positions on the scale so that the falling weight strikes it with varying velocities.

In one form the weight moves the short arm of a lever, the long arm passing over a contact strip. Another form is one in which the fulcrum of the lever changes, first giving contact and then breaking the circuit immediately afterwards. In still another type the falling weight strikes a lever arm and releases a spring, which makes the contact, and a further motion of the lever breaks the contact, thus giving a differential effect between the velocity of the weight and the rapidity of the spring. With this key it is possible to obtain a contact of only 0.000017 second and with careful adjustment it seems possible to reach 0.00001 second.

Experiments made with pendulums consisting of a steel ball suspended by a wire, and striking against a steel anvil, gave very positive and satisfactory contacts. Using a pendulum with the suspension wire about four meters long and the steel ball two inches in diameter, an arc, of $.5^{\circ}$ gave 0.00039 second, while a pendulum with a short suspension wire using one-half-inch steel ball, through an arc of 90° gave 0.000079 second.

It is interesting to note that in working with condensers the best mica condenser gives no appreciable variation in capacity for the very briefest times of charge, while a paraffine condenser may show a reduction in capacity of some sixty per cent. from a time charge of 0.4 second to that of 0.001 second.

Professor Bogert's talk was a very interesting discussion of "Some Products Derived from Coal," paying special reference to the products from coal tar. From bituminous coal by distillation are derived (1) coal gas, (2) ammonia water, (3) tar and (4) coke.

The uses of coal gas and coke are so well known as to need no mentioning. In the United States the total production of ammonium compounds for the year 1900 amounted to 27,000 tons, valued at about \$2,000,000.

The chief source of coal tar is the coal gas manufacture, but, large amounts are also obtained from the by-product coke ovens, the water gas industry, etc. During the year 1900, 20 per cent. of the gas produced in the United States was coal gas, requiring the distillation of 1,350,000 tons of coal, and producing 13.5 billion cubic feet of gas, *i. e.*, 10,000 cubic feet per ton of coal. The yield of tar is approximately 5 per cent. of the weight of the coal used; the product of tar was therefore, 67,000 tons. If we add to this the 52,500 tons of tar from the by-product coke ovens, we have a total of about 120,000 tons of tar produced in 1900 from coal. This is less than one fifth of the amount produced in England from similar sources. The total production of coal tar in Europe for the year 1898 was 1,120,000 tons.

Coal tar is first roughly divided into the following fractions

1. First runnings, or light oil (lighter than water).

2. Middle oil, or carbolic oil.
3. Heavy oil, dead oil, or creosote oil.
4. Anthracene oil or green grease.
5. Pitch (remains in the stills).

These five products were taken up in detail, and about one hundred drugs, perfumes, etc. were exhibited, the method of derivation of the substances being explained.

S. A. MITCHELL,
Secretary.

SECTION OF BIOLOGY.

FEBRUARY 9, 1903.

Section met at 8:15 P. M. at the American Museum, Vice-President Dean presiding. The minutes of the last meeting were read and approved.

The following program was offered:

W. A. Cannon, CYTOLOGICAL STUDIES OF VARIATION IN HYBRIDS.

Bashford Dean, PAST AND PRESENT STUDY OF ZOOLOGY IN JAPAN.

H. F. Osborn, ON THE PRIMARY DIVISIONS OF THE REPTILIA INTO TWO SUBCLASSES.

SUMMARY OF PAPERS.

Dr. **Cannon's** paper, was based upon his studies of hybrids of cotton plants, and discussed the relation between the maturation mitoses in hybrids and the variation of the hybrid race. Two forms of mitosis occur in fertile hybrids. One of these is the normal type, which occurs in pure races and may be supposed to give rise to reproductive cells of pure descent. This is the form in hybrids between closely related parents (monohybrids), and probably forms the basis for the regular reversion in them. The other type of mitosis is irregular. It is suggested that this kind of maturation mitosis may organize cells of mixed descent, and if found in hybrids from parents rather distantly related, would constitute the basis for such mixture of the characters of the pure parents as occurs in these hybrids. However, after

the characters have become mixed in all possible proportions, and the limit of variation thus reached, normal mitoses probably occur. Thus it appears that the mingling of the characters, as well as the regular reversion in hybrids, may have a morphological basis.

Professor **Dean**, first reviewed the history of the study of zoölogy, and then considered the present status of zoölogical investigation and teaching in that country. With the aid of lantern illustration, descriptions were given of the laboratories, the fauna available for study, and the prominent Japanese workers.

Professor **Osborn's** paper was presented by Dr. Hay. This has been published in full in *Science* for February 13, 1903.

M. A. BIGELOW,
Secretary.

SECTION OF GEOLOGY AND MINERALOGY.

FEBRUARY 16, 1903.

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

William Hallock, AN ASCENT OF MT. WHITNEY, CALIFORNIA, WITH NOTES ON THE GEOLOGY.

J. F. Kemp, THE LEUCITE HILLS OF WYOMING.

SUMMARY OF PAPERS.

Professor **Hallock's** paper was as follows: Mt. Whitney with an altitude of 14,625 feet claims the distinction of being the highest peak in the United States. It is a mountain of high relief in a rugged country. The easiest way to the summit is by a five-day journey skirting the canyons from the southwest. Sedimentary rocks do not occur in the part of the Sierras near Mt. Whitney. The country rock is a deeply weathered granite, split by countless joint planes. Mt. Whitney exhibits the effects of glacial sculpturing, and adjacent to its top, holds many small lakes in the cirques, which have resulted from ice undercutting. Professor Hallock also described a lava flow

with cinder cones on Volcano Creek, Cal. Lantern slides were used to bring out these features and to illustrate the topography.

Professor **Kemp** said: Before giving an account of his work in this region with Professor Knight, of Wyoming University, he described the mineralogical and petrographical features of the leucite rocks as they occur in America, and referred to their discovery in Wyoming by the members of the Fortieth Parallel Survey. These rocks were originally determined by Dr. Zirkel. The speaker then called attention to Dr. Cross's more extended work in the district. His own contribution had to do with the general geology of the Leucite Hills. As many as seventeen separate mesas and buttes isolated by erosion have been mapped, representing in most cases single extrusive and intrusive flows of these rare rocks. They are found in sandstones near the top of the Cretaceous, and their distribution and field relations tend to confirm the view that they are volcanic outpourings at different times from a laccolithic reservoir of great extent, which is nowhere exposed at the surface. Lantern slides were used in illustrating the geology, and specimens of the rocks in question were exhibited.

GEORGE I. FINLAY,
Secretary, pro tem.

SECTION OF ANTHROPOLOGY AND PSYCHOLOGY.

FEBRUARY 23, 1903.

The regular meeting of the Section was held February 23, in conjunction with the New York branch of the American Psychological Association, Professor Thorndike presiding. Afternoon and evening sessions were held, the members dining together at the close of the afternoon session. The following papers were presented:

E. W. Scripture, PHONETIC SURVEYS.

Clark Wissler, CORRELATIONS OF MEASUREMENTS OF GROWTH.

(Read by title.)

J. H. Bair, CORRELATIONS IN SCHOOL CHILDREN.

J. E. Lough, APPARENT MOTION IN STEREOSCOPIC VISION.

Robert MacDougall, AN EXPERIMENT IN FACIAL VISION.

E. H. Sneath, NOTES ON THE WASHINGTON MEETING.

J. McKeen Cattell, GRADES FOR MENTAL TRAITS.

W. H. Davis, A PRELIMINARY REPORT ON TESTS OF ONE HUNDRED MEN OF SCIENCE. (Read by title.)

SUMMARY OF PAPERS.

Professor **Scripture's** paper was as follows: After brief mention of the phonetic surveys being carried on by Grierson in India and Guilleron in France, a description was given of the chief talking-machine methods that may be used for this purpose. It was pointed out that the advances in the construction of phonographs, graphophones and gramophones during the last couple of years have been so great as to revolutionize these methods. It was also explained that making a speech record was like taking a photograph; everybody can take a picture, but a good picture requires skill. By use of the graphophone the records made on wax cylinders can be used for making metal molds; from these indestructible molds copies in hard wax can be made. The gramophone method likewise furnishes metal molds from which hard discs are produced; but the talking machine requires an expert. This gramophone method was lately used on three expeditions sent out by the Vienna Academy of Sciences. The new methods furnish records that are perfect in recording every detail of the voice. There is not the slightest loss even of the most difficult consonants. Criticisms stating the contrary are derived from acquaintance with methods that are now out of date. From the gramophone records the curve of speech can be traced off with great accuracy; whereby every detail of the voice can be measured. A similar method can be applied to phonograph records. It was urged that the fast disappearing dialects and languages should be recorded and preserved in one of these ways. It was pointed out that such records could be made and delivered at smaller cost per word than in the case of Guilleron's "Atlas." It was stated that the various talking machine companies have shown self-sacrificing interest in such

work, and that the Victor Talking Machine Company would be willing to loan its record-talking car when it is finished. Exhibits of various material and speech curves were made.

Dr. **Bair** stated that the measurements were taken on Worcester school children. A high coefficient of correlation was shown between stature and height-sitting, stature and weight, and height-sitting and weight. Between stature, height-sitting, weight, with length of head and width of head the amount of correlation was much less and much more irregular than between the measurements first named. This irregularity was partly due to the small number of cases examined.

Professor **Lough** said that stereoscopic pictures may be united without the aid of a stereoscope, *i. e.*, by direct fixation, whenever the distances between similar objects in the two pictures is not greater than the interocular distance. When pictures are so united — giving a direct perception of the third dimension — any movement of the picture from side to side gives the impression that objects in the background are moving through a greater distance than are the objects in the foreground. This "slipping" of the background is perceived with still greater vividness when the picture remains stationary and the head is rotated or moved from side to side. In bringing a stereoscopic picture nearer the eyes the background seems to approach more rapidly than the foreground, and in moving the picture away from the eyes the background seems to move away more rapidly. The apparent motion in stereoscopic pictures seen under the above conditions is probably due to the fact that the angle of parallax remains constant, while the line of direction varies, with every movement of the head or of the picture.

