present such men as Ostwald, Roozeboom, Lobry de Bruyn, Spring, Lorenz, Goldschmidt, Du Bois, Bredig, Ikeda, Dawson, De Hemptinne, Holleman, Jorissen, Reicher, Var Laar, Wind, Cohen, Meyerhoffer, and many others; including a large number of his students and friends.

The Burgermeister of Rotterdam made an address of welcome, which was followed by a second address by Ostwald. Telegrams were received from all parts of Europe, and cablegrams from America, Japan and Java; extending congratulations to Van't Hoff. Cohen, who was for a long time Van't Hoff's assistant in Amsterdam, prepared and presented to Van't Hoff a biographical sketch of the life of the latter, while Meyerhoffer presented the 'Jubelband.'

A word in conclusion in reference to this volume. Some two years ago a printed slip was sent to all who had worked with Van't Hoff, inviting them to contribute an original investigation to a volume which would be published and presented to Van't Hoff on the twenty-fifth anniversary of the day on which he received his degree of Doctor of Philosophy. A short time before the volume was published we were notified that it would appear as an extra volume of the *Zeitschrift für physikalische Chemie.*

It has thus appeared as volume 31 of this Journal and is known as the 'Jubelband für J. H. Van't Hoff.' Outside of its personal interest to those who have sent contributions, and of its scientific value, it has a linguistic interest. It contains papers in four languages: German, English, French, and Dutch. The papers are evidently published in the languages in which they were written by the contributors. The volume contains twenty-six papers in all, most of them from Germany and Holland, but there are a few from England and two from America.

Thus was celebrated the first quarter of a century of activity of this most brilliant man. The history of men of science has few such records.

Harry C. Jones.

Chemical Laboratory,
Johns Hopkins University,
February 2, 1900.

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*THE MEETING OF NATURALISTS AT CHICAGO.*

In response to a call issued December 8, 1899, and signed by Professors C. R. Barnes, H. H. Donaldson, S. A. Forbes, W. A. Locy and Jacob Reighard, about thirty naturalists of the Central States met at the Hull Biological Laboratory, on Thursday and Friday, December 28th and 29th. Among those present, in addition to the Chicago naturalists, were Professors Burrill, Kofoid and Smith, of the University of Illinois; J. G. Needham, of Lake Forest; H. V. Neal; of Knox College; Birge, of Wisconsin; Lee, Nachtrieb and Sigerfoos, of Minnesota; H. L. Osborne, of Hamline University; Nutting, of Iowa; Eigenmann, of Indiana and Reighard and Jennings, of Michigan. Professor Donaldson presided at all the meetings and at the dinner.

Thursday morning and Friday morning and afternoon were devoted to the reading of papers. Twenty-five titles were announced; but five of these were omitted through the absence of the naturalists who announced them or through lack of time. Thursday afternoon was devoted to a discussion on 'Methods and Results of Limnological Work.' Professors Birge and Kofoid opened the discussion, in which Professors Reighard, Nachtrieb, Eigenmann, Osborn and Davenport also took part. The papers of Professors Birge and Kofoid follow this report. On Thursday evening a dinner was held at the Quadrangle Club, and was attended by thirty persons. After the dinner the question of organization was considered. Since the American Society of Naturalists simultaneously meeting at New Haven had neither rejected nor adopted the

proposition that a branch or section of the American Naturalists should be authorized to hold meetings in the Central States, but had appointed a committee to consider the matter, it was decided not to organize. A committee consisting of Professors Rieghard, Locy and Nachtrieb was instructed to nominate five naturalists who should have charge of all arrangements for a second meeting and should report at that meeting recommendations for a permanent organization and for the establishment of relations with the American Society of Naturalists. The committee subsequently elected consists of Professors Birge, President; Barnes, Lee, Nutting and Davenport, Secretary.

Abstracts of the papers read at the meeting follow:

*Townet collecting at Cold Spring Harbor, Long Island.* CHAS. P. SIGERFOOS.

During the summers of 1898–99 fairly complete records of townet collecting were kept at the Laboratory of the Brooklyn Institute. Cold Spring Harbor is so far from the open sea that larval and other transitory pelagic forms are never, perhaps, swept in by winds and tides from the outside. This is an advantage in many cases, because it enables the collector to say that certain forms found there live, thrive and breed locally.

As elsewhere, the day collections are less varied and abundant than those made in the night-time. In the former are present the medusæ of various hydroids (*Podocoryne, Bougainvillea, Perigonimus, Obelia*, etc.); ctenophores (*Mnemiopsis*) in all stages; starfish larvæ; pelagic fish eggs; and many other forms found less frequently or especially at night. In the night-time there are present, in addition to the above, great numbers of copepods (mostly of a species of *Acartia*), many of its individuals parasitized by *Apoblema;* larvæ, in various stages, of *Squilla*, decapods and other crustaceans; adult *Diastylus, Mysis, Gammarus*, etc.; the larvæ of various molluscs (*Ostrea, Crepidula, Bulla*); and many other forms found less frequently. One of the most interesting finds consisted of a few specimens of tornaria larvæ, apparently belonging to an undescribed species of *Balanoglossus* found at Cold Spring Harbor.

