section held a joint meeting with Section A, in which the teaching of mechanics by experiment was discussed.

As usual at these association meetings there were some evening lectures on more general topics. A most interesting lecture on Volcanoes was given by Mr. Tempest Anderson, of York; another was on the manufacture of light, by Professor Sylvanus Thompson, and another on The Electrical Signs of Life and their Abolition by Chloroform, by Dr. A. W. Waller.

In 1907 the association meeting will be held in Leicester; in 1908, in Dublin; and in 1909 in Winnipeg, Canada.

GARY N. CALKINS.

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. SECTION F—ZOOLOGY.

SECTION F at the Ithaca meeting held joint sessions for the reading of papers with the American Microscopical Society, June 29 and 30. The following papers were read under the auspices of Section F.

Chromosome Relations in the Spermatocytes of Oniscus: M. LOUISE NICHOLS, University of Pennsylvania.

In the equatorial plate of the first maturation division, chromosomes differing from each other in shape may be discovered. They are of three kinds: First, straight or dumb-bell-shaped, in which the halves of the bivalent chromosome lie end to end; second, curved or crescent-shaped, in which the halves lie end to end but with the extremities curved toward each other; third, a form in which the halves lie side by side. In each type a split may be seen running the length of the individual chromosome and the first division is reductional. In the prophases of the first maturation division chromosomes of the first and second types are present as straight or curved rods; the third type is represented frequently by rings, complete or nearly so, occasionally by V-shaped structures. The reduced number of chromosomes, as far as could be determined, is sixteen. Of this number, two have the ring form in the prophase, two the crescent form, while the remainder are straight or dumb-bell shaped. The chromosomes vary somewhat in size, but the differences are not strikingly great. The largest have the ring form, the smallest are straight. A tendency to localization in the nucleus is observable. The ring forms usually lie on opposite sides of the nucleus, separated by a crescent. Similarly the crescent forms lie on opposite sides with a ring between.

Notes on the Poison Organs in Fishes: H. D. REED, Cornell University.

Axillary poison glands are found in all species of *Noturus* and *Schilbeodes*. In *S. gyrinus* and *S. nocturnus* poison glands are found enveloping the pectoral and dorsal spines. Wherever found these glands are invaginations of the skin, in which respect, as well as in structure, they are identical with the poison organs of the weever fishes.

Exhibition of Bird Drawings: L. A. FUERTES, Ithaca, N. Y.

Exhibition of and Remarks upon Certain Rare or Unique Specimens in the Cornell University Museum of Neurology and Vertebrate Zoology: BURT G. WILDER, Cornell University.

Among the specimens are the smallest recorded manatee fetus; a human embryo about 4 mm. long attached to the vitellus; an embryo shark with undivided cerebrum; the brain of the anguin, or frilled shark, presenting the indifferent relation of the cerebral and olfactory portions more nearly than in any other known vertebrate; the brain of *Ceratodus*, presenting the characteristic dipnoan ventral cerebral extensions; the brains of *Tarsius*, *Cheiromys*

and all the anthropoid apes; the brain of the manatee; the brain of a sheep with defective callosum and fornix, and that of a cat lacking these parts altogether; that of a child born at term with the cerebral hemispheres in the fetal condition of large cavities and thin parietes; an adult human brain with an extra precommissure; the brains of two philosophers and mathematicians differing markedly, and that of a mulatto resembling one of the former; the brain of a dentist presenting two self-inflicted pistol-ball wounds; the separable dental laminæ of a young elephant; mastodon teeth and bones from near Ithaca; the brains of some rare Japanese sharks.

Sex Differentiation in Dinophilus: Edwin G. Conklin, University of Pennsylvania, Philadelphia.

Korschelt (1882) discovered that *Dinophilus apatris* lays two kinds of eggs, the one three times the diameter of the other; and he further determined the important fact that the small eggs invariably develop into males and the large ones into females. He did not, however, study the oogenesis of these two kinds of eggs. The occurrence some years ago of a related species of *Dinophilus* in the marine aquaria at the University of Pennsylvania gave me an opportunity to study this problem.