The paper of Professor **MacDougall** supplements and in three respects aims to correct the reports of previous experiments on facial vision. In the perception of objects in proximity to the face independently of the sense of sight, the nature of the sensory impression upon which perception depends is not commonly discriminated. In the present investigation the percentage of correct perceptions was found to lie between 50 and 75, that is, within the subliminal region. This result is contrary to previous work

in which the percentage lay clearly above the threshold of 75. If a true perceptual process be involved, the percentage of correct responses should be a function of the absolute differences between the objects discriminated. This was found to be the case in the present set of experiments, but not in preceding investigations. In work published heretofore the perception was reported to be mediated solely by sensations of sound, but in the present investigation the shutting off of auditory stimulation made practically no reduction in the percentage of correct responses.

Professor **E. H. Sneath** said that the Washington meeting, if compared with a possible meeting of psychologists twenty-five years ago, shows the lines along which progress has been made. Such a comparison demonstrates clearly (1) the special training required of the psychologists of to-day ; (2) the position of psychology among the sciences ; (3) the growth of productive scholarship ; (4) the differentiation of the work into experimental, genetic, comparative, abnormal, educational, etc. ; (5) the development of new methods of approach.

The paper of Professor **Cattell** treated the accuracy with which grades can be assigned for college studies, and the methods to be employed in assigning grades. Those who do well in one study or have one trait in excess are likely to do well in other studies and to have other traits in excess, and they are more likely to succeed in after life. It was shown, however, that the grades assigned to students have not very great validity. It was recommended that grades be assigned in a scale of ten and that a probable error be attached to the grade. The grades should represent groups of equal size rather than equal differences in merit. The paper also discussed the grade assigned to large groups for mental, moral and physical traits, and gave some of the results that the writer had obtained.

JAMES E. LOUGH,
Secretary.

BUSINESS MEETING.

MARCH 2, 1903.

The Academy met at 8.15 P. M., Vice-President Poor presiding. The minutes of the last business meeting were read and approved.

The Secretary reported from the Council as follows: that the Executive Committee of the Council, constituted a Committee on the Budget for 1903 presented the report, a copy of which is filed herewith, which was accepted by the Council; that a special committee of the Council had considered the advisability of depositing the library of the Academy in the American Museum of Natural History and had presented a report, a copy of which is filed herewith, favoring such transfer; the Council had adopted this report.

The following candidate for active membership, approved by the Council, was duly elected: Ralph W. Tower, American Museum of Natural History.

The following candidates for election as Fellows of the Academy, on recommendation of the Council, were unanimously elected:

Frederick J. E. Woodbridge, Columbia University.

Edward Phelps Allis, Jr., Mentone, France.

Adjourned.

REPORT OF THE COMMITTEE ON THE BUDGET.

FEBRUARY 9, 1903.

The Executive Committee, constituted by vote of the Council on January 5th a Committee on the Budget, presents the following estimates for the year 1903:

Estimated income.....	\$3,000
Cash on hand, December 15, 1902.....	3,756
	<hr/>
	\$6,756

ESTIMATED EXPENSES.

Recording Secretary.....	\$300
Librarian.....	200

Treasurer.....	50
Dues, Scientific Alliance.....	50
Miscellaneous expenses.....	150
Publications in press.....	600
Publications for current year.....	1,000
	<hr/>
	\$2,350
Estimated Surplus	\$4,406

For the Committee,

HENRY E. CRAMPTON,

Recording Secretary.

REPORT OF THE SPECIAL COMMITTEE ON EX- CHANGES AND THE TRANSFER OF THE LIBRARY.

A second meeting of the Special Committee consisting of the Library and Publication Committees was held at the American Museum on January 12, 1903. Present: Professors Cattell, Britton, Boas, Bumpus, Farrand and Crampton. Originally constituted to consider the Academy's exchanges, this Committee, together with Professor Britton, was empowered to consider the question of transferring the Library to the American Museum.

As a result of its deliberations, the Committee recommends that the Library of the Academy be deposited in the American Museum of Natural History, the Library Committee retaining general control, and the matter of exchanges remaining with the Academy. The Museum will assume the custodianship of the Library, and the expense of cataloging and suitable book-plating; the Academy's books will be placed in the library of the Museum unless they should be duplicates of those already on the shelves, in which case they will be stored; the Museum will bind such books as it may desire, the cost of binding to be a lien upon the books so bound; the Museum will execute the transfer. The Museum can assume no liability for damages by fire. The Library will be open for consultation from 9 A. M.,

to 5 P. M. The above agreement may be terminated six months after due notice by either party.

With regard to the matter of exchanges, the Committee recommends that after the transfer of the Library, the Library Committee should collect information regarding the number of societies and of libraries which receive the Academy's publications; and that it should make systematic efforts to induce libraries to subscribe for such publications, offering back numbers as far as possible, with a view to reducing the number of societies receiving the Academy's publications by way of exchange. The Committee also recommends that all requests for the institution of exchanges be referred to the Library Committee with power.

HENRY E. CRAMPTON,
Secretary.

SECTION OF ASTRONOMY, PHYSICS AND CHEMISTRY.

MARCH 2, 1903.

The section met at 8:30 P. M. Dr. Charles Lane Poor presiding. The minutes of the last meeting were read and approved. The following program was then offered:

William Hallock, MEASUREMENT OF THE ALTITUDE OF MT. WHITNEY, CALIFORNIA, BY BOILING POINT DETERMINATIONS.

S. A. Mitchell, THE DISCOVERY OF NEW GASES IN THE SUN.

SUMMARY OF PAPERS.

Professor **Hallock's** paper was as follows:

At the time of the ascent of Mount Whitney last summer by the party under Mr. Harrington Putnam, apparatus was taken to the top, and a determination of the boiling point was made at ten o'clock on August 23. The observed boiling point was $186^{\circ}.47$. Applying the instrumental corrections and reducing this by the Smithsonian tables, the corresponding barometric pressure was 17.70 inches. The Weather Bureau kindly furnished the barometric pressure, temperature and vapor tension

for Independence, California, for that morning. They were : barometric pressure 25.93 inches, temperature $78^{\circ}.0$, vapor tension 0.110 feet. Substituting these values in the formula given by Bigelow on page 490 of the second volume of the annual report of the " Chief of the Weather Bureau " for 1898-1899, a difference in altitude between Independence and Mount Whitney of 10,633 feet results. Inasmuch as this determination was made five feet below the actual summit of the mountain, and Independence is 3,910 feet above sea-level, it would give a final value for the elevation of Mount Whitney of 14,548 feet. It may be stated in this connection that the value which was obtained by Secretary Langley as a result of a very complete series of determinations was 14,522 feet. The probable error in either case is undoubtedly not less than ten or fifteen feet. One object of this determination was to show the availability of boiling-point apparatus which is light and convenient for such determinations as being very much more reliable than the aneroid barometer, and much easier for transportation than the mercurial barometer.

In the course of Dr. **Mitchell's** paper it was shown that the interdependence of the sciences is nowhere better illustrated than in spectroscopic work, when astronomy, the most ancient of all the sciences, goes hand in hand with physics to find a new chemical element. In recent years, through spectroscopic researches several metals have been added to the list of elements. In April, 1895, by investigations on a specimen of cleveite, Ramsay announced the discovery of terrestrial helium which gives a line in its spectrum agreeing with the D_3 line familiar for more than twenty-five years in stellar, prominence and chromospheric spectra. About the same time, Rayleigh and Ramsay announced the discovery of another new element which was called argon. In the early summer of 1898, Ramsay found two more gaseous elements, neon and krypton, and subsequently a heavier gas to which the name xenon was applied. These five new elements, helium, neon, argon, krypton and xenon are found in atmospheric air, and can be obtained from air by fractional distillation by making

use of the extremely low temperatures of liquid air and liquid hydrogen. Atomic weights have been assigned as follows: helium, 4; neon, 20; argon, 40; krypton, 82; and xenon, 128, and the gases seem to form a series in the periodic table of elements between the fluorine and sodium groups.

Investigations carried out on photographs of the "flash" spectrum at the Sumatra eclipse of 1901 enabled Dr. Mitchell to find that the remarkable variations in the intensities of the lines of the ordinary solar spectrum and of the "flash" spectrum (for one does not *look* to be the reversal of the other) are due to the different *heights* to which the vapors of the various metals ascend above the sun's surface. As a consequence, although helium lines are not found in the ordinary solar spectrum, the helium lines in the spectrum of the chromosphere are very bright indeed.

In view of the similarity of the new gases, neon, argon, etc., to helium, and as the helium lines are such prominent ones in eclipse spectra, it was expected that the new atmospheric gases — at least the lighter ones, neon and argon — might appear in the sun's atmosphere. A detailed comparison of the lines of the flash spectrum measured by Dr. Mitchell with those of the new gases lately published has led to the discovery that neon and argon are both probably present in the chromosphere, while it is doubtful whether krypton and xenon are there or not.

S. A. MITCHELL,
Secretary of Section.

SECTION OF BIOLOGY.

MARCH 9, 1903.

The Section met at 8.15 P. M., Professor Bashford Dean presiding. The following papers were presented:

W. S. Sutton, CHROMOSOMIC REDUCTION IN ITS RELATION TO MENDEL'S LAW.

Graham Lusk, INFLUENCE OF NUTRITION ON THE GROWTH OF YOUNG MAMMALS.

C. L. Bristol, ON THE COLORS AND COLOR-PATTERNS OF CERTAIN BERMUDA FISHES.

SUMMARY OF PAPERS.

Mr. **W. S. Sutton** pointed out that the processes of synapsis and reduction in the germ-cells of the grasshopper *Brachystola* are such as to indicate strongly that they are the causes of the character-reduction which forms the basis of the Mendelian principle of heredity. Probably the reducing division in *Brachystola* does not effect a separation of chromosomes into maternal and paternal groups, but the chromosome-series of the mature germ-cells is made up of a chance combination of chromosomes from the two parents. This is in accord with the results of Mendel and others who have shown that hybrid offspring exhibit a chance combination of characters from the two parental lines.

Professor **Graham Lusk** based his paper upon experiments conducted in his laboratory by Dr. Margaret B. Wilson (*Amer. Jour. Phy.*, VIII., 197, 1902), whose results support his own earlier work. It was shown that new-born pigs develop normally when fed with skimmed cow's milk, or with the same milk to which three per cent. of dextrose or lactose has been added. The growth is proportional to the calorific value of the food — always supposing sufficient proteid to be present. This agrees with the results of other workers who have studied the growth of children and other young mammals. The growth of the pigs was on the average about 215 grams growth for 1,000 calories in the food. Eighteen to nineteen per cent. of the energy of the food was retained in the body as new tissue.