*On the motor reactions of Flagellata and Ciliata.* H. S. JENNINGS.

Previous work had shown that the aggregations of Paramecia in certain chemicals, in regions of optimum temperature and the like, as well as their avoidance of certain agents, are due to a motor reflex of essentially the same character as the motor reflexes so well known in higher organisms. This reflex consists in swimming, when stimulated, toward a structurally defined end and turning toward a structurally defined side, whatever the nature or position of the stimulating agent. The paper presented a study of a number of flagellates and ciliates, to determine whether such a motor reflex is common. It showed that *Chilomonas, Euglena, Loxophyllum, Colpidium, Microthorax, Dileptus, Loxodes, Prorodon, Stentor, Spirostomum, Bursaria, Oxytricha* and some others respond to many stimuli by a reflex essentially similar to that of *Paramecium.* It seems probable therefore that the so-called chemotaxis, thermotaxis, tonotaxis, and the like of these groups of organisms are in general, as in *Paramecium*, produced through such a reflex. Whether this reflex plays a part in phototaxis, electrotaxis and geotaxis has not been shown. The paper showed also that many of these organisms are much more sensitive at their anterior ends than elsewhere on the body, and brought out a number of facts in regard to the reactions to localized stimuli.

*Notes on the occurrence of Uroglena in the Lafayette water supply.* SEVERANCE BURRAGE, Purdue University.

*Uroglena* is one of the organisms that has become of interest to engineers and biologists on account of the disagreeable oily or fishy taste and odor imparted by it to water supplies. It is apt to occur in the clearest and purest waters. The Lafayette supply is derived from driven wells in the bed of the Wabash river, and before reaching the reservoir is a most excellent and inoffensive water. This reservoir, however, being uncovered, furnishes an admirable opportunity for the growth of any organism. It seems probable that several small ponds—so-called lakes—that lie within a few hundred feet of the reservoir, serve as culture beds for the *Uroglena*, and the reservoir may become inoculated by means of birds and other agents. *Uroglena* may be found in some one of these ponds at almost any time. The Lafayette reservoir was infested with this organism in the late summer and early fall of 1896, and it has reappeared quite regularly ever since, in the warm weather. The species of *Uroglena* occurring here corresponds fairly well with *U. Americana* (Calkins), as described in Massachusetts State Board of Health Report, 1891.

It was not the purpose of the paper to bring out any new facts in regard to the organism *Uroglena*, but merely to record its rather regular appearance in Lafayette.

*Remarks on a series of wax-models, illustrating cleavage stages in Crepidula.* Thomas G. Lee.

The models shown were made by Mr. B. Eric Dahlgren, one of Dr. Lee's students, at his laboratory at Minneapolis. Mr. Dahlgren seems especially fitted to do this sort of work, if there is a demand for it.

*Spermatogenesis in Hybrid pigeons.* M. F. Guyer.

Hybrid pigeons exhibit several abnormalities in spermatogenesis. These are most marked in the sterile hybrids. In such, the first thing to strike the attention is a curious bead-like varicosity about the middle of the spermatozoön head. In the development of such spermatozoa the nucleus does not elongate completely, as it does normally, to form the head; consequently, at one point there remains a sort of vesicle corresponding in position to the original nucleus before the ends pushed out to form the long head. Some of the sterile birds showed also a marked degeneration of the germinal cells. In some cases no spermatozoa were matured and many of the cells had degenerated. Often deeply-staining masses of protoplasm each with a large central vacuole were present. In both sterile and fertile hybrids there was much variation in cell division. Inequalities in chromatin distribution were common and multipolar spindles, abundant. The nuclei of the spermatogonia contained sixteen chromosomes, which is the regular number. In normal primary spermatocytic there are eight large ring chromosomes, each apparently being equivalent to two of the spermatogonial type, but in the hybrids there were often more than eight. Sometimes there were as high as sixteen small rings, in which case a doubling of the chromosomes had evidently not occurred. When sixteen chromosomes were present in the spermatocytes they were usually located on two spindles, eight to a spindle. Frequently both large and small rings were present. These peculiarities in chromosome formation may point perhaps to a tendency in the chromatin of each parent species to retain its individuality. If such is the case, then in those cells with two spindles each bearing eight chromosomes, it is evident that after division, some of the new cells will have chromatin from only one of the original parent species and some, from the other. Some of the spermatozoa, therefore, will bear chromatin from one only of these species. It is a well-known fact that the offspring of hybrids are extremely variable, a portion of these variations being

usually in the form of reversions to one or the other of the parent species. The possibility presents itself then, that this reversion may be due to the persistence of the chromatin of only one species in one or both of the germ cells. Carrying the conception still further, the other variations in the offspring of hybrids may be due, perhaps, to the varying proportions of the chromatin of each species in the mature germ cells.

