to reconcile assertions that would otherwise seem contradictory. It is for that reason that we venture again to express the hope that a more explicit answer may be given to our questions.

Very truly yours,
Edwin R. A. Seligman,
Henry W. Farnam,
Henry B. Gardner.

Leland Stanford University, Cal.,
February 7, 1901.

Professor Edwin R. A. Seligman,
Professor Henry W. Farnam,
Professor Henry B. Gardner.

Gentlemen: Your letter of January 30th is at hand asking further information as to the reasons for the dismissal of Professor Ross. When I expressed my willingness to answer further questions I did not mean to indicate that I would enter into any circumstantial description of events leading to or following from Professor Ross's dismissal. Nor do I consider it expedient or proper to go into a discussion of extracts from my letters or conversations or of my statements or alleged statements, or those of others, as published in the newspapers. There are, however, certain assurances which it is within the privilege of the public to ask, and which it is my desire to furnish, that the public may be assisted in forming a judgment as to the position of the University upon important questions. It seems to me that I shall answer these questions best by certain plain statements which involve the important facts concerning the University. It will be necessary for you to assume my knowledge of all the facts, also that the interpretation herewith presented is authoritative from the University standpoint.

First. Professor Ross was not dismissed on account of his views on Oriental immigration nor on account of his opinion on any economic question.

Second. Professor Ross was dismissed because in the judgment of the University authorities he was not the proper man for the place he held. The responsibility for the correctness of this judgment belongs to the University authorities and to them alone.

Third. No ground exists for any interpretation of his dismissal reflecting on his private character, of which your letter seems to imply a fear.

Fourth. The judgment that Professor Ross was not the proper man for the place he held is not incompatible with my appreciation of many good qualities he possesses, nor with my wishes or efforts at any time to further his prospects. I have been neither ignorant of his professional shortcomings nor inappreciative of his good qualities. Of such appreciation Professor Ross has himself adduced several expressions from my letters.

In the hope that you may find in the above a substantial answer to the questions involved in your inquiries, I remain,

Very truly yours,
David S. Jordan.

THE SECOND MEETING OF NATURALISTS AT CHICAGO.

The committee appointed by the meeting of 1899 issued a call for a second meeting of Naturalists at Chicago, December 27th and 28th. About one hundred naturalists were in attendance or three times the number present last year. Among those present in addition to the Chicago Naturalists were Messrs. Folsom, Hart, Holferty, Mills and Frank Smith of University of Illinois; Professors Locy and Charles Hill of Northwestern University; Needham of Lake Forest; Atherton, Birge, Juday, and Timberlake of Wisconsin; Densmore, and Grant Smith of Beloit; Lee, MacMillan and Nachtrieb of Minnesota; Osborn of Hamline; Nutting and Shimek of Iowa; Kelly of Cornell College; Thorn of Missouri; Ward of

Nebraska; Dr. Ida Hyde of Kansas; Rameley of Colorado; Eigenmann, King, Mottier and Slonaker of Indiana; Tower of Antioch College; Williams of Miami University; Grover of Oberlin; Guyer of Cincinnati; Williamson of Vanderbilt; Copeland and Parke of West Virginia; Holmes, Jennings and Pearl of Ann Arbor; Clark of Olivet; Bensley and Jeffrey of Toronto. The attendance was drawn from a much larger territory than last year and included proportionately far more botanists. Professor Nutting presided at Thursday's session and Professor Birge at Friday's.

All day Thursday papers were read at a general session and in the evening a dinner attended by forty-one persons was held at the Quadrangle Club. Friday morning was devoted to a discussion on 'State Natural History Surveys; methods, results and cooperation.' Professors Birge, Nachtrieb and Frank Smith opened the discussion in which Professors Eigenmann, MacMillan, Nutting, Ward, Cowles, Hartzell and others also took part. The papers of Professors Birge, Nachtrieb and Smith will appear in SCIENCE. As a result of an eloquent plea for higher ideals of university and college administrators with reference to research, made by Professor Loeb at the dinner, the following committee on the relations of colleges to research was appointed: Professors Loeb, Cowles, H. M. Kelly, MacMillan, Nachtrieb, Nutting and Ward. As the relation of the Naturalists' meeting at Chicago to the American Society of Naturalists was still undefined no definite organization was effected but the following committee on a meeting in 1901 was appointed: Professor S. A. Forbes, University of Illinois, Chairman; W. A. Locy, Northwestern University; Conway MacMillan, University of Minnesota; D. M. Mottier, University of Indiana and C. B. Davenport, University of Chicago; the last as Secretary.

