sides brief articles, including a note on a fossil flower related to Hydrangea. The supplement, devoted to 'The Families of Flowering Plants,' by Charles Louis Pollard, treats of the Sarraceniales and Rosales.

An editorial article in the *Observatory* accuses the *Astrophysical Journal* of reprinting without credit an article on the 'Siderostat' by M. Cornu. As the *Bulletin astronomique*, in which the French copy of the article appeared, was published in February, 1901, and the number of the *Astrophysical Journal* in March, 1901, the editor of the *Observatory* must appreciate the promptness of American methods. As a matter of fact important European articles on astrophysics are published by the authors simultaneously in the *Astrophysical Journal*. This makes the concluding sentence in the editorial in the *Observatory* interesting: "they print the same paper in several journals, so that it may be widely read, whereas in Europe we have made it a point *not* to reprint."

SOCIETIES AND ACADEMIES.

SECTION OF ANTHROPOLOGY AND PSYCHOLOGY OF THE NEW YORK ACADEMY OF SCIENCES.

A regular meeting of the Section was held on April 22d, with Professor Farrand in the chair. Professor Eberhardt Fraas, of Stuttgart, a corresponding member of the Academy, was introduced by Professor Osborn, and briefly addressed the meeting.

Mr. A. L. Kroeber presented some 'Notes on the Arapahoe Indians.' In this paper the social and ceremonial organization of these Indians was compared with that of other Plains Indians. On superficial examination various tribes appear to be organized according to identical principles, but fuller knowledge generally reveals differences among the similarities. From this it was concluded that such terms as gens, band, age-fraternity and dance-society have no stable or exact meaning and hence little descriptive value, detailed information being the great desideratum.

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

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

The last report of the evening was by Dr. R. S. Woodworth, on the 'Voluntary Control of the Force of Movement.' By recording simultaneously the force of a blow struck by the hand and the extent of the movement preliminary to the blow, it is possible to see how far the force is dependent on the extent. The results showed a certain degree of correlation between the two, but comparatively a slight degree. The inference was that the force of the movement was only partially and loosely dependent on the extent, and that the control and perception of the force of a movement were in

some measure a direct and independent function.

R. S. WOODWORTH,
Secretary.

SECTION OF BIOLOGY OF THE NEW YORK ACADEMY OF SCIENCES.

A REGULAR meeting of the Section was held on April 8th, Mr. M. A. Bigelow presiding. The following program was offered :

E. B. Wilson: 'The History of the Centrosomes in Artificial Parthenogenesis, and its Relation to the Phenomena of Normal Fertilization.'