Professor **C. L. Bristol's** paper dealt with correlations between habits and appearance with reference to warning and protective coloration of these fishes. An abstract will soon appear in *Science* in the proceedings of the American Morphological Society.

M. A. BIGELOW,

Secretary.

SECTION OF GEOLOGY AND MINERALOGY.

MARCH 16, 1903.

The Section met at 8.30 P. M., and, in the absence of Professor Kemp, Dr. Julien was made temporary chairman.

The following program was presented :

A. W. Grabau, THE GEOLOGY OF BECRAFT MOUNTAIN, NEW YORK.

C. W. Dickson, THE MINERALOGY AND GEOLOGY OF THE SUDBURY-ONTARIO-COPPER-NICKEL DEPOSITS.

SUMMARY OF PAPERS.

Dr. **Grabau** said that Becraft Mountain, in Columbia Co., N. Y., is an outlier of the Helderberg Mountains. Its base is formed by the upturned and eroded rocks of the Hudson Group, chiefly, the Normans Kill shales. Unconformably upon this rests the upper part of the Manlius limestone, followed in turn by the members of the New York Devonian up to and including the Onondaga limestone. The structure of the eastern and southern portion of the mountain, which is of the Appalachian type was discussed, and the excessive folding and faulting upon it were illustrated by maps and sections. The paper was discussed by Dr. Stevenson and Dr. Julien.

In Mr. **Dickson's** paper it was shown that by magnetic concentration of the ore nearly all the nickel can be eliminated from the pyrrhotite, proving that the element is present in a separate mineral and that it does not replace part of the iron of the pyrrhotite isomorphously. The economic concentration of the nickel by magnetic methods is, however, practically impossible. The composition of the nickel mineral corresponds closely to that of pentlandite, but there is always an excess of (FeNi) over that required by the formula (FeNi)S in the proportion 11:10.

After studying the relations of the ore and rock minerals in the field and by the aid of the microscope, the conclusion was reached that, in their present form, the deposits are replacements along crushed zones through which the mineral-bearing waters circulated, and that they cannot be original magmatic segregations, as generally held.

GEORGE I. FINLAY,

Secretary, pro tem.

SECTION OF ANTHROPOLOGY AND PSYCHOLOGY.

MARCH 23, 1903.

The regular meeting of the Section was held at 8.30 P. M., Professor Thorndike presiding. The following program was offered:

Clark Wissler, OBSERVATIONS ON ABNORMALITIES OF THE HARD PALATE.

A. Hrdlicka, PHYSICAL ANTHROPOLOGY OF THE HYDE EXPEDITION IN 1902.

SUMMARY OF PAPERS.

Dr. **Clark Wissler's** paper reported progress in the measurements of the casts of the hard palates of idiots. The first thing to be considered in this work was the determination of the significant points and dimensions in the palate. The results presented indicated important structural relations between the width at the canine teeth and the length of the palate measured from the first molars and the maximum height of the arch. The comparative study of the palates of normal and of idiotic persons will be based upon these measurements.

During 1902 Dr. **Hrdlicka** made two expeditions, one of seven and the other of three months' duration, to the southwestern United States and Mexico. These expeditions were the conclusive ones of a series of five, begun in 1898, made for the purpose of ascertaining the physical characteristics of all those present as well as extinct tribes which occupy or occupied the region marked by the boundaries of the ancient Pueblos, Cliff-Dwellers and Nahaun (Toltec, Chichimec, Aztec) peoples. The region thus bounded extends uninterruptedly from Utah and Colorado to the Mexican States of Morelos and Guerrero, and in it live at present a little over forty tribes or distinct groups of Indians. About nine tenths of all these peoples were visited on the five expeditions and examined; all the measurements and data secured are being studied, but to arrive at detailed results will require several years.

What can now be safely stated is: (1) All the ancient as well as the modern peoples in the region mentioned belong to

three physical types, and these types are identical with those widely represented in all directions outside of this region; and (2) a very large majority of the present peoples examined are physically identical with the prehistoric inhabitants of these same districts (so far as could be ascertained from the osteological material recovered); the prehistoric remains (osteological) show no type that is not represented somewhere in the region covered to-day and there is no type among the living tribes not represented among the ancient ones.

The visit of so large a number of tribes, as well as the search for skeletal remnants of the extinct peoples, afforded a very good opportunity for general ethnological and archeological observations, the substance of which can be stated as follows: The Mexican Indians visited, with the exception of the Huichols and Tarahumares, are in their mode of life and habits far more like the whites about them than is the case with our Indians of the southwest; nevertheless, the Mexican tribes preserve much that would be of value to the ethnologist. Dr. Hrdlicka's exploration in northern Jalisco and in Zacatecas resulted in the discovery of the ruins of eleven good-sized pueblos or towns, the excavations at one of which showed that its inhabitants had reached a comparatively high grade of culture. The pueblo and cliff ruins of our southwest may be compared to a head which connects by a long narrow neck running through Cora Grande in Arizona, Coras Grande in Mexico, Zape in Mexico and La Quemada in Zacatecas, with a large body of ruins which begin in southern Zacatecas and Jalisco and extend through all the southern part of Mexico to Guatemala and Central America. La Quemada was found to be above all a fort, in all probability the most representative stone-built native fort in North America.

In Zacatecas Dr. Hrdlicka discovered a colony of Tlascaltecs, transplanted hither by the Spaniards in the seventeenth and eighteenth centuries; and further south he found two villages still occupied by the remnants of the ancient Chichimecs of Teul. South of Juchipilla, in Zacatecas, is located a perfect cliff-dwelling, probable the most southern one in existence. This particular ruin, known under the name of "Las Ventanas"

(the windows), has been visited by at least one American before, namely, by Miss Britton.

JAMES E. LOUGH,
Secretary.

BUSINESS MEETING.

APRIL 6, 1903.

The Academy met at 8.15 P. M., Vice-President Poor presiding. The minutes of the last business meeting were read and approved.

No report from the Council was presented.

There being no business to come before the meeting the Academy adjourned.

HENRY E. CRAMPTON,
Recording Secretary.

SECTION OF ASTRONOMY, PHYSICS AND CHEMISTRY.

APRIL 6, 1903.

Section met at 8:20 P. M., Vice-President Poor presiding. The minutes of the last meeting were read and approved.

Mr. **P. H. Dudley**, C.E., Ph.D., of the New York Central and Hudson River Railroad, read a paper full of interest to those familiar with American railroad methods, on "STREMMATOGRAPH TESTS: PRINCIPLES AND FACTS RELATING TO THE DISTRIBUTION OF THE STRAINS IN THE BASE OF RAILS UNDER MOVING TRAINS." This paper is published in full in *Science*, N. S., Vol. XVII, No. 436, May 8, 1903.

S. A. MITCHELL,
Secretary.

SECTION OF BIOLOGY.

APRIL 13, 1903.

The Section met at 8:30 P. M., Professor Bashford Dean presiding. After reading the minutes, the following program was presented:

A. G. Mayer, THE INSTINCTS OF LEPIDOPTERA.

H. E. Crampton, VARIATION AND REPRODUCTIVE SELECTION
IN SATURNID MOTHS.

SUMMARY OF PAPERS.

Dr. **Mayer's** paper was a mere preliminary account of certain observations made by the writer. It is planned that the research will be continued and finally published conjointly with Miss Caroline G. Soule. Certain lepidopterous larvæ, such as *Danaus plexippus*, are negatively geotactic and positively phototactic toward the ultra-violet rays. The combination of these reactions in nature maintains the larva at or near the top of its food plant, where incidentally it finds the youngest and best leaves, and tends to prevent its crawling down and away from the plant, thus incurring risk of starvation. Other larvæ, such as *Pyrrharctia isabella*, are indifferent either to the attraction of gravitation or to ordinary variation in conditions of light. Others react differently at different stages of development. Larvæ which will devour only certain definite species of leaves may be induced to eat sparingly of any other sort, provided the instinct to eat be first set into operation by the presence of the proper food plant. Under such conditions about the same number of bites are taken upon each presentation of the uneatable food to the larva. This phenomenon may be called "momentum of the reaction" and inclines one to conclude that the eating reaction is probably an unconscious reflex. Another series of experiments appeared to show that larvæ are unable to learn to follow a definite path to their food, and that the associative memory of lepidopterous larvæ does not endure for as long a time as ninety seconds. Certain larvæ when about to pupate display a well-marked geotropism.

The mating instinct is called into play by the perception of the characteristic odor of the female, and is merely a phenomenon of chemotaxis uncomplicated by æsthetic appreciation or sexual selection on the part of the female.

Professor **Crampton** described briefly the principal results of a statistical study of the correlation between structural character-

istics and reproductive ability or disability in *Samia cecropia*. It was shown that the pupæ of those individuals, male and female, which mated were different from those which failed to mate, although all were placed under the same conditions as far as possible. True reproductive selection was evident, and related to typical conditions as well as to variabilities. A brief discussion was given of the real basis for the selective process and of the relation between reproductive selection manifested after emergence to that selection which occurred during pupal existence.

M. A. BIGELOW,
Secretary.

SECTION OF GEOLOGY AND MINERALOGY.

APRIL 20, 1903.

Section met at 8.15 P. M., Professor James F. Kemp presiding. The minutes of the last meeting of section were read and approved.

The following program was then offered:

A. A. Julien, THE HORNBLENDE SCHIST OF SPUYTEN DUYVIL CREEK, MANHATTAN ISLAND.

D. W. Johnson, THE GEOLOGY OF THE CERILLOS HILLS NEW MEXICO.

SUMMARY OF PAPERS.

Dr. **A. A. Julien**, in the first paper of the evening, presented the results of his work on the hornblendic schist which occurs at the extreme northern end of Manhattan Island, near Spuyten Duyvil Creek. He was able in the first place to prove the undoubted igneous origin of this rock by the unaltered crystals which it still preserves and which point to an original gabbro. The speaker then presented his views in favor of the igneous origin of all the hornblende schists of Manhattan Island.

Mr. **D. W. Johnson** presented a paper on the "Geology of the Cerrillos Hills, New Mexico." The Cerrillos Hills form the most northerly group of a series of four laccolithic mountain masses in northern central New Mexico. The rela-

tion of these hills to the associated Cretaceous beds, and the age of the intrusions were discussed. A brief petrographical description of the several igneous rocks was given, and the subdivision and correlation of the sedimentaries on palæontological grounds considered. The origin of the anthracite coal of the Madrid area, and the origin of the famous turquoise deposits of the hills were then discussed. The speaker closed with a résumé of the geological history of the region. An interesting discussion followed.