The earliest stages in the developing ovary of *Dinophilus* which I have examined shows only one kind of primitive egg cells or oogonia. These cells are very small and details of their structure are not readily made out, but all are approximately of the same size. The size and structure of these cells and of their nuclei are apparently the same in all cases. I have repeatedly seen the last oogonial division, but the chromosomes are so small and numerous (about 20) that it has not been possible to distinguish any constant difference either in the number or in the shapes of these chromosomes.

After the oogonia have entered upon the growth period and have reached about twice their original diameter they begin to fuse together and in this process at least twenty-five or thirty fuse to form the female eggs, while a much smaller number fuse to form the male eggs, a fact recently reported by R. Hertwig (1905). In the fusion, the cell boundaries first disappear and then some time later the nuclear membranes dissolve and the nuclear contents are scattered in the cell, where they slowly dissolve. Only one nucleus remains in the syncytium; this is in most cases centrally placed, but I have been unable to determine whether its survival depends upon its position or upon some intrinsic difference.

In the fully formed ovarian eggs the nucleus of the small eggs is relatively larger than that of the large ones, as R. Hertwig (1905) has stated, the relative diameter of the nucleus to the entire cell being about 1:4 in the case of the male eggs and about 1:6 in the case of the female eggs. In this fact Hertwig thinks we have the cause of sex determination. It is doubtful whether this can be accepted as a general explanation, and even in the case of *Dinophilus* it is not certain that it is the true explanation. The relatively greater size of the nucleus in the male eggs is probably due to the smaller number of cells which fuse to form the cell body, and this may result from the relative isolation of the male eggs as compared with the crowding of the female eggs.

In the first maturation division the chromosomes, though small, may be counted, and it is found that there are ten in both male and female eggs. No differences in the size of individual chromosomes can be detected in the two kinds of eggs.

The manner in which the primary oocytes

fuse together to give rise to the male or female eggs suggests that the position of the eggs in the ovary and their relative isolation or crowding may here be the sex-determining factor.

Glycogen in the Nervous Tissue of Embryo Mammals, with Demonstration: SIMON H. GAGE, Cornell University.

From the first discovery of glycogen in animal tissues by Claude Bernard in the fifties until the present time, all investigators assert that glycogen is not present in nervous tissue at any stage of development or during any state of activity. In the summer of 1904 while at the Bermuda Biological Station *Amphioxus* material was fixed in absolute alcohol for the determination of glycogen. Abundant glycogen was found in the large nerve cells of the central nervous system in both *Amphioxus* and *Asymmetron*. From this discovery it was believed that glycogen would probably be found in the nervous tissues of mammals if they were taken at the right time. A series of pig embryos from 7 to 70 mm. were sectioned and plentiful glycogen was found in the cells of the dorsal ganglia in embryos from 7 to 20 mm. In the 20 mm. embryo glycogen was also present in the developing nerve trunks, and in older embryos it nearly or quite disappeared from the ganglion cells but became exceedingly abundant in the nerve trunks. These facts point to the conclusion that at some period in the growth of nervous tissue glycogen plays as important a part as in the other tissues of the body.

The Notochord of the Head in Human Embryos of the Third to the Twelfth Week, and Comparisons with Other Vertebrates: SUSANNA PHELPS GAGE, Ithaca, N. Y.

In the Cornell collection are many sagittal series which are especially favorable for the study of a mesal organ like the notochord. In a human specimen of sixty days the relations of the notochord to the cartilaginous base of the skull and the epithelium of the mouth are clear. On emerging from the axis, it forms a knotted protuberance dorsal of the base of the skull, passes diagonally through it to a pocket from the roof of the mouth, thence cephalad to come in contact with two other mouth pockets, thence diagonally dorsal through the base of the skull, again forming a knot and turning sharply ventrad, ending near the hypophysis but within the cartilage.

The same relations exist in a specimen of forty-eight days in which the base of the skull is not as far from the roof of the mouth and the excursion of the notochord is not so far ventrad.

At thirty-six days the condensed mesoderm foreshadows the skull, and the same general relations occur, the ventral excursion of the notochord being very limited and touching the straight roof of the mouth in three or four loops.