On Friday afternoon separate sections in botany and zoology were organized for the reading of papers. Abstracts of the papers read at the meeting follow:

On the Absorption of Water by Frogs: HENRY H. DONALDSON.

A group of frogs that had been dried for hours was weighed and it was shown that through exposure to the air of the laboratory in a dry dish, they had lost 14 per cent. of their body weight. These frogs were at once placed in a dish containing water about 1 cm. deep, and in 24 hours had regained nearly the entire weight lost by drying. This gain in weight was attributed to the absorption of water through the skin, and the fact that frogs never took water by the mouth was emphasized. Both the loss and the absorption of water are more rapid during the summer season than in the period of hibernation. The general influence of this capacity of the frog to lose and gain water readily was pointed out, and the evidence adduced that the amount of water normal to the spinal cord varied with the season of the year, being high from the last of May to the first of July, a season during which growth probably occurred, and gradually diminishing from this period to the time of hibernation.

Heterogeneous Induction in Tadpoles: E. B. COPELAND.

In water deficient in oxygen tadpoles swim like fish, with their noses to the surface. This behavior, though, is not a direct search for oxygen, but a manifestation of negative geotaxis. If the water is covered with oil they stick their noses into it and keep them there, or in full and closed glass vessels they keep their noses against the glass above. When in the greatest need of oxygen they remain, as under ordinary conditions, negatively phototactic. Their behavior with reference to gravity is not the result of their own experience.

The Reactions of Hydra to the Electric Current: Raymond Pearl.

An expanded hydra with the long axis of the body at right angles to the direction of the current becomes oriented with the head towards the anode shortly after the current is made. This orientation is brought about by a contraction at a point just above the foot on the anode side of the body. The bending of the body at this point is very slow, but continues until the long axis is parallel to the direction of the current and the head is towards the anode, *i. e.*, until the Hydra is oriented. The details in the mechanism of this orientation are modified with increasing intensity of current, but the essential factor, namely, contraction on the anode side, is constant except when the very strongest currents are used. On making a current of such strength as practically to kill the hydra, immediately there occurs a slight muscular spasm on the *kathode* side of the body. If at the time of making the long axis of the body is already parallel to the direction of the current and the head is towards the anode, the animal contracts immediately and violently, while in the opposite position there is no immediate contraction. The contraction phenomena of the tentacles are different from those of the body as a whole.

The Effect of some Climatic Factors upon the Color and Color-patterns of Insects: W. L. Tower.

The effect upon variations of color and color patterns of the environmental factors, temperature, moisture, food and light has been investigated experimentally during the past two years. Coleoptera and Lepidoptera have been used and have been subjected to the conditions of the experiments throughout the life cycle. The results represent more nearly the effects these factors produce as they act in nature, than when applied at one stage alone, *i. e.*, pupal. The most extensive work has been done with *Leptinotarra decem-lineata* Say, and these results will be published soon.

Additional Remarks on Cave Salamanders: C. H. Eigenmann.

The types of a new cave salamander from Missouri were exhibited, also a specimen of the bleached cave salamader, *Typhlotriton* from Marble Cave, Mo. The latter had been kept in the light for a few weeks and showed a marked increase of pigment in its chromatophores. The amount of bleaching in cave animals is directly proportional to the degree of degeneration reached by the eye. Whether there is any connection between the two is under investigation. Epigean species, if living in caves for any length of time, become bleached. The presence or absence of color is, then, due in the first instance to the environment. The cave fishes of Indiana no longer respond to the change in their environment, as the salamander does, and even the young of the cave fishes, if reared in the light, do not take on color. The bleached condition has become hereditary in their character. In the establishment of the bleached condition, which in the first case is an individually acquired character in the hereditary mechanism, we have an instance of the transmission of the direct effect of environment.

The Relation between Base-leveling and Plant Distribution: Henry C. Cowles.