GEORGE I. FINLAY,
Secretary, pro tem.

SECTION OF ANTHROPOLOGY AND PSYCHOLOGY.

APRIL 27, 1903.

The regular meeting of the Section was held in conjunction with the New York branch of the American Psychological Association, Professor Thorndike presiding.

The following papers were presented:

E. L. Thorndike, MENTAL TRAITS IN THE TWO SEXES.

W. H. Davis, A PRELIMINARY REPORT OF TESTS OF SCIENTIFIC MEN.

S. C. Parker, CORRELATION OF SCHOOL ABILITIES.

Robert MacDougall, THE SPECIALIZATION OF THE HAND IN RELATION TO MENTAL DEVELOPMENT.

SUMMARY OF PAPERS.

Professor **E. L. Thorndike** reported the results of extended measurements of mental traits in the two sexes. In general the females were less variable. In the case of children 9 to 12 the ratio of female to male variability was .92; in the case of children 13 and 14 it was 1.02; in the case of children 15 it was .97; in high school pupils .95; in college students .85. In the abilities measured the greatest difference found was the female superiority in the tests of impressibility, such as the rate and accuracy of perception, verbal memory and spelling. In these only about one third of the boys reach the median mark for girls.

Mr. **William Harper Davis's** paper dealt with some twenty physical and mental measurements made upon one hundred professional men of science, under the auspices of the Committee on Anthropology of the American Association for the Advancement of Science. No significant correlations were found between any of the tests and the several departments of scientific activity, although the cases were too few to warrant an expectation of decided results. (The superiority of psychologists in "logical memory" was attributed to the accident that the passage used in the tests was psychological in content.) Vivid mental imagery was less common among the older than among the younger men. Two cases of color-blindness were detected.

Comparison with Columbia College students, upon whom the same measurements have been made, revealed no significant difference between the two groups, except such as would naturally arise from their disparity in age.

Critical comments were made on some of the tests and on the method of administering them. It is expected that these measurements will be continued under the direction of Professor J. McK. Cattell, who is engaged upon a comparative study of scientific men.

Mr. **S. C. Parker** presented a paper upon "Correlation of School Abilities." Several investigations in Teachers College have had for their subject "The Correlation of School Marks." The method and results of these researches are set forth in Vol. XI, No. 2, of the "Columbia University Contributions to Philosophy, Psychology and Education." This paper reports the results of some new calculations based on the marks of 245 boys in a New York City high school.

It must be borne in mind that we do not know exactly what school marks represent; they may represent real ability in the school subjects or merely the ability to get marks.

In performing the statistical work, it is important to transmute each teacher's marks separately. This point is mentioned because the neglect of it by one investigator lays his results open to question.

There is not any very great variation in the correlations between marks in academic subjects, such as the languages, sciences and mathematics. The Pearson coefficients run between 40 per cent. and 60 per cent. The correlations of drawing with academic subjects are low—lying as a rule between 0 and 25 per cent. From a psychological standpoint, the academic correlations are high. But it must be borne in mind that many constant errors enter which would make the correlations much higher than the essential relationships would be. From an educational standpoint the correlations are low. They show the futility of the belief in general brightness for all things, and are one of the best arguments for the elective system.

JAMES E. LOUGH,
Secretary.

BUSINESS MEETING.

MAY 4, 1903.

The Academy met at 8.15 P. M., Vice-President Poor presiding. In the absence of the Recording Secretary, the reading of the minutes of the last meeting was dispensed with.

No business was reported from the Council. As no new business was presented, the Academy adjourned.

CHARLES LANE POOR,
Secretary, pro tem.

SECTION OF ASTRONOMY, PHYSICS, AND CHEMISTRY.

MAY 4, 1903.

The Section met at 8.30 P. M., Vice-President Poor presiding. The minutes of the preceding meeting were read and approved.

The following papers were presented and read:

Ernest R. von Nardroff, A NEW INTERFEROMETER METHOD FOR MEASURING THE REFRACTIVE INDEX OF A TRANSPARENT PLATE.

G. B. Warring, SOME PECULIARITIES OF THE GYROSCOPE.

SUMMARY OF PAPERS.

Mr. von **Nardroff** stated that this method was planned to avoid the use of compensation, which leads to grave errors unless in the compensating material the ratio of the velocities for any two wave-lengths is the same as in the substance being measured. It is frequently impracticable to fulfil this condition, as for example by using as a compensator a second plate of the same material. Air compensation is of course out of the question.

In the present method, in which no use is made of white light fringes, the transparent plate, a microscope cover-glass, for instance, is mounted on a special stage perpendicular to the path of one of the beams in a Michelson interferometer. With sodium light, bands are seen that are generally distorted through lack of perfect parallelism between the surfaces of the plate. The stage is now rotated forward about a vertical axis through an angle of 45° up to a fixed stop, thus increasing the path through the plate. Slowly turning the stage backward, the bands passing a fixed point in the field are carefully counted until the plate returns to the perpendicular position, when the motion of the bands reverses. A new count is now made while the stage is turned past the perpendicular, backward 45 degrees to a second fixed stop. Generally these counts differ by a few tenths of a band, owing to imperfect mounting of the stage as a whole on the interferometer, but they may be averaged without sensible error. Since the light passes through the plate twice, one half the number of bands counted should be taken to represent the increase of optical path, N , in wave-lengths. The thickness, t , of the plate at the part of it observed in the interferometer may be measured by means of a micrometer caliper or by a spherometer. The following exact formula, much simplified through the use of precisely 45 degrees of rotation, gives the value of the refractive index, μ :

$$\mu = \frac{\frac{1}{2} + \left(1 - \sqrt{\frac{1}{2} - \frac{N\lambda}{t}}\right)^2}{2 \left(1 - \sqrt{\frac{1}{2} - \frac{N\lambda}{t}}\right)}.$$

For sodium light where the wave-length, λ , is 0.0005893 mm.,

$$\mu_{na} = \frac{0.5 + \left(0.2929 - \frac{0.0005893N}{t}\right)^2}{2 \left(0.2929 - \frac{0.0005893N}{t}\right)}.$$

This method has been extended to the measurement of doubly refracting plates, such as mica. The plate crystalline must contain in its plane at least one of the axes of the so-called ellipsoid of elasticity, and must be mounted with this axis vertical. The bands may be observed through a Nicol prism having its shorter diagonal vertical.

Dr. **G. B. Warring** detailed the results of some interesting experiments with the gyroscope. The paper led to an interesting discussion.

S. A. MITCHELL,

Secretary.—

SECTION OF BIOLOGY.

MAY 11, 1903.

A regular monthly meeting was held at the American Museum of Natural History on May 11, Professor Bashford Dean presiding.

The following papers were presented and read:

H. F. Osborn, ON RECENT MODELS AND RESTORATIONS OF A NUMBER OF EXTINCT ANIMALS, WITH A DISCUSSION OF THEIR PROBABLE HABITS AND MODES OF LIFE.

E. L. Thorndike, NATURAL SELECTION AND FERTILITY IN MAN.

C. T. Brues, THE INTERNAL FACTORS OF REGENERATION AND REVERSAL OF ASYMMETRY IN THE CRUSTACEAN ALPHEUS.

SUMMARY OF PAPERS.

Professor **Osborn's** paper was based upon models and restorations from the Department of Vertebrate Paleontology of the American Museum of Natural History, prepared by Charles

Knight under the direction of the speaker with the assistance of other members of the department. Numerous models and drawings were exhibited and described. Of special interest were the following: *Elephas imperiales* (Imperial mammoth); *Trilophodon productus* (Miocene mastodon); and *Ichthyasaurus* and young; several Pleistocene rhinoceroses; and *Diplodocus* (a bird-catching dinosaur).

Professor **Thorndike** reported a study of the size of families of college graduates during the nineteenth century and of the descendants of a New England family during the eighteenth and nineteenth centuries. The average number of children in the latter case rose gradually to an acme in the generation born about 1720 and then fell steadily, the figures for eight generations being 5.3, 6.3, 7.7, 10.0, 7.2, 5.5, 4.4, 3.8. This rise is inconsistent with the common hypothesis that social custom is the cause of change in the productivity of races. So also is the form of the surface of frequency of family size in the later decades of the nineteenth century (see *Popular Science Monthly*, May, 1903, p. 68). A real decrease in natural fertility would account perfectly for the statistical appearances found; and, if we judge only by them, is the most likely hypothesis.

Mr. **Brues** presented a preliminary account of "The internal factors of Regeneration and Reversal of Asymmetry in the crustacean *Alpheus*." Przibram and Wilson have recently shown that when the larger of the asymmetrical chelæ of these animals is amputated, the smaller one on the opposite side develops into a claw of the large type while a small one regenerates on the stump of the large one. If the nerve of the small claw be severed at the time of removing the large one, reversal does not take place, or only incompletely. Histological examination of animals in which such changes are taking place indicates that the regeneration and remodeling are influenced by the nervous system, due possibly to increased nutrition in the ganglion which supplies the small chela. As the nervous system shows no morphological asymmetry corresponding to that of the claws, it probably acts only in a passive way in determining the type of the claw, although it evidently gives the

stimuli for the more minute changes which take place in the remodeling of a small chela to form one of the large type.

M. A. BIGELOW,
Secretary.

SECTION OF GEOLOGY AND MINERALOGY.

MAY 18, 1903.

Section met at 8:15 P. M., Professor James F. KEMP presiding.

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

The following program was then offered:

George I. Finlay, THE GEOLOGY OF THE NEPHELITE SYENITE AREA AT SAN JOSÉ, TAMAULIPAS, MEXICO.

Fred H. Moffet, THE COPPER MINES OF COBRE, SANTIAGO DE CUBA.

SUMMARY OF PAPERS.