F. S. Lee: 'Some Observations on Rigor Mortis.'

In continuation of his communication given at the December meeting, Professor E. B. Wilson presented the results of further studies on the development of the unfertilized eggs of *Toxopneustes* when treated by Loeb's magnesium chloride method. The principal points considered were the origin and history of the centrosomes and the general relation of the phenomena to those occurring in normal fertilization. Evidence was brought forward that the cleavage centrosomes of the primary division figure arise by the division of a single primary centrosome that is formed outside, but immediately upon, the nuclear membrane. As regards the chromatic transformation of the nucleus, two types of chromosome formation were described. In both cases a large nucleolus is formed, which attains a much greater size than in the fertilized eggs. In one type this nucleolus remains a plasmosome, or true nucleolus, which fades away at the time of division, the chromosomes arising nearly in the usual manner from the chromatin network. In the second type, the entire chromatic content of the nucleus is gradually accumulated in the nucleolus, which thus forms a chromatin-nucleolus, from which the chromosomes are afterwards derived nearly in the same manner as in *Spirogyra*. In regard to the accessory asters, or cytasters, it was shown that they contain central bodies often indistinguishable in sections from the centrosome of the nuclear figure, though in many cases less well developed. Sections demonstrate that the division of the cytasters is preceded by division of the central body, which draws out to form a central spindle in a manner similar to that described by MacFarland in the eggs of gasteropods. This fact, taken in connection with the physiological activities of the cytasters, seems to remove every doubt regarding the identification of the central bodies as true centrosomes. In comparing the phenomena in the magnesium eggs with those of normal fertilization, it was pointed out that the formation of accessory asters at the time of fertilization or cell-division is a widespread phenomenon. In normal fertilization or division, the accessory asters are of very transient character. In the magnesium eggs they attain a much greater development both structurally and functionally, but they are probably to be regarded as differing only in degree from those which appear during the normal process. In all cases, their disappearance is probably due to a concentration of the protoplasmic activities about the more active centers, connected with the nucleus, which alone survive to perform the normal functions of division. Evidence was adduced that the nuclear transformation occurring in normal fertilization is not primarily due to the union of the sperm-nucleus, or sperm-centrosome with the egg-nucleus, but to a general stimulus of the ovum effected by the entrance of the spermatozoon. Apart from the different character of the stimulus, this transformation of the egg-nucleus does not differ essentially from that taking place in the magnesium eggs. This is proved by the fact that in etherized eggs the egg-nucleus may undergo the karyokinetic transformation *without union with the sperm-nucleus or centrosome* — an observation which agrees with the much earlier results of O. and R. Hertwig on eggs treated with chloral hydrate. In normal fertilization this activity of the egg-nucleus is modified through its union with an active individualized sperm-centrosome, the presence of which inhibits the formation of an egg-centrosome such as occurs in the magnesium eggs.

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

contraction and is the final vital act of the dying muscle cell. In connection with his studies of muscle fatigue, the author, with Mr. C. C. Harrold, has made some observations on cat's muscle, which seem to contradict Hermann's conclusion. Fasting, which is characterized especially by a diminution of the free carbohydrates in muscle, hastens the on-coming of rigor mortis. The administration of the peculiar drug, phlorhizin, which eliminates both the free and the combined carbohydrates, has a similar but much more pronounced effect. On the other hand, the ingestion of grape-sugar by a phlorhizinized animal delays rigor. Hence the conclusion seems justified that the absence of carbohydrates is favorable, and their presence unfavorable, to the development of rigor mortis. As regards the ability of the muscle to contract, carbohydrates have exactly the opposite effect, their absence being unfavorable and their presence favorable. Hence, in this respect, contraction and rigor mortis are not analogous processes.

Henry E. Crampton,
Secretary.

Section of Astronomy, Physics and Chemistry of the New York Academy of Sciences.

The section met on May 6th, at 8:15 P. M. The first paper of the evening was by Mr. C. B. Warring, entitled 'What Theology owes to Modern Science.' The paper was a very interesting interpretation of the Mosaic cosmogony in the light of modern scientific theories. The author defended the thesis that the order of events given in the cosmogony of Genesis did not necessarily contradict the order assumed by modern science. The paper was followed by a very interesting discussion.

The second paper of the evening, 'A Differential Astatic Magnetometer, suggested by Professor Rood,' was read by Mr. C. C. Trowbridge. The essential part of the instrument described is the suspension system, which consists of two groups of small magnets, set 23 cm. apart, rigidly connected by a fine glass fiber. The system is suspended by a single raw silk fibre 10 cm. long. By making the polarity of the two groups of magnets opposite, a system that is approximately astatic is obtained.

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

A magnet placed within a meter of the instrument and outside of the neutral plane between the two groups of magnets acts strongly on the nearest group, producing a deflection of the system.

The instrument was used in relative determinations of magnetic moments.

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

Magnets made from Crescent Co. and Sheffield magnet steels were chiefly tested.

The magnetic moment of bars magnetized at —186°C. and at 20°C. were found to be approximately the same, other conditions being equal. This was found to be true for both the steels mentioned.

Three Crescent steel bars magnetized at —186°C. were found to lose 38, 30.6, and 30.2, per cent. of magnetism when warmed to 20°C. A bar of this steel magnetized at 20°C. lost 9.5 per cent. of magnetism when cooled to —186°C.