The local distribution of plants depends largely upon the character of the topography. The topography constantly undergoes well-known changes, hence the vegetation must change. In other words the ecological study of plants and plant societies should be based on dynamical principles. The growth of a river well illustrates these principles; first, there is a xerophytic gully, then a ravine, whose slopes soon become mesophytic. As the valley widens the

slopes become xerophytic. In the valley itself a flood plain eventually develops which has at first a hydrophytic and finally a mesophytic flora. There are local digressions from this history, but in general it may be said that mesophytic flood plain vegetation is ever on the increase and may be regarded as the ultimate type.

Base-leveling and its Faunal Significance, with Illustrations from Southeastern United States: CHARLES C. ADAMS.

Attention was called to the necessity of correlating the influences of the base-leveling processes with the distribution of habitats, and especially the importance of a knowledge of river histories in the study of fresh-water faunas. An outline was given to illustrate the principles involved in the reduction of an elevated country to sea-level. By the growth of valleys there is a decrease of uplands, a premium being placed upon those forms whose habitat is increasing in area; thus tension lines are produced. There is a definite succession of forms advancing up a valley, and thus in descending a river one may find a rough recapitulation of the types of faunas which occupy a stream during its ideal history. With a reduction of divides, rapid water, upland faunas are the first to mix. Attention was attracted to the importance of the base-leveling factors about two years ago, in connection with the studies on the *Pleuroceridæ*. The anomalous distribution of this family in the Tennessee and Coosa-Alabama river systems was at once explained upon learning, at that time, that formerly the Tennessee river from Chattanooga flowed to the Gulf viâ the Coosa-Alabama system. Valley faunas are isolated by uplands and *vice versa*. The Cumberland Plateau and the Smoky Mountains have been isolated by the Tennessee valley and consequently have peculiarities in their fauna. The land shells, according to Pilsbry, of the Cumberland Plateau have about 20 characteristic species or varieties and the Smoky Mountains about 25. The geologists (Woodworth) have had a better appreciation of these factors. Students of distribution should give more importance to habitat as a dynamical factor in their study of faunal problems. This will lead to the study of faunas in a comparative and genetic way.

Demonstration of certain Features in the Reactions of Infusoria: H. S. JENNINGS.

Demonstrations by means of the projecting microscope and stereopticon, of the reactions of unicellular organisms toward carbon dioxide and various other chemicals. The demonstrations were essentially the same as those described in SCIENCE for January 11, 1901, pp. 74, 75.

On certain Methods by which Organisms Regulate their Movements with Relation to the Position of External Objects acting as Stimuli: H. S. JENNINGS and RAYMOND PEARL.

The paper showed the biological significance of the revolution on the long axis, with the resulting spiral path, which is a feature of the swimming of many lower organisms. These organisms usually tend to swerve toward one side, and thus to swim in circles; the revolution on the long axis converts this circular path into a spiral one, and thus permits an unsymmetrical organism to follow a course which is in effect a straight one. The paper gave an account of very simple mechanisms for turning to or from a source of stimulus in a number of organisms, Rotifera, ctenophores, flatworms, and the earthworm.

Experiments in Artificial Parthenogenesis: J. LOEB. Already described in SCIENCE.

Cœnogametes: DR. B. M. DAVIS.

The peculiar multinucleate gametes of the *Phycomycetes* were considered and the results of Dr. Stevens' studies and the writer's on Albugo were described. These

peculiar structures (Cœnogametes) are likely to be found far more generally in this group of fungi than has been imagined, and the subject takes on considerable biological interest.

The fusion of multinucleate gametes results in the pairing of the sexual nuclei and consequent union, two by two, giving about half as many fusion products as the original number of sexual nuclei. The phenomenon recalls the conjugation of swarm spores in water outside of the parent gametangium, the difference being that here the sexual elements are retained in the parent structure.

The origin of these cœnogametes is uncertain. It was suggested that they may have come from a much simpler condition of sexual organs than has been supposed. They are possibly derived from a gametangium of the lowly type presented in several algal groups where motile gametes are discharged into water. An alternative hypothesis demands that the behavior is exceptional and derived from a condition of heterogamy. But a serious objection will be raised to such a view if the cœnogametes, as seems likely, are found to be far from exceptional among the *Phycomycetes*.

Early Development in certain Hybrid Species: W. J. Moenkhaus.