In his paper Dr. **Finlay** said in part: The town of San José in the State of Tamaulipas, Mexico, lies in a hollow surrounded on all sides by mountains, and is about seventy miles from the coast of the Gulf of Mexico. The range of peaks immediately to the south of it, and extending for fifteen miles in that direction, is of nephelite-syenite. The range is known as the San Carlos Mountains. San José itself is on the site of an eroded laccolith of andesite (locally known as "porphyry"), intruded into limestone. Some limestone masses stand on end within the area of the laccolith, and are thought to have floated or worked their way down to their present position during the intrusion of the igneous rock. There are two or three hundred of these isolated limestone masses, and it is in connection with these that the copper ores are found. Contact metamorphism has not been developed to any great extent in the limestone surrounding the laccolith, but has been greatly induced in the included masses; marble, grossularite, vesuvianite and other minerals having been produced. Aside from the occurrence of the nephelite-syenite in the area south of the laccolith, the region is interesting on account of the dyke rocks which are found cut-

ting the andesite of the laccolith. Among these are found analcite-tinguaïtes and camptonites, as well as vogesite and diabase. Two main streams now drain the hollow formed by the down-cutting of the dome where the weaker andesite has been laid bare as far as the limestone cover has been cut back.

Dr. Finlay's paper was discussed by Professor Kemp, who called attention to the interesting association of types presented by the intruded rocks; and by Dr. H. S. Washington, who dwelt on the importance attaching to the additional localities here and elsewhere recently reported for the peculiar dyke rocks mentioned.

In his paper Mr. **Moffet** said in brief: The copper mines of El Cobre are located about nine miles west of the bay of Santiago, where a series of eruptive flows, andesites and rhyolites, are interbedded with fragmental rocks, agglomerates, breccias and tufts. The strike of the beds is east and west, and they dip at a low angle to the north. The series is cut by trap dykes and by two major systems of faults, the older of which runs east and west and carries with it the large ore bodies. The second major system has a direction nearly north and south. Cross faults cut and displace the ore bodies of the older system, and carry copper, though in less amount. The copper workings of the old English mining companies produced enormous quantities of very rich oxidized ore which gave place in the lower levels to sulphides. Much difficulty is encountered in handling the mine water on account of the porous nature of the country rock. At the present time the iron ore of the region is of much greater commercial importance than the copper.

In the discussion which followed, Professor Kemp spoke of the great importance to the United States which the iron ore deposits possessed on account of their great extent and convenient location. The ore is extremely low in phosphorus, but contains some sulphur. The copper may again be of great importance, strong efforts are being made at present for its exploitation.

E. O. HOVEY,
Secretary.

BUSINESS MEETING.

OCTOBER 5, 1903.

The Academy met at 8:15 P. M., President Cattell presiding. The minutes of the last business meeting were read and approved.

The Secretary reported from the Council as follows :

That a communication had been received from the Secretary of the Scientific Alliance stating that an appropriation in aid of scientific research not to exceed \$450 had been made from the income of the Herrman Fund, and that a grant of \$50 in aid of research in zoölogy or botany had been made from the John Strong Newberry Fund. The Secretary stated that applications for grants should be sent to the Secretary of the society of which the applicant is a member, to be approved by the Council of that society before being forwarded to the Scientific Alliance.

The following candidates for active membership, approved by the Council, were duly elected : Dr. John Cutler Torrey, Dr. William Morton Wheeler, Dr. Joseph Hyde Pratt.

On the recommendation of the Council, Dr. William Morton Wheeler was duly elected a Fellow of the Academy.

The Academy then adjourned.

HENRY E. CRAMPTON,
Recording Secretary.

SECTION OF ASTRONOMY, PHYSICS AND
CHEMISTRY.

OCTOBER 5, 1903.

The Section met at 8:30 P. M., Dr. Charles Lane Poor presiding. After the reading of the minutes the following papers were presented :

Harold Jacoby and S. Alfred Mitchell, A COMBINED PRISMATIC TRANSIT AND ZENITH TELESCOPE.

George F. Kunz and Charles Baskerville, NOTES ON RADIUM.

SUMMARY OF PAPERS.

Professor **Harold Jacoby** and Dr. **S. Alfred Mitchell** exhibited a combined prismatic transit and zenith telescope. This instrument, just received by the Department of Astronomy of Columbia University, was made by Bamberg, of Berlin. It includes all the latest observational devices, including an eye-piece of the Repsold pattern for the automatic registration of transit observations.

Dr. **George F. Kunz** and Dr. **Charles Baskerville** gave an exhibition of radium of 300,000 activity, with some notes on the action of the Röntgen ray, ultra-violet light and radium on mineralogical substances. This paper has been published in *Science*, N. S., Vol. XVIII, 1903, pp. 769-783.

S. A. MITCHELL,
Secretary of Section.

SECTION OF BIOLOGY.

OCTOBER 12, 1903.

The first meeting of the academic year was held at the American Museum of Natural History on October 12, Professor Wilson acting as temporary chairman. As in former years, this first meeting after the long vacation was devoted to reports on scientific work carried on by members of the Section during the summer. The following notes indicate the lines of the work of the members who reported.

Professor **Bristol** in association with Professor **Mark**, of Harvard, directed the summer work of the Bermuda Biological Station. Dr. **Hay** was very successful in collecting in Wyoming materials for his studies of fossil turtles. Professor **Osborn** directed explorations in Wyoming, Nebraska and South Dakota in the interest of the American Museum of Natural History, securing much valuable material which supplements collections previously made. Professor **Grabau** collected in Michigan materials for continuation of his studies on Devonian faunas. Dr. **Summer** directed the Biological Laboratory of the

United States Fish Commission at Woods Hole, Mass. Professor **Calkins** studied the relation of Protozoa to cancer and smallpox. Professor **Crampton** continued the accumulation of data relating to selection in Lepidoptera. Mr. **Bigelow** studied the early embryology of some crustaceans. Mr. **Yatsu** experimented on regulation and organization of nemertean eggs. Professor **Wilson** at Naples studied problems of localization and mosaic development of molluscan eggs.

M. A. BIGELOW,
Secretary.

SECTION OF GEOLOGY AND MINERALOGY.

OCTOBER 19, 1903.

Section met at 8:15 P. M., Professor James F. Kemp presiding. There were no minutes to be read. Notice of the election of officers of the Section at the November meeting was read.

The following program was then offered :

G. F. Kunz, BISMUTH (NATIVE) AND BISMITE FROM SAN BERNARDINO CO., CAL. (Read by title.)

G. F. Kunz, CALIFORNITE (VESUVIANITE); A NEW ORNAMENTAL STONE. (Read by title.)

E. O. Hovey, OBSERVATIONS ON THE 1902-1903 ERUPTIONS MT. PELÉ, MARTINIQUE.

SUMMARY OF PAPERS.

The main paper of the evening consisted of a lecture by Mr. **Hovey** on the principal events in the volcanic history of the island of Martinique during the last year and a half. He described the phenomena of the eruptions, the mud-torrents and mud-flows, the attendant and subsequent aqueous erosion on the slopes of the mountain, the rise and vicissitudes of the new cone of eruption and its wonderful spine or obelisk. The lecture was illustrated with about 95 lantern slides from negatives taken by the author on the two expeditions which he has made

to Martinique for the American Museum of Natural History since the eruptions began. The details of these observations are given in the publications of the Museum and in the *American Journal of Science*, the *Scientific American Supplement*, the *National Geographic Magazine* and elsewhere, and will not be repeated here.

The papers by Dr. **Kunz** have been published in full in the *American Journal of Science*, Vol. XVI, December, 1903, pp. 397, 398.

Three hundred fifty-two members and their friends were present.

EDMUND OTIS HOVEY,
Secretary.

SECTION OF ANTHROPOLOGY AND PSYCHOLOGY.

OCTOBER 20, 1903.

The regular meeting of the section was held October 20, in New Haven, Conn., in conjunction with the New York Branch of the American Psychological Association and the Philosophical Club of Yale University.

The following papers were presented:

S. I. Franz, LOCALIZATION OF BRAIN FUNCTION.

Robert Yerkes, THE APPLICATION OF THE CONCEPT OF VARIABILITY IN REACTION-TIME WORK.

W. P. Montague, THE "SPECIOUS PRESENT" AND THE REAL PRESENT.

E. H. Cameron and **W. M. Steele**, THE EFFECTS OF PRACTICE ON THE POGGENDORFF ILLUSION.

Charles H. Judd, THE ZÖLLNER FIGURE.

J. McKeen Cattell, STATISTICS OF AMERICAN PSYCHOLOGISTS.

Raymond Dodge, THE PARTICIPATION OF THE EYE MOVEMENTS IN THE VISUAL PERCEPTION OF MOTION.

Geo. T. Stevens, ON THE HOROPTER.

R. S. Woodworth, INTELLIGENCE AND MOVEMENT.

Lightner Witmer, THE MINIMAL VALUE OF THE PSYCHOPHYSICAL REACTION-TIME. Read by title.

H. R. Marshall, PRIMARY AND SECONDARY PRESENTATIONS.
Read by title.

SUMMARY OF PAPERS.

Dr. **Franz**, of Dartmouth Medical College, presented an account of an attempt to determine by physiological experiments whether or not the so-called motor areas are also sensory in function. Cats were used in the investigation, and the results indicate that in these animals the motor cortex has also certain sensory functions. It was not determined with what sensory processes the areas are concerned, but results of clinical observations made it appear probable that the center for muscle sense is there located.

Dr. **Yerkes**, of Harvard University, stated that inasmuch as the degree of constancy of reaction-times differs for different species, individuals, conditions of the individual, modes and intensities of stimulation, it is clear that variability is an important quantity in the analysis of reactions, which should make possible the quantitative estimation of the influence of the various factors which play a part in determining the time of reaction.

The mean or average variability is generally determined in recent studies of reaction time, but of far more importance for comparative work is what may be known as the relative variability. This quantity is an index of the variability, which gives not the absolute variableness of the reaction time, but the ratio of the variability to the time of reaction. For reaction times, which are symmetrically distributed about a mode, the relative variability may be gotten from the formula

$$\frac{\text{mean variability} \times 100}{\text{mean}}$$

In case of asymmetrical distribution Pearson's formula for obtaining the coefficient of variability should be used.

Examination of reaction time statistics in which the variability is given indicates that the relative variability, as well as the time of reaction and the mean variability, decreases with increase in the strength of the stimulus. For electric stimulation this appears to be true from the threshold intensity to that which

causes a reflex reaction, but in case of other modes of stimulation it is possible that beyond a certain point increase in intensity of the stimulus causes slower and more variable reactions.