At twenty-eight and twenty-one days the notochord lies directly in contact with the epithelium of the roof of the mouth, thus showing the beginning of the history. Transections verify the above observations.

The comparative study of pig, sheep, calf, mouse, cat, chick, amblystoma, frog, shark and lamprey shows that the notochord after the earliest stages is usually completely separated from the roof of the mouth, being included in the more condensed tissue forming the skull and taking a straight course. In the pig, however, about twenty per cent. were similar to man, being in contact with mouth pockets.

In the calf, contrary to the observation of Froriep, the specimen examined showed the usual straight form.

The cephalic tip of the notochord in the

above mentioned examples varies in relation, being in contact with: (*a*) the hypophysis (ingrowth of skin); (*b*) Sessel's pocket (outgrowth of enteron); or (*c*) the first mesodermic head cavity (derivative from enteron). The last condition, found in shark, may be the typical one.

Importations of the Gipsy Moth and Brown-tail Moth Parasites from Europe: L. O. Howard, U. S. Department of Agriculture.

In the late spring of 1905 the state of Massachusetts appropriated ten thousand dollars a year, for three years, to be expended in an effort to import into the United States the European parasites of the two destructive insects mentioned in the title. The larger part of this appropriation, together with a small appropriation of twenty-five hundred dollars, made by the general government, was used and is being used in this attempt, the whole European end of the effort having been placed under the control of the speaker.

In June, 1905, he visited Europe, landing at Naples on the fifteenth of that month. At the time, the south European brown-tail moths had all issued, and the gipsy moth was in the full-grown caterpillar stage. Arrangements were made with experts in Italy, in Austria, in Hungary, in South Germany, Switzerland and France to send to Boston full-grown larvæ and pupæ of the gipsy moth; and full instructions were given as to methods of shipment. During the following summer months very many specimens were received in Boston and were cared for in a temporary laboratory at Malden and a number of different species of parasites issued, the most promising ones being tachina flies. These over-wintered successfully in Massachusetts, and a certain proportion of flies issued from the over-wintering puparia the present spring.

In April, 1906, the same journey was practically repeated, the speaker visiting first France, then Italy, then Austria and Hungary, and afterwards Germany and Switzerland, and arrangements were made, at an earlier period in the season, so that much larger quantities of both species will be secured. Shipments from many points in Europe are already being received and many parasites are being bred from European specimens of both species.

The most interesting feature of the effort so far has come through the wholesale introduction of the over-wintering nests of the brown-tail moth. On the strength of an unpublished observation of Jablonowski, of Budapest, mentioned to the speaker in July, 1905, no less than one hundred and eighty-five thousand nests were imported into Massachusetts from forty different localities in Europe, ranging from Rennes on the northwest to Budapest on the southeast. From these nests were bred the present spring and early summer many thousands of specimens of parasites of different groups; these have been colonized in the open and in out-door cages constructed of wire gauze and placed over good-sized trees thoroughly infested with both gipsy moth and brown-tail moth larvas.

The interesting feature of the experiment is the large scale upon which it has been conducted. Earlier attempts to introduce and acclimatize beneficial species from one part of the world into another have been done on a small scale; but comparatively few have been imported at any one time. In this instance the experiment was so perfectly safe and the country into which the forms were introduced was so extensively ravished by the insects that the introduction of additional pests of the same species could possibly do no harm; whereas, by such wholesale introduction, vastly greater numbers of the parasites would be

secured, thus promising earlier relief than by the other method.

On the Connections of the Funicular Nuclei of the Brains of Fishes: C. JUDSON HERRICK, Denison University.

In those teleosts which possess elaborately developed taste bud systems in the outer skin, we find that the entire taste bud system of nerves, including nerves from sense organs in the mouth and pharynx and also from similar organs in the outer skin, is very intimately connected with the viscero-motor nervous apparatus, as was to have been expected. But the terminal nuclei of the nerves from taste buds in the outer skin, which unquestionably belong morphologically to the visceral sensory system, have extensive additional sensory connections with distant motor centers of the somatic type. These long reflex gustatory paths are of relatively recent phylogenetic origin and in some teleosts are very elaborately developed. The connections in the mid-brain of the ascending secondary gustatory path I have described in a previous communication. In this paper I have analyzed the descending secondary gustatory path and found that in its further course and connections in the funicular nucleus region it has all of the functional characteristics of a somatic reflex arc—from cutaneous organs of taste to somatic muscles. This is a point of considerable theoretical interest as a concrete illustration of the way in which the most rigid morphological lines may be crossed by the exigencies of functional adaptation.