In more than 20 crosses among fishes, there was not a single failure of impregnation, although some of them were between species of different orders. The per cent. of impregnation ranged from 1 to 95. The highest per cent. may be between the most distantly related species. Eggs normally impregnated complete the segmentation stages. Two crosses and their reciprocals largely went to closure of the blastopore with the main axis of the embryo apparently normally formed. Only the closely related species went far enough to hatch. The cross between brook trout ♀ and lake trout resulted in 'fingerlings,' a large per cent. of which had the caudal peduncle aborted and many had the anal fin wanting.

The *rate* of development was in all cases that of the egg species or slower. The conjugation of the pronuclei is normal. In the first cleavage spindle of the cross between *Fundulus heteroclitus* ♀ and *Menidia notata* the ♀ chromosomes appear as long, slightly wavy rods, and the ♂ chromosomes as short, comma-shaped rods. This difference is maintained to the 16-celled stage, as far as they have been followed. In the cross between *Fundulus heteroclitus* ♀ and *Ctenolabrus adspersus* the ♂ chromosomes are scattered along the spindles. This condition obtains as far as the third cleavage and there is some evidence that some or all of the ♂ chromatin may be lost in the course of development.

Abnormalities on the Horny Plates of the Turtle, Chrysemys marginata: S. E. Meek. (Will appear in the *American Naturalist*.)

Variation in the Madreporic Body and Stone Canal of Asterias vulgaris: Gertrude C. Davenport.

A number of cases of multiple madreporic plates were observed in the starfish *Asterias vulgaris*, of Cold Spring Harbor. This multiplicity may occur either in one interradius, in several of them, or in all. Thus three plates were observed in one and the same interradius and in another case five. In one case five plates were observed in one interradius, and one in another of the same starfish. A six-rayed individual had one madreporic plate in each of the six interradii. When only one madreporic plate is present it may be lobed or partially divided by cross seams into 2, 3, 4, 5 and 6 parts.

The multiplicity of plates may or may not be accompanied by a multiplicity of stone canals. A group of four plates had only one canal, while one of five had two.

In European starfishes multiple madreporic plates occur in those forms that multiply by self division. Hence they are the result of regeneration. This multiplicity is more frequent in starfishes, normally or abnormally, with more than five rays. The Cold Spring Harbor starfishes very freely cast off their arms when handled. Do they practice autotomy in nature?

Some Variations in Lucanus placidus, Statistically Examined: ELIZABETH B. MEEK.

The mandibles of the stag beetles, especially in the male sex, are extraordinarily developed and armed with teeth or projections. These vary greatly in different species and in different individuals of the same species; correlative with these differences there are extreme differences in body length. In some species the variations are so great that dimorphism exists, resulting in a division into high and low males. A quantitative expression for these differences in size and form in *Lucanus placidus*, was sought, with the following results: The average body length is .4 mm. greater in the male than in the female and the coefficient of variation is greater; this is also true of the mandibles where the average length is 2 mm. greater in male than female. The coefficient of correlation between length of body and length of mandible is .2 greater in the male than female. The teeth on the mandibles may be termed primary and secondary. A large or primary tooth is invariably present on the mandibles of both male and female, but there is great variation in position, form and number of the secondary teeth even on the same pair of mandibles, as one cutting edge may have only one while the opposite has any number of secondary teeth. Average number of teeth on mandible of male is 4 more than on female. There is a correlation between the number of teeth and length of mandible which is .2 mm. higher in males than females. Number of spines on fore tibiæ varies from 6 to 11, with an average of 4 more upon tibiæ of males than females.

It is thus found, as should be expected that variation is greater in the males than females. Also that there is no dimorphism in length of bodies, mandibles nor tibiæ. There is positive skewness in the body lengths and negative in the mandibles, but just what this may mean I am, at present, unprepared to say, as this study is preliminary to a more complete one of the variation and distribution of representative Lucanidæ in the United States.

The Place-mode of Daphnia pulex, for Cold Spring Harbor, Long Island: H. M. KELLY.

The results of measurements of many organs on a large number of individuals.

Contributions to the Biological Interpretation of Skew Variation: C. B. DAVENPORT.

The paper presented conclusions based on a study of many cases of skew variation in organisms.