Since the time of reaction varies with the intensity of the stimulus it is useless to compare reaction times for different modes of stimulation, or those of different species or individuals, unless the relative variability is known. It is not improbable that careful investigation of the relation of relative variability to reaction time will furnish a satisfactory basis for the accurate comparison of different results. To say that one person reacts more quickly than another to a given stimulus without taking into account the variability of the reaction time is meaningless.

Dr. **Montague** said that a psychosis, like all systems, possesses in its totality a form or structure which is distinguishable, as the perceiving subject, from its individual contents, as perceived objects. Changes in the individual contents produce concomitant, though generally lesser, changes in the totality. The segment of duration or change perceived in any one moment is not itself a real change, but simply the *ratio of the change-rate of the individual contents to the change-rate of the totality, at that moment*; and this ratio, though finite and variable, does not itself require a finite time for its realization. Each unextended moment of "real" time is thus adequate for the appreciation of an extended period of perceptual or "specious" time.

The paper of Messrs. **Cameron** and **Steele** reported the results of a series of experiments dealing with the effect of practice on the Poggendorff illusion. (1) Quantitative determinations were made with a number of illusions; (2) practice with one illusion was carried on for an extended period; (3) determinations were again made with all of the illusions which were used before the practice series.

The apparatus used was demonstrated. The results show that the illusion tends to disappear after a period of seven weeks' practice. The effects of such practice were found to hold good for figure other than that which the practice was made.

The paper of Dr. **Judd** reported a series of quantitative determinations of the amount of illusion in the Zöllner figure

when the figure was rotated through 360 degrees and was divided so that the illusion for each of the long lines was determined without reference to the next long line. It was found that the illusion is not the result of equal deflections in opposite directions of the neighboring lines. In some cases one of two neighboring lines is not deflected at all, or even in a direction opposite to that usually assumed. The important deflection is in every second long line. Rotation through various angles shows that there are four positions in which deflection is great, four in which it is small.

Professor **Cattell** described the methods he has employed to select 1,000 American men of science for scientific study. Among about 4,000 scientific men, there are about 200 psychologists. The methods by which they were arranged in the order of merit were explained, and the possibility of measuring degrees of scientific merit by the positions and probable errors was discussed. Some statistics were then given in regard to the academic origin, course and distribution of the psychologists. They were educated at 76 different colleges, this large dispersal indicating that in general psychologists are not greatly influenced by the institutions at which they study. The members who pursued graduate studies at different institutions were: Berlin, Leipzig 35, Columbia 31, Clark 31, Harvard 30, Cornell 25, Yale 16, Johns Hopkins 13. Of the 200 psychologists, all but eight are engaged in teaching or administrative educational work, being distributed among 77 institutions. Statistics were also given in regard to publications, from which it appears that the United States contributes about one seventh of the more important publications, leading in experimental psychology. The paper will be published in the *American Journal of Psychology*.

Professor **Dodge** showed that photographic registration of eye movements has exposed the poverty and inaccuracy of all introspective data with respect to their number, velocity and amplitude, while it shows that, even if our consciousness were full and exact in all three aspects, it would be either useless or misleading as a datum in the visual perception of motion.

Every pursuit movement of the eyes is a definite muscular reaction to retinal stimulation. As such it is evidently conditioned both in direction and in velocity by some definite characteristics of the stimulus which occasions it. Since its accuracy can never transcend the accuracy of the data on which it occurs, it follows that the kinesthetic factor from a reactive pursuit movement could never correct nor materially augment the data furnished by the stimulus.

Moreover, the reaction of the eye involves a long reaction interval, about 160-170. This suggests both the relative importance of the actual motor response and a considerable elaboration of the sensory data in what seems like a simple reaction. But any reaction interval at all renders it impossible for the actual eye movement to parallel the movement of the object of interest either in velocity or in amplitude.

Experimental verification of the above takes two forms: Whenever all other sensory data for the perception of motion are suppressed, except the hypothetical kinesthetic factor, there is no immediate perception of motion. And whenever the former are distorted by eye movements, the appearance of motion is respectively decreased or increased, entirely without correction by kinesthetic data.

A horopter, said Mr. **Stevens**, will be formed when the two eyes are so adjusted as to enable the image of the point fixed to be located exactly at the maculas of the two retinas. It follows that horopters succeed each other in endless variety and with amazing rapidity. With every glance a new horopter is developed. Two tenets constitute the essential foundation for the doctrine of the horopter, the theory of actually horizontal and actually vertical meridians of the retinas and a doctrine of corresponding points.

Corresponding points of the two retinas are those which answer to proportional degrees of rotation of the eyes about the center of rotation, and which, from given individual points in the plane of fixation, each receive incident rays which must pass through the nodal points. They represent, therefore, the relation between the muscular and the retinal senses.

Dr. **Woodworth**, in his paper, argued that the mental cue of a voluntary movement was not ordinarily a kinesthetic image of the movement. Even in learning a new movement, experiment shows that no such image need be present. Since voluntary movement is developed from instinctive, the original mental cue must have been that provided by instinct, and the instinctive cue is never an image of the movement about to be made. The actual sensation of a movement can evidently not be the stimulus to that same movement, and the reproduced sensation can hardly have a motor power not possessed by the sensation itself.

JAMES E. LOUGH,
Secretary.

BUSINESS MEETING.

NOVEMBER 2, 1903.

The Academy met at 8:15 P. M., Vice-President Poor presiding. The minutes of the last business meeting were read and approved.

There being no further business to come before the meeting, the Academy adjourned.

H. E. CRAMPTON,
Recording Secretary.

SECTION OF ASTRONOMY, PHYSICS AND CHEMISTRY.

NOVEMBER 2, 1903.

The section met at 8.30 P. M., Dr. Charles Lane Poor presiding.

After reading the minutes the following papers were presented.

Bergen Davis, THE ELECTRICAL CONDUCTIVITY AND ABSORPTION OF ENERGY IN THE ELECTRODELESS DISCHARGE.

Charles Lane Poor, THE MEASUREMENT OF RACING YACHTS.

SUMMARY OF PAPERS.

Dr. **Davis** discussed the discharge produced in an annular vessel by the high frequency discharge from a Leyden jar sys-

tem. The vessel in which the discharge was produced contained electrodes which were connected through a galvanometer to a source of E.M.F. of 220 volts. When the discharge passed in the vessel, the gas became a good conductor. The conductivity as indicated by the galvanometer was found to depend on the pressure of the gas somewhat. That is, when the pressure becomes so low that the white discharge appeared, the conductivity increased to near a maximum. It remained nearly constant until at a low pressure the discharge disappeared, when the conductivity became zero.

The absorption of energy was measured by placing a hot-wire galvanometer in the circuit leading from the jars to the coil surrounding the vessel. The oscillating current passing through this galvanometer and coil can be expressed by

$$c = Ae^{-qt} \cos pt.$$

The greater part of the energy is dissipated in heating the gas and the vessel. The energy will be proportional to the square of the current, while the galvanometer reads current direct. Hence

$$\text{Reading} \propto \int_0^{\infty} e^{-2qt} \cos^2 ptdt.$$

$$\text{Readings} \propto \frac{2p^2 + 3q^2}{4q(p^2 + q^2)},$$

$$\text{Readings} \propto \frac{1}{q}.$$

That is: a certain reading is obtained without the vessel in the coil. When the discharge passes in the vessel, the readings drop back to a smaller value. This drop-back is proportional to the dissipation q in the circuit. The energy absorbed reaches a maximum near the pressure at which the discharge first appears. It steadily decreases and becomes zero again at the pressure at which the discharge disappears.

The measurements discussed by Dr. Poor are made for the purpose of classifying the yachts and furnish a basis for handicapping them in racing. From such measurements, made of

the hull, spars and sails, an expression is found for the "theoretical speed," or speed the yacht should make under normal conditions. While every little detail of hull and rigging contributes its part in producing a fast yacht, yet it is manifestly impossible to take account of all such details in finding the "theoretical speed"; only the main factors can be considered. These factors, which enter the rules in common use, are length of hull, sail area and displacement.

It was shown that the rules introduce these factors in such a way as to involve the assumption that speed is proportional to: (a) The square root of length; (b) the fourth root of sail area; and that the New York Yacht Club rule involves these two assumptions and the additional one that speed is proportional to (c) the inverse sixth root of displacement.

Dr. Poor discussed these assumptions in detail and showed that, while there is some apparent basis for the assumption in regard to length, there appears to be no scientific basis for those in regard to sail area and displacement. In fact, the available data seem to point to the conclusion that the assumption in regard to sail area is wrong, that speed is more nearly proportional to square root of sail area. In support of this view the results of many races between two yachts in 1902 and 1903 were used. Dr. Poor called attention to the scientific aspect of the problem, and suggested several lines of experiment, by means of which the relationship between speed and the factors of measurement could be determined.

S. A. MITCHELL,
Secretary.

SECTION OF BIOLOGY.

NOVEMBER 9, 1903.

The November Meeting of the section was held on the 9th of the month at the American Museum of Natural History, Professor Brashford Dean presiding. A business meeting of the Section preceded the scientific program. Professor E. B. Wilson was nominated to the Council as vice-president and chairman of the Section of Biology for the coming year. M. A. Bigelow was re-elected secretary of the section.

Professor **Gary N. Calkins** then gave an illustrated lecture on "THE LIFE-HISTORY OF CYTORYCTES VARIOLÆ, THE CAUSE OF SMALLPOX."

M. A. BIGELOW,
Secretary.

SECTION OF GEOLOGY AND MINERALOGY.

NOVEMBER 16, 1903.

Section met at 8.15 P. M., Professor James F. Kemp presiding. The minutes of the last meeting of the Section were read and approved.

The following officers were elected for the year 1904 :

Chairman, Professor James F. Kemp.

Secretary, Edmund Otis Hovey.

Notice was given regarding applications for grants from the Hermann Fund.

The following programme was then offered :

A. W. Grabau, "DISCUSSION OF AND SUGGESTIONS REGARDING A NEW CLASSIFICATION OF ROCKS."

Wallace Goold Levison, "NOTE ON FLUORESCENT GEMS."

George F. Kunz, "MINERALOGICAL NOTES."

SUMMARY OF PAPERS.