These magnets after 9 days of approximately constant temperature at 20°C. were found to have further lost 6.1, 5.7, 8, and 12 per cent. of magnetism respectively.

Two bars made from Sheffield tungsten steel magnetized at —186°C. lost 12.2 and 15.7 per cent. magnetism when warmed to 20°C.

One bar of this steel magnetized at 20°C. lost 6.5 per cent. when cooled to —186°C.

A bar of Stubbs tool steel magnetized at 20°C. changed in magnetic moment, when cooled and heated between —186°C. and 20°C., as follows: at —186°m. —12.7; at 20° —30.5; at —185°, + 18 per cent.

Mr. Trowbridge stated that results similar to that found in the experiment with Stubbs steel have already been obtained by Professor Dewar.

F. L. Tufts,
Secretary.

TORREY BOTANICAL CLUB.

AT the meeting of the Club on March 10th, Dr. Marshall A. Howe discussed 'The Algal Genera *Acetabularia* and *Acicularia*' in the light of specimens recently collected by him in the Bermudas. One of the specimens he had identified as *Acetabularia Schenckii* Möbius by comparison with type material from Brazil. Since its original collection in Brazil the species has been found, according to Count Solms-Laubach, on the island of Curaçoa, off the Venezuelan coast, and also in Guadaloupe, but its occurrence now in Bermuda, about a thousand miles further north, is a point of some interest. The aplanospores in this species surround themselves each with a thick calcareous shell and these shells adhere so that on the decay of the sporangium wall the spores are left in a single coherent mass. On this ground, Solms-Laubach refers *Acetabularia Schenckii* to the fossil genus *Acicularia*, hailing it as the only known living species. The generic separation from *Acetabularia* was thought by Dr. Howe to be defensible, but doubt was expressed as to the nature of *Acicularia pavantina*, the fragmentary fossil on which the genus *Acicularia* was established. Efforts are now being made to secure this *Acicularia* type for examination. With the aid of material preserved in formalin, stages in the development of the disk of both *Acicularia Schenckii* and *Acetabularia crenulata* were followed out which have been observed hitherto only in *Acetabularia mediterranea* and more completely in some respects than have been recorded for this species. This complete series of developmental stages of the disk seems to confirm, with much certainty, the morphological explanation of the disk put forward by Solms-Laubach in 1895. The disk as a whole is evidently not a complex aggregate of primary 'leaf-whorls' or primary whorls of sterile branches, as is taught by Wille in 'Die natürlichen Pflanzenfamilien' and by others, but is to be homologized with a single primary whorl of sterile branches, as has been suggested somewhat tentatively by Count Solms-Laubach. A point of some biological interest is found in connection with the aplanospores of *Acicularia Schenckii*, the walls of which are provided with a circular lid or operculum to permit the escape of the zoogametes. As the spores lie embedded in the calcareous massula the lid is always turned toward its surface and is but slightly, or not at all, incrusted with lime. It is expected that Dr. Howe's paper will be published in full in an early number of the *Bulletin*.

The second paper, by Mrs. E. G. Britton and Miss Alexandrina Taylor, was on the life-history of *Schizaea pusilla*, *Lygodium palmatum* and *Vittaria lineata*. Living and pressed specimens were shown of all three; also microscopic preparations and drawings illustrating the gametophyte from the spore to the sporophyte in the various stages of development. For *Schizaea pusilla* the exhibit of the life-history was very complete, and the descriptions and plates have already been published in the *Bulletin* of the Torrey Botanical Club for January, 1901. In *Lygodium palmatum* the development has been slow. During the winter, in the laboratory, the spores have germinated and formed an irregular protonemal growth, finally perfecting their normal prothallia, which are spatulate and bifurcated at apex. Thus far no antheridia or archegonia have been found. Of *Vittaria lineata*, fresh material was received from St. Augustine, Florida, early in February and a complete series of slides and drawings secured, showing a much branched thallus, bearing gemmæ at the extremities, as described by Goebel in certain East Indian species. The gemmæ were found bearing antheridia, radicles and young prothallia, evidently serving the double purpose of a sexual reproduction and cross-fertilization. The sporophyte in its young stages was also studied and the structure and venation worked out. Pressed specimens, named *Vittaria lineata*, were shown from the herbarium of Columbia University, which had been compared with Fee's monograph of the genus. Many of these were found to be incorrectly named as a comparison of the spores, sporangia and bracts at the base of the leaf proved.