The Hackled Band in the Webs of Certain Spiders: J. H. COMSTOCK, Cornell University.

It is well known that those spiders which possess a cribellum and a calamistrum spin two kinds of silk: one, a simple smooth thread of the ordinary type, and another that presents a curled appearance. Photomicrographs of the silk of representatives of three families of cribellate spiders were presented. In each the characteristic silk consists of a ribbon-like structure which, on account of the manner in which it is made, may be termed the hackled band. In each case the hackled band consists of two elements: a series of longitudinal threads, which may be termed the warp, and a sheet of viscid silk supported by the warp, which may be termed the woof. In the hackled band of *Uloborus* and *Hyptiotes* the warp consists of two straight threads, and the woof of an exceedingly regular series of overlapping lobes. In the hackled band of *Amaurobius* the warp consists of four threads. Two of these lie in the central portion of the band; they are straight and parallel. The other threads extend, one along the middle of each lateral half of the band, and are curled. These four threads support a sheet of viscid silk, the woof. The woof has a wavy outline, but does not consist of a regular series of lobes, as in the Uloboridæ. In the hackled band of *Filistata* there are four kinds of silk. First, a double supporting line; second, the primary looped threads; third, the secondary looped threads; fourth, the woof of viscid silk.

The Divided Eyes of Blepharocera tenuipes Walker: WM. A. RILEY, Cornell University.

The physiology of the divided eyes of *Blepharocera tenuipes* has been discussed by Kellogg, but aside from incidental mention nothing concerning their morphology has been published. The facets of the dorsal eye average forty microns in diameter, those of the lateral eye twenty-four microns. Both eyes are clothed with hairs, usually one at each facet angle, rarely two. In section the dorsal ommatidia are about three times the length of the lateral. Un-

like other nematocerous diptera studied, the eyes—both dorsal and lateral—are of the pseudocone type. Among the numerous slender secondary pigment cells may occasionally be found a much-reduced trichogen cell. There is no special corneal hypodermis such as is present in Crustacea and Collembola, but it is represented by the primary pigment cells. The presence of abundant pigment between the ommatidia and the position of the visual rods preclude the formation of superimposed images. There is no evidence of pigment migration dependent upon intensity of light. In the youngest pupæ studied the eye is represented by a one-layered hypodermis in which groups of enlarged sensory cells are separated by more slender cells. There is no invagination, but the groups of sensory cells become bud-like, pushing the pseudocone cells and the primary pigment cells to their distal surfaces while the secondary pigment cells become crowded into wedge-shaped masses at either end. In course of further growth the elements elongate greatly. The lateral eye differentiates more rapidly than the dorsal, a condition to be explained by the late phylogenetic appearance of the dorsal eye.

The Nervous System and Nephridia of Dinophilus: J. A. NELSON, Cornell University.

The nervous system exhibits an embryonic condition, consisting of a brain in close contact with the hypodermis, and a pair of lateral nerve cords, connected by transverse commissures arranged metamerically. Ganglion cells, lying within the hypodermis, accompany the lateral nerve cords, and are arranged to form five pairs of ganglia. A preoral commissure connects the circumœsophageal commissures. The nephridia number five pairs, and are arranged metamerically. Those of the posterior four pairs are simple, and similar to those of annelid larvæ, terminating blindly at their inner ends. Those of the first pair are much more complex, each exhibiting two curious canalar plexuses. The whole anatomy indicates close relationship to the annelids.

Early Stages in the Development of the Salivary Glands in Sheep and Pig Embryos: WM. C. THRO, Cornell University.