Dr. **Grabau** said in part, that all classification ought, as far as possible, to be genetic or according to progressive development. Such a classification is practicable in the biologic sciences, but not in those, which, like minerology, deal with inorganic substances. In developing his theme the speaker suggested the following provisional subdivisions : endogenetic rocks, or those formed by chemical means, and exogenetic or clastic rocks, which are chiefly of mechanical origin. The first group is further subdivided into : pyrogenic, or igneous rocks ; hydrogenic or aqueous rocks ; biogenic or organic rocks. The hydrogenic and biogenic rocks were each again subdivided into rocks of calcareous, silicious, ferruginous, carbonaceous and miscellaneous composition ; and a further subdivision was made into unaltered and altered or metaphoric types.

The exogenic or clastic rocks were divided into autoclastic, hydroclastic, pyroclastic, bioclastic and anemoclastic.

A further subdivision according to texture was, into rudaceous or conglomeratic, arenaceous or sandy, and lutaceous or mud rock.

The next division was according to composition, into two main groups — silicious and calcareous; and finally into unconsolidated and consolidated and metamorphic rock.

In the discussion of the paper Professor **Stevenson** spoke of the value of such a classification through its giving teachers ideas for presentation to their classes regarding the interrelations of rock. Professor **Kemp** spoke of the system being well adapted to geologic study on account of its giving the surroundings in which any specified rock has developed, although it is not practicable to assign a place to every small rock group which is really of mineralogical rather than of geological value.

Mr. **Levison** said: Fluorescence or the property of increasing the wave-length of certain luminous rays enhances the beauty of a few colored gems under conditions which lessen the effectiveness of others that do not possess this property. Garnet, for instance, which is non-fluorescent, loses its rich crimson color and becomes dull gray in pure blue light. On the contrary, most kinds of ruby and ruby spinel, and pink topaz respond to light-rays above the red on account of their fluorescence, and in blue-violet light still display their characteristic tints. The red color of the ruby is somewhat developed by the light of the air-gap spark and an uncovered Crookes tube. It is intensely excited by the cathode rays. Willemite displays a beautiful greenish-yellow color not only in ordinary light rich in the yellow-green rays but also in light consisting chiefly or wholly of the more refrangible colors in which its characteristic color would be effaced but for the possession of fluorescence in high degree. This mineral is excited furthermore by some of the ultra-violet rays and by the Roentgen and Becquerel rays.

Other materials which owe desirable tints to fluorescence are pearl, opal, hyalite, chalcedony and kunzite (the new lilac spo-

dumene). Hiddenite, the green spodumene, seems to be non-fluorescent. Impaired by fluorescence are triphane, a yellowish-green spodumene, which exhibits pink fluorescence in blue light; emerald, which shows crimson fluorescence in the upper part of the spectrum, and diamond, with greenish-blue to blue fluorescence excited by several kinds of energy but more or less masked in ordinary light.

In fluorescent substances excitation produces a certain opalescence or milkiness which is sometimes of sufficient strength to be of importance. It cannot be taken as an indication of impurities in the materials. In the white diamond such a phenomenon is a detrimental quality.

Fluorescence affords a simple and positive method of distinguishing some of the fluorescent gems from imitations. All glass imitations are fluorescent with the color characteristic of glass from which the fluorescent color of the genuine stone differs distinctly. In doublets the cement appears as an opaque film and the components differ in behavior. Artificial pearls of high grade have not been examined, but probably they will behave like the genuine. Artificial or "regenerated" ruby has been examined in a single specimen. It acts like the natural stone in blue light, while with the air-gap spark between iron or aluminum electrodes it has a brighter color than any of the several natural rubies which were examined. The wave-length which excites fluorescence of each substance must eventually be stated.

The following gems were stated to be non-fluorescent: garnet, amethyst, Spanish topaz, yellow Brazilian topaz, sapphire, ordinary beryl, possibly Siamese ruby.

In the discussion of Mr. Levison's paper Professor **Kemp** expressed the hope that there would be a practical outcome from such investigations which would enable those not experts to detect false or artificial gems; while Mr. **Kunz** said that there were simpler ways than the use of fluorescence for the determination of gems, and Professor **D. S. Martin** emphasized the desirability of getting definite information as to the wave-lengths to which gems respond.

In the course of his paper Dr. **Kunz** exhibited white compact garnet from Fresno County, California, associated with the newly described compact vesuvianite, or "californite." In connection with these two compact minerals attention was called to the third compact mineral "pectolite," which was described some years ago by W. P. Blake. Pyroelectric zinc blende associated with wollastonite from Mariposa County, California, also was exhibited.

EDMUND OTIS HOVEY,
Secretary.

SECTION OF ANTHROPOLOGY AND PSYCHOLOGY.

NOVEMBER 23, 1903.

The section met on November 23, in conjunction with the American Ethnological Society.

The following paper was presented and read :

Clark Wissler, RECENT RESEARCHES ON THE DECORATIVE ART OF THE PLAINS INDIANS.

Dr. **Wissler** said it was demonstrated by specimens and explanations that among the Indians of the plains may be found a type of graphic art that is purely decorative in contrast to a type that is absolutely symbolic. In addition, a transition type occurs in which both the symbolic and the asthetic motives function. The whole of this art is the work of women. In the purely decorative art complex geometric designs are built up from simple geometrical elements. These elementary designs have technical names and are worked into compositions according to recognized principles and standards. In the symbolic art the designs are conventional representations of objects with sacred or mystic associations and are realistic in motive. While a number of conventional designs are used which are known once to have possessed symbolic value and to have originated in realistic motives, the majority of design elements do not appear to have originated in this way. Their occasional use in a symbolic sense is an afterthought and a makeshift.

From which it appears that the graphic art of these Indians, as we find it to-day, is an objective development in contrast to the subjective symbolism of other tribes.

JAMES E. LOUGH,
Secretary.

BUSINESS MEETING.

DECEMBER 7, 1903.

The Academy met at 8:15, Vice-President Dean presiding. The minutes of the last business meeting were read and approved.

The Secretary reported from the Council as follows: that the following Active Members had been nominated as candidates for election as Fellows—Isaac Adler, M.D., Edward K. Dunham, M.D., William Harper Davis, Miss Ida N. Ogilvie, Ph.D., and Charles H. Townsend.

That the following nominations for officers for the coming year had been made:

President, Edmund B. Wilson.

Vice-Presidents: James F. Kemp, L. M. Underwood, C. L. Poor, F. J. E. Woodbridge.

Corresponding Secretary, R. E. Dodge.

Recording Secretary, H. E. Crampton.

Treasurer, C. F. Cox.

Librarian, R. W. Tower.

Editor, C. L. Poor.

Councilors (to serve three years): Livingston Farrand, E. O. Hovey.

Finance Committee: J. H. Hinton, C. A. Post, H. F. Osborn.

That the Annual Meeting would consist of a formal meeting for the election of Fellows and Officers, for the reading of the annual reports of the officers for the past year, etc., and that this would be followed by a dinner to be served in the Museum building. Full notices would be sent to members in the usual manner.

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

Oswald Speir, 310 West 94th Street.

Emil Heuel, M.D., 1 West 94th Street.

On recommendation of the Council, the following Active Member was elected a Fellow :

Ralph W. Tower.

MISCELLANEOUS BUSINESS.

The notice of the Academy was called to the death of Dr. H. Carrington Bolton, a former President of the Academy, by Professor D. S. Martin, with a statement that it would be eminently fitting for the Academy to take formal action in recognition of the long services of Dr. Bolton to the Academy. It was voted that the Chairman appoint a Committee of three to prepare a suitable minute relating to Dr. Bolton's death. The Chairman appointed D. S. Martin, N. L. Britton, and E. B. Wilson.

The Academy then adjourned.

H. E. CRAMPTON,
Recording Secretary.

SECTION OF BIOLOGY.

DECEMBER 7, 1903.

The December meeting was held on the seventh of the month, Professor Bashford Dean presiding. Professor Wilson declined the nomination for the vice-presidency and chairmanship of the Section which was made at the November meeting ; and Professor L. M. Underwood was by unanimous vote nominated as the candidate from the Section to be presented at the annual meeting for election of officers of the Academy.

The following scientific program was presented :

E. B. Wilson, AN EXPERIMENTAL STUDY OF THE GERM-REGIONS IN THE MOLLUSCAN EGG.

A. G. Mayer, THE CORAL REEFS OF THE BAHAMAS (illustrated).

SUMMARY OF PAPERS.

Dr. **Mayer** said that the shallow Bahama banks are veritable submarine deserts covered with finely divided silt and fragments of the calcareous remains of marine animals and plants. The corals grow in clusters chiefly on the outer edges of the banks and may be compared to oases in the desert.

The water of the banks is generally charged with a flocculent mass of silt which is fatal to most of the pelagic animals. Accordingly the Bahamas have only about half as many species of pelagic animals as the Tortugas, Florida.

The exceptional richness of the Tortugas' fauna is also due to the drift from the Gulf Stream caused by prevailing north-east and southeast winds, while the fauna of the Bahamas is depleted from the same cause. In other words the Bahamas lie on the wrong side of the Gulf Stream for the study of pelagic life. About one-half of the pelagic forms of the Bahamas are equally abundant at the Tortugas; but about one-quarter of the remainder are more abundant at the Bahamas, and a few of these seem to be confined exclusively to this region.

The Bahamas are richer in species of corals and actinians than the Tortugas, this being due to the fact that the coral-reefs of the Tortugas were largely killed by a drift of dark-colored water which passed over them in October, 1878, and have only partially recovered. No more favorable situation for the study of pelagic life has been discovered in the tropical Atlantic than that of the Tortugas, Florida.

Prof. **Wilson's** paper is to be published in a forthcoming number of the *Journal of Experimental Zoölogy*.

M. A. BIGELOW,
Secretary.

SECTION OF GEOLOGY AND MINERALOGY.

DECEMBER 14, 1903.

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

Herschel C. Parker, EXPLORATIONS AND FIRST ASCENTS IN THE CANADIAN ROCKIES.

George F. Kunz, GEM MINERALS OF SOUTHERN CALIFORNIA.
(Read by title.)

George F. Kunz, CLACKAMAS METEORIC IRON. (Read by title.)

SUMMARY OF PAPERS.

Professor **Parker's** paper occupied the evening, and consisted of an illustrated lecture describing the section of the Rocky Mountains in British Columbia and Alberta known as the "Canadian Alps."

In a brief introduction an explanation was given of the physical characteristics which determine the Alpine nature of mountain ranges and it was pointed out that the Rocky Mountains of Canada may justly be termed the "Switzerland of America."