Professor Underwood commented on the Linnean treatment of the *Vittarias*, and their subsequent mutations.

Professor Millspaugh, of the Field Columbian Museum, Chicago, spoke briefly on the results

of a recent trip to the West Indies for the purpose of studying the economic fruits of the tropics.

D. T. MacDougal,
Secretary pro tem.

DISCUSSION AND CORRESPONDENCE.

BIBLIOGRAPHY OF GEODESY.

To the Editor of Science: In the Report of the United States Coast and Geodetic Survey for 1887 there was published a Bibliography of Geodesy. Since the date named so many important contributions have been made to the literature of this subject that during the last meeting of the International Geodetic Association a resolution was passed requesting the undersigned to prepare a new edition of the Bibliography.

This work is now well under way, and every possible effort will be made towards making it complete. This desirable end can be attained only with the assistance of those authors who are good enough to send as soon as possible titles of their publications to the address given below.

As in the first edition, it is proposed to include all papers, books and reviews, pertaining to geodesy, least squares, figure of the earth, density of the earth and gravity determinations, including theoretical discussions of the pendulum.

In complying with this request, authors should give:

1. Full name.
2. Complete title.

a. If book, give size, number of pages in preface and in body of book, number of plates and illustrations, date and place of publication.

b. If in a serial publication, give name of publication, volume, and year and pages occupied by the contribution.

c. If a review, state the title of work reviewed.

In case the work has been reviewed, give name of reviewer and where the review may be found.

If preferred, in order to insure harmony in the form of making out the titles, publications may be sent to the undersigned. The International Exchange Service of the Smithsonian Institution has graciously consented to transmit such works as may be forwarded with the object named in view. They should be sent in my name to the Smithsonian Institution, Washington, D. C.

By giving this their early attention, author will confer a favor upon the compiler and upon those who may find it necessary to consult the work when published.

J. H. Gore.

Columbian University,
Washington, D. C.

SHORTER ARTICLES.

NOTE ON THE WESTERN TERTIARY.

The recently published discussion on 'The Freshwater Tertiary Formations of the Rocky Mountain Region,' * by Professor W. M. Davis, in which he indicates published evidence to prove those supposed lacustrine deposits not to have deposited in large lakes, but rather in regions of lakes and rivers, explains well the Eocene deposits which I have seen in northwestern Wyoming in the Bighorn basin. This region was visited by a party from the University of Minnesota in the summer of 1899.

The Eocene badlands there show an extent of horizontal strata which, when viewed as it is exposed for miles around one, does suggest at once a large filled lake basin. But there is a rapid alternation of clay and sand strata, and the several diverse kinds observed recur so unequally, and yet often so monotonously that the theory of a large permanent lake does not suffice to explain the phenomena. In fact while exploring for fossils I had the impression that we were not beyond the supposed lake's marginal zone, even when 40 miles or more from the formational boundary, and came finally to believe that this freshwater Tertiary might be different from others of the West. Professor Davis's argument now convinces me that it is not.

In order to find fossils rapidly one had to search out what we called rivers and bogs. The former are shallow trough-shaped beds of sand occurring either as intercalated masses or as thickened parts of a regular stratum. The bogs occurred here and there, more or less

* *Proceedings Am. Acad. Arts and Sci.*, Vol. XXXV., p. 345.