The Genetic Development of the Forests of Northern Michigan: H. N. WHITFORD.

This article will appear in full in an early issue of the *Botanical Gazette*. The factors controlling the distribution of plant societies and formations are divided into three groups—climatical, ecological and historical. These are discussed with special reference to their effects on forests.

A succession of plant societies on four sets of physiographic formations is recognized. In each instance the climax society is the deciduous forest.

In the sand series the stages are beach, heath, coniferous forest and deciduous forest. Here a controlling factor is the accumulation of humus. The pre-Cambrian rocks of the Marquette region offer an admirable field for the stages in the life-history of rock societies. Here not only humus, but inorganic soil, has to be accu-

mulated before the deciduous forest appears. Swamp series and clay soil series show similar stages before the climax deciduous forest society is made possible. In every instance there must be a coniferous or poplar-birch forest before the maple-beech deciduous forest, for in that way only can shade conditions be obtained for the protection of maple and beech seedlings.

Application of the Quantitative Method to the Dynamical Study of Plant Societies: Henry C. Cowles.

The vegetation in the vicinity of Chicago is being systematically mapped from an ecological standpoint, topographic maps being used as a basis for work. By means of accurate mapping and recording of field observations at selected points, it is hoped that sets of data may be obtained showing the rapidity of encroachment of one plant society upon another. By means of photographs taken at one-year intervals considerable change has been found in the dune region, and this suggests the desirability of a similar study for other plant societies.

An Anatomical Classification of Vascular Plants: E. C. Jeffrey.

The use of the skeleton in the phylogenetic study of plants has been almost entirely neglected. In recent years paleobotanists have done something to remedy this defect, but they have been without the important aid furnished by the study of development. The present article, illustrated by a large number of photographs of the vascular skeleton of living and fossil plants, and especially the developing skeleton of extant groups of plants, is intended to show that there are a number of absolutely constant and characteristic anatomical criteria.

Stomata of some Liliaceæ: E. P. Copeland.

The stomata of Liliaceæ are very diverse in structure, but most of them are well built to open and shut. Many of them (*Uvularia, Smilacina, Polygonatum, Dracœnam, Smilax, et al.*) are so circular in surface view that an increase in turgescence would not open the pore if the walls at the ends of the guard cells were not much more rigid than those of their backs. This rigidity is secured by special local thickening, or by the mode of insertion of the walls of adjacent cells. The stomata of *Medeola* are also circular, but the backs are strengthened by folds in the wall. The pore opens by an increase in the depth of the guard cells, *i. e.*, at right angles to the surface of the leaf. It is a perfect development of what has been called the Mucinus type of stoma.

Methods of Plankton Measurement: Jacob Reighard and Henry B. Ward.

The paper presented a brief review of methods introduced by Hensen, and used by a number of observers for computing the amount of plankton obtained by hauls of a vertical net, and of the calculations on theoretical and experimental bases given by Hensen, Reighard and others for determining the coefficient of the net, *i. e.*, the fraction of the column of water which actually passes through it. The authors propose to determine the coefficient by actually measuring the amount of water passing the mouth of the net. This is to be accomplished by means of a three-vane meter suspended in the axis of the net opening a short distance inside its upper rim. By means of an electric pen register the revolutions of meter are recorded on a tape, and parallel to them, both the starting and stopping signals, and the time record from the chronometer, from which it is possible to calculate the number of revolutions in the time of the haul, or the time or revolutions in any desired fraction of the haul. The difficulties and errors in the management of the apparatus were discussed, together with the means for detecting them. The rating of the meter by two different methods was

also considered, and the coefficient of the net shown in the plottings of the rating experiments. Experiments without a meter were also used to demonstrate that the efficiency of Hensen's net had not been diminished, but rather increased by the addition of the brass cylinder and meter at the net opening.

As prominent factors in determining the efficiency of the net were mentioned the size of the orifice, and the ratio between the area of the orifice and the area of the filtering surface. Various details in improvements of apparatus were mentioned, and the laboratory of the United States Fish Commission at Put-in-Bay, together with the steamer and apparatus used and the records obtained, were illustrated from lantern slides.

A New Method of Reproduction in Tubularian Hydroids: C. C. NUTTING.