Glands in Sheep Embryos.—In an embryo 17.5 mm. long all the glands are present. The submaxillary is the most advanced, since a few side buds project from the body of the gland. The sublingual consists of a short ridge-like projection of the epithelium lining the mouth-cavity. In a 20 mm. embryo the sublingual consists of a solid cord of cells attached by its cephalic end to the epithelium lining the mouth-cavity and running caudad a short distance beneath the epithelium. In a 26 mm. embryo Wharton's duct possesses a lumen. In a 43 mm. embryo the sublingual and parotid have lumina. In an embryo 44.5 mm. long the ducts of the submaxillary and sublingual run side by side and open beneath the tip of the tongue, cephalad of the frenum.

Glands in Pig Embryos.—In an embryo 15 mm. long, head-breech measurement, the very earliest stages of the parotid and retrolingual glands are found, while the submaxillary is represented by a well-developed bud with enlarged extremity.

The Development and Relations of the Columella in the Amphibia: B. F. KINGSBURY, Cornell University.

The Inheritance of Characteristics in Poultry: C. B. DAVENPORT, Carnegie Institution of Washington.

In how far are the characteristics of organisms immutable units, incapable of modification, even when pitted against each other in pairs, as occurs in hybridiza-

tion of individuals having opposed characteristics? If the characteristics typically blend in the hybrid offspring, the theory of unit characters loses its main support; but if they typically do not blend, but reappear in the hybrid offspring, each in its pristine purity, then the theory of unit characters is supported and its corollary—evolution by mutation—follows. Hybridization of poultry shows that most characteristics do not blend and do reappear in subsequent hybrid progeny almost unaltered—*almost*, but not quite.

The Egg-laying of Chironomus annularis: JAMES G. NEEDHAM, Lake Forest, Ill.

Chironomus annularis, one of the larger midges of wide distribution in Europe and North America, occurs in the campus pond at Lake Forest College, where in May a number of new observations were made as to its manner of oviposition. The eggs are extruded while the female is hanging up among the leaves of the sedges at the water's edge. There occurs a preliminary flight back and forth across the water lasting fifteen to twenty minutes. This flight ends well in-shore, where the female settles and releases the egg masses upon the surface. The egg mass gradually settles beneath the surface, but remains attached to a little transparent float by a slender adhesive gelatinous thread which stretches out to a length of about six inches. The mass then drifts until this suspensory thread comes in contact with some submerged sedge leaf or other solid support, where it remains until hatched. It contains about 1,800 eggs, which hatch in about three days.

Some Notes on the Breeding Habits of our Ithaca Anura: A. H. WRIGHT, Cornell University.

Of the eight local anura, there have been identified the eggs of all in the field and of six in captivity. The mating embrace has been photographed with all excepting *Rana catesbiana*.

C. JUDSON HERRICK,
Secretary.

SCIENTIFIC BOOKS.

Applied Sociology. By LESTER F. WARD. Boston, Ginn and Co. 1906.

The clearness, brilliancy and vigorous defense of some pronounced doctrine which we have learned to expect from Professor Ward are characteristic of this book. It concerns real facts, not verbal distinctions; it delights by its cleverness of thought and style; it attempts to rehabilitate a particularly unpromising form of the Leibnitzian theory that proper education can create a millennium.

Very briefly, the argument of the book is as follows: The welfare of people in general (whom I understand the sociologists to mean by the perilous word society) is improvable by the control of inanimate and animate nature, including people themselves, by reason guided by science and ruled by justice. Justice means the satisfaction of every one's wants, so far as they are not outweighed by others' wants. There is reasoning capacity enough in all classes of society. Nature then does not to any degree worthy of consideration limit this control; the cause of weal and woe lies in nurture. The particular error of nurture which people should now reform is the inequality of knowledge; the many suffer because they are ignorant. The equalization of intellect will make happiness for all and will multiply a hundredfold the men and women whose eminent achievements in the sciences and arts free life from undesired labor, fear or sickness and add to it noble impulses and the means to realize them. The equalization of intellect will be secured by giving all knowledge to all men through a proper system of public education.

That the present misery of people in general is due largely to the unequal distribution of knowledge is assumed with little or no discussion of evidence or of the contrary hypothesis that one or two supermen who should next week find cures for cancer, gout and