A series of more than 100 lantern slides was shown, many of them illustrating first ascents made by the lecturer. These summits were Mt. Dawson, the highest peak of the Selkirks, Mt. Goodsir, one of the highest and most difficult peaks in British Columbia, Mt. Lefroy, Mt. Hungable ("the Chieftain"), Mt. Deltaform and Mt. Biddle, these latter peaks being situated in Alberta near Lake Louise. The summits of some of these mountains were previously thought to be practically inaccessible and the climbs were attended with the greatest difficulties. Mt. Lefroy was climbed by the lecturer in 1897, Mt. Dawson in 1899 and the remaining four summits during the past season. The lecturer also briefly described an interesting trip of about 100 miles north of the railroad to Wilcox Pass where the Saskatchewan and Athabasca Rivers take their rise.

The papers by Dr. **Kunz** have been published in *Science*, N. S., Vol. XIX, January, 1904, pp. 107-108.

EDMUND OTIS HOVEY,
Secretary.

ANNUAL MEETING.

DECEMBER 21, 1903.

The Academy met for the Annual Meeting at 6.45 P. M., President Cattell in the Chair.

The accompanying reports of officers for the past year were called for and presented, in the following order : Corresponding Secretary, Recording Secretary, Treasurer, Librarian, and Editor.

No Honorary or Corresponding Members were elected.

The following Active Members were elected Fellows of the Academy, on the nomination of the Council :

Isaac Adler, M.D.,
William Harper Davis,
Edward K. Dunham, M.D.,
Ida H. Ogilvie, Ph.D.
Charles H. Townsend.

The election of officers for the year 1904 was then held, tellers being appointed, ballots distributed and the votes counted. The following officers were elected :

President, Edmund B. Wilson.

Vice-Presidents, James F. Kemp, Lucien M. Underwood,
Charles Lane Poor, F. J. E. Woodbridge.

Corresponding Secretary, R. E. Dodge.

Recording Secretary, Henry E. Crampton.

Treasurer, Charles F. Cox.

Librarian, Ralph W. Tower.

Editor, Charles Lane Poor.

Councilors (three years), Livingston Farrand, E. O. Hovey.

Finance Committee, John H. Hinton, C. A. Post, Henry F. Osborn.

The meeting then adjourned to the Hotel Endicott ; it was continued in the form of a dinner, at which fifty members of the Academy and their friends were present.

The accompanying report of the special Committee appointed at the meeting of the Academy of December was presented by the Chairman of the Committee, Professor D. S. Martin.

Brief addresses were made by the retiring President, Professor Cattell, by the President-elect, Professor Wilson, and by the past-Presidents of the Academy, Professor Woodward, Professor Osborn, and Professor Stevenson.

The meeting then adjourned.

HENRY E. CRAMPTON,
Recording Secretary.

REPORT OF THE CORRESPONDING SECRETARY.

The Corresponding Secretary would report that there are at present on the rolls of the Academy 39 Honorary Members and 191 Corresponding Members. During the year the list of Honorary and Corresponding Members has been corrected by comparing it with the latest editions of "Minerva," "Who's Who" and other authoritative publications. The list as corrected was printed by the Academy during the summer. Letters have since been written to all Honorary and Corresponding Members asking for additional information or necessary corrections. The names of those who do not reply for two consecutive years will be dropped from the lists.

Respectfully submitted,

RICHARD E. DODGE,

Corresponding Secretary.

REPORT OF THE RECORDING SECRETARY.

Since the last Annual Meeting, twenty-nine regular meetings of the several sections have been held at which seven lectures and fifty-one stated papers have been presented. The titles were distributed as follows :

Section of Astronomy, Physics and Chemistry.

Astronomy,	4 papers.	
Chemistry,	1 paper.	
Physics,	7 papers.	1 lecture.
		12 papers, 1 lecture.

Section of Biology.

Botany,	1 paper.	
Palæontology,	1 "	
Zoology,	11 papers.	2 lectures.
		13 papers, 2 lectures.

Section of Geology and Mineralogy.

Geology,	7 papers.	
Hydrography,		1 lecture.
Mineralogy,	2 "	
Physiography,	1 paper,	2 lectures.
		10 papers, 3 lectures.

Section of Anthropology and Psychology.

Anthropology, 8 papers, 1 lecture.

Psychology, 18 "

26 papers, 1 lecture.

Total, 51 papers, 7 lectures.

Through the courtesy of the authorities of the American Museum in permitting the use of the Great Hall of the Museum, it has been possible to develop the work of several sections by having public lectures delivered on topics of general scientific interest. Particular mention may be made of the lectures presented by Professor Calkins on the Organism of Small-pox, by Dr. Hovey on his observations of Mont Pele and by Professor Parker on his Explorations in the Canadian Rockies. Mention may also be made of Dr. Hollister's account of the Hydrographic work of the U. S. Geological Survey, of Professor Dean's report on zoological work in Japan, and of Dr. Kunz's demonstration of radium and its effects on various minerals.

Another extension of the work of the Academy demands special attention, namely that in the Section of Anthropology and Psychology. This section has met in conjunction with the New York Branch of the American Psychological Association, at times outside the City of New York, and at these meetings a more extended series of varied papers has been presented than would be possible at ordinary sectional meetings.

The membership of the Academy has somewhat decreased during the past year. At present there are two hundred and eighty-seven Active Members, of whom one hundred and twenty-eight are Fellows, while the election of five Fellows is pending. Eight Members have resigned, and eight new Members have been elected, while thirteen members have died since the last Annual Meeting. The Academy notes with sorrow the death of several men, devoted to scientific research and to the furtherance of true scientific progress, whose names stood for true ideals of service in behalf of mankind. The Academy and the community at large suffers from the loss of H. Carrington Bolton, one of its past Presidents, of Andrew H. Green, Will-

William E. Dodge, Cornelius Van Brunt, Albert R. Leeds, and
Abram S. Hewitt.

HENRY E. CRAMPTON,
Recording Secretary.

REPORT OF THE TREASURER.

NEW YORK, December 21, 1903.

TO THE NEW YORK ACADEMY OF SCIENCES:

Gentlemen—As required by the by-laws, I herewith submit
a statement of my receipts and disbursements since my last
annual report, and a balance sheet from my ledger, as of this date.

Respectfully yours,

C. F. Cox,
Treasurer.

Examined and found correct,

JOHN H. HINTON,
For the Financial Committee.

RECEIPTS.

Balance as per last annual report		\$3,756.09
Annual dues for 1900,	\$ 30.00	
“ 1901,	60.00	
“ 1902,	200.00	
“ 1903,	1,930.00	
“ 1904,	30.00	2,250.00
Initiation fees,		45.00
Interest at 4½ per cent. on Bond and Mort- gage of \$12,000,		540.00
Interest on deposits in Bank,		61.23
		<u>\$6,652.32</u>

DISBURSEMENTS.

Cost of Publications,	\$703.66	
Less Sales,	59.98	643.68
Expenses of Recording Secretary,		261.09
“ Corresponding Secretary,		5.00
“ Librarian,		276.70
“ Treasurer,		21.23
General Expenses,	80.00	1,287.70
Balance on hand,		<u>\$5,364.62</u>

BALANCE SHEET.

	DR.	CR.
Permanent Fund,		\$10,371.43
Publication "		1,823.99
Audubon "		1,897.25
Income, Permanent Fund,		676.31
Income, Publication Fund,		113.77
Income, Audubon Fund,		115.99
General Income,		2,006.18
Investment on Bond and Mortgage, ..	\$12,000.00	
Cash on hand,	\$ 5,364.62	
	<u>\$17,364.62</u>	<u>\$17,364.62</u>

NEW YORK, December 21, 1903.

REPORT OF THE LIBRARIAN.

In accordance with the agreement between the New York Academy of Sciences and the American Museum of Natural History, the library of the Academy was on March 3, 1903, transferred to the custody of the Museum. Since that time the attention of the Librarian has been confined to the care of incoming exchanges and the correspondence of the office. Mr. William M. Erb has continued as the assistant in charge of the details of the work. The Librarian of the Museum has been engaged in arranging the Academy library and it is now in better condition for reference than ever before, and is available at any time to members of the Academy.

In laying down his office, the Librarian would call the especial attention of the Academy to the advisability of revising the exchange list, in consultation with the authorities of the American Museum, in order to avoid the useless duplication of minor exchanges brought about by the union of the two libraries.

Respectfully submitted,

LIVINGSTON FARRAND,
Librarian.

REPORT OF THE EDITOR.

During the year 1903 the Academy printed and issued the following publications :

Part III, Vol. XIV, of the Annals, containing a paper by John Cutler Torrey, entitled, "The Early Embryology of *Thalassema mellita* (Conn.)." This was issued in October, and consisted of 81 pages, 2 plates and 10 text-figures.

Part I, Vol. XV., of the Annals, containing the records of the meetings of the New York Academy of Sciences, January, 1902, to December 1902, by Henry E. Crampton, Recording Secretary. This was issued in September and consisted of 152 pages.

Both of these publications were mailed to every member of the Academy.

Vol. XIV, No. 4, and Vol. XV, No. 2, are in press and will soon be issued.

CHARLES LANE POOR,
Editor.

HENRY CARRINGTON BOLTON.

The undersigned, appointed at the meeting of December 6, 1903, a Committee to prepare a minute and resolutions concerning the death of H. Carrington Bolton, long an active member of the Academy, having held various offices therein, including the office of President in 1893 herewith present the following report :

WHEREAS, it has pleased the great Disposer of all events to remove from this world our late friend and associate, Dr. Henry Carrington Bolton, on the 19th day of November last, therefore,

Resolved, that in the name of the New York Academy of Sciences, as well as in the fulness of our own personal feeling, we take a mournful pleasure in expressing our profound sorrow at his unexpected demise in the full activity of his powers, and our keen sense of the loss thus caused to American science.

Resolved, that we recall with warmest interest his breadth of culture, his cordiality of intercourse, his devotion to science, his untiring activity, and his dignity and uprightness of personal character.

Resolved, that we bear our grateful witness to his long and faithful services in and to the New York Academy of Sciences, as Councilor and as Secretary through many years, and as President in 1893 ; since which time he has resided principally at Washington, and has thus become less well-known to the younger body of members.

Resolved, that these resolutions be entered upon the records of the Academy and that a copy thereof be sent to his widow by the Secretary.

DANIEL S. MARTIN, *Chairman*,
N. L. BRITTON,
E. B. WILSON.