The medusæ of *Hybocodon prolifer* were found to be reproducing by means of actinules formed on the manubrium. The process of development of the actinules was described, and the intergradation between this process and the production of actinules in the gonophores of ordinary tubularians was traced through a series of forms including *Tubularia spectabilis* (Agassiz), *Tubularia cathouyi* Ag., and *Corymorpha pendula* Ag. The paper was illustrated by charts prepared by the author.

Remarks on the Distribution of Hydroida on the North Pacific Coast: C. C. NUTTING.

The basis of this paper was a study of the Hydroida of the Harriman Alaska Expedition. The division of the Pacific Coast fauna made by Dall in 1876 was found to be untenable in the light of our present distribution of the hydroids. It was shown that there was no marked differentiation between his Aleutian and Oregonian faunæ, on the one hand, and that the Oregonian fauna does not extend to Monterey, California, on the other. The facts seem to indicate a division between an Alaskan and a Californian province just south of Puget Sound. The author pointed out that this arrangement was only tentative, and that the distribution of other groups of marine animals of that region would be necessary before any conclusive statement could be made.

The Holothurians of the Pacific Coast of North America: H. L. CLARK.

The examination of 52 specimens, representing 11 species, from Pacific Grove, California, has thrown considerable light on the holothurians of the Pacific Coast. The occurrence of three species (*Synapta inhærens, Cucumaria calcigera, Psolus squamatus*) which also occur on the Atlantic Coast would seem to indicate that these species either are now, or have been, circumpolar forms with southward prolongations of their range on the east and west sides of the continent. The most interesting feature of the collection is the occurrence of three new species, all of which show some peculiarity in the manner of caring for the young. A small, black *Cucumaria* broods its eggs and young, while a small, red *Thyone* is viviparous, the young being found in the body cavity of the mother, as in *Synapta vivipara*. The most remarkable species, however, is the representative of a new genus, *Thyonepsolus*, which is perfectly intermediate in character between *Thyone* and *Psolus*, having the ventral surface flattened to a creeping sole covered by a thin skin, while the dorsal surface is convex and soft. On the sole the feet are in three longitudinal rows, while dorsally they are numerous and irregularly scattered. The young are carried on the back of the mother, partially imbedded in the thick, soft skin.

Structure of Clinostomum (Preliminary notice): HENRY L. OSBORN.

The finding of *Clinostomum* at Neebish, Chippewa Co., Michigan, in August, 1900,

encysted in the black bass and yellow perch, and adult in the mouth and throat of the great blue heron, gave me an opportunity to examine this form. It appears to be specifically identical with the one described by MacCallum in the *Journal of Morphology* (vol. xv, p. 697, 1899), as *C. heterostomum*, and by Braun (*Zool. Jhrb. abt. f. System*, 14, p. 1, 1900), as *C. marginatum*. There are, however, a number of points in which my material differs from the account given by MacCallum. The cuticle is armed with spines, they are very numerous, acutely tapering, run obliquely backward and are located wholly within the cuticle, barely projecting beyond its outer boundary in a few places. There is a single genital opening leading into a common chamber into which the uterus opens from in front and the cirrhus sack from behind. A pharynx as described by MacCallum is wanting. The oral sucker, as surmised by Braun, is directly followed by a characteristic œsophagus, lined with cuticle and supplied with usual longitudinal and circular muscle fibers—and surrounded by glandular cells, apparently forming the customary œsophageal gland. Circular muscle fibers are demonstrated in the intestines as well as longitudinal ones in iron hæmatoxalin stained sections. The oviduct opens into the uterus near its anterior end and not posteriorly as indicated by MacCallum. Glandular cells abound in the area directly in front of the ventral sucker, but ducts from them to the oral disk, as described by Braun, have not as yet been recognized in my material.

Note on the Marginal Sense Organs of Cotylogaster occidentalis: W. S. Nickerson. (Paper accompanied by demonstrations.)

Members of the Trematode family Aspidobothridæ, with but one known exception (*Stichocotyle*), have a series of organs in the margin of the large multilocular sucker which have been generally regarded as sensory structures. These organs in *C. occidentalis* appear to be both sensory and glandular in function. Each is made up of a bulb-shaped body measuring about 38 × 27 μ, which communicates with the exterior by means of a narrow tortuous duct whose outer portion is lined by cuticula continuous with that covering the body. The duct arises from the distal end of the bulb, making first a sharp bend downward beside the bulb for about one-half the length of the latter, then making a second sharp turn toward the surface, where it opens directly over the bulb. The appearance of the contents of the bulb varies from finely granular to coarsely vesicular, corresponding probably with different phases of activity of the glandular protoplasm. Nuclei (except those of nerve cells) are not distinguishable in the bulb. The duct is capable of eversion so that the interior of the bulb may be protruded through the opening. A bundle of delicate nerve fibers enters the bulb at its basal end. The chief interest in the organ centers, however, in a cluster of bipolar cells lying upon the side of the bulb toward which the duct turns. These are undoubtedly sensory cells, and their peripheral processes are probably distributed upon the walls of the duct, although the exact place and method of their termination could not be made out in the specimens studied. The presence of the bipolar sensory cells establishes the sensory character of the organs which hitherto has been a matter of conjecture.

The Changes in the Facial Cartilaginous Skeleton of the Flatfishes, Pseudopleuronectes Americanus (a dextral fish) and Bothus maculatus (sinistral): S. R. Williams.

In specimens of *P. americanus* about 3½ mm. long whose eyes are still perfectly normal in position the two supra-orbital

bars are present as in other fishes, extending from the ec-ethmoid cartilages to the otic capsules. The first indication of the coming transformation is the thinning out and disappearance of the left supra-orbital in its middle region just above the eye. Sections give evidence of the pressure exerted, since the eyeball is indented where it touches the supra-orbital. For a short time there are two regions of degeneration, one progressing toward the ec-ethmoid and the other toward the otic capsule. By the time the supra-orbital bar is resorbed the fish is at least 5 mm. long. The left eye begins to pass around to the right side of the animal through the gap prepared for it. This part of the process is comparatively rapid. After the eye shows evidence of elevation it may take the fish three or four days to assume the adult position. Nishikawa, a Japanese observer, described the passage of the eye in 24 hours in one case. Fishes of 15 mm. in length are all transformed and many take the adult position at the length of 9 mm. The twisting from left to right is greatest in the plane of the eyes, being about 120°. The brain case shows little asymmetry. The left nasal pit is raised about 30° and the anterior part of the ethmoid not much more. The mass of the ethmoid is twisted so that the left ec-ethmoid points directly up and the right down—90° from their first position. The dorsal fin, after the passage of the eye, extends forward as far as the middle of the eye.

Bothus, the sand dab, lies on its right side, whereas *P. americanus* lies on its left. But by merely transposing the terms, using *right* supra-orbital instead of left, the description just given for *P. americanus* will hold in general for *Bothus*. The dorsal fin extends to the nose ultimately in this species. The sand dab is more symmetrical than is *P. americanus*. This is correlated with its greater free-swimming habit. The flounder and the sole cling most closely to the bottom and are the most distorted.

The Cardiac Gland of the Mammalian Stomach with Remarks on the Evolution of the Stomach of the Artiodactyla: R. R. BENSLEY. (Read by title.)

CHAS. B. DAVENPORT,
Secretary.

ANNUAL MEETING OF THE NEW YORK ACADEMY OF SCIENCES.

THE Annual Meeting of the New York Academy of Sciences was held at 12 West 31st Street on Monday, February 25th, under the presidency of Professor Robert S. Woodward, of Columbia University. The meeting opened with the annual reports of the officers for the year just closed. The Corresponding Secretary reported that the Academy had on its list 41 Honorary Members and 206 Corresponding Members, and that five members had been lost by death during the past year. The report of the Recording Secretary was as follows:

During the last Academy year the business of the Academy has progressed in the customary paths. The several sections have held their usual meetings, with ordinarily the same attendance as in former years. The Council has held the meetings prescribed by the by-laws, and has accomplished several important objects. On the whole, however, the year can not be called a year of progress. The accomplishments of the year leading to increased efficiency in the Academy work are first, the establishment of a series of publication rules that will make the future work of the Editor, and the cost of publication much less than formerly; secondly, the vote to establish a budget for the next fiscal year, within the limits of which each officer will be required to work; thirdly, the hiring of the rooms of the Chemists' Club for the meetings of the next year, at a greatly reduced rental, with accommodations equal to those which