*The egg of the Stichostemma.* C. M. CHILD.

During the autumn of 1899 a species of *Stichostemma*, probably *S. asensoriatum* Montgomery, was found in great abundance in a park lagoon in Chicago. In this small fresh-water nemertean, the gonads occupy the position usual in nemerteans, *i. e.*, between the diverticula of the intestine. The animal is hermaphroditic and probably more or less completely protandric, though spermatozoa are often found in the same gonads with ripe eggs. The gonad is in the form of a follicle, which is lined with the germinal syncytium. The portion of the syncytium which is to form the egg, containing one nucleus, bulges out into the cavity of the follicle and grows in size so that the follicle is filled. It remains attached to the remainder of the germinal mass by a pedicle, and yolk spheres are formed not only within the limits of the oöcyte itself but also in the protoplasm about the pedicle. As the oöcyte grows, the greater portion of the germinal protoplasm appears to pass into it and all or nearly all of the germinal nuclei disappear leaving a single oöcyte in the gonad. Sometimes two oöcytes instead of one are formed in one gonad. The growing oöcyte forms a membrane about itself, but the stalk remains until the egg is laid, when it is broken off and the membrane, which swells rapidly under the action of water, closes over this portion of the cell also. Thus the oöcyte does not become a distinct cell until the moment of laying.

The pore of the gonad is apparently not preformed, appearing at the time of laying. As it is very small the egg is greatly deformed in its passage, but its protoplasm is so fluid that it flows out easily, in a fine stream, all except the nucleus, which often appears to block the way for a moment and then pops out suddenly. After laying the egg soon assumes a spherical form and the membrane swells to a considerable thickness. Eggs are laid normally in strings somewhat less in length than the body of the worm, and containing two rows of eggs in a considerable amount of slime secreted by the skin, and attached to plants, etc.

Self-fertilization may occur (probably occurs normally in many cases) and is followed by normal development. Almost immediately after fertilization the whole surface of the egg becomes roughened in consequence of ectoplasmic activity, and soon accumulations of liquid appear between the egg and the membrane. Various changes of form occur during the formation of the two polar bodies, and, the vitelline membrane being absent, amœboid processes of the ectoplasm appear at many points. Soon after their formation the polar bodies begin to enlarge and become transparent, and before the first cleavage is completed they have usually disappeared. In the manner of their degeneration they resemble very closely injured or unripe eggs which die in the water. These increase in size very rapidly and become vacuolated and soon the yolk becomes liquid and disappears.

Just before and during the first cleavage pseudopodia-like outgrowths of the ectoplasm are abundant in the region of the cleavage-furrow. The ectoplasm is clearly continuous between the cells.

In the resting two-cell stage, again in the four-cell stage, and between adjacent cells in subsequent stages temporary cavities appear which are filled with liquid. These

increase in size and finally collapse, often opening distinctly to the exterior. The next division begins almost immediately after their collapse. The excretion of fluid during maturation and fertilization, the tendency to vacuolation of the protoplasm observable in the polar bodies and injured eggs and the accumulation of fluid in temporary intercellular cavities during cleavage are probably, as Kofoid suggests concerning similar phenomena in pulmonates, etc., connected with life in fresh water. The cleavage is spiral.

*Concerning Cotylogaster occidentalis sp. nov.* Preliminary notice. W. S. Nicherson.

An American representative of the trematode genus *Cotylogaster* occurs in the Mississippi valley parasitic in the 'sheepshead.' The animal is from 8–10½ mm. long. The anterior proboscis-like part of the body is terminated by a five-lobed disk surrounding the mouth. The ventral surface bears a compound sucker composed of from 132–144 acetabula of which from 31 to 34 form a median longitudinal row of transversely elongated grooves; the remaining 100–110 are in a single row surrounding the median series. These are rounded or elliptical in outline and not definitely arranged with respect to the members of the median row. Marginal organs are present.

From the dorsal surface near the posterior end rises a broad conical elevation. The excretory pore is at the base of this cone between it and the posterior margin of the sucker. The genital aperture is median, in front of the margin of the sucker. A penis is lacking: the testes are two in number posterior to the ovary. The ovary is smaller than the testes and on the left of a median plane. The shell gland is anterior to the ovary, diffuse. The vitellaria are a pair of elongated laterally placed cords of tissue. The eggs are numerous, spheroidal, destitute of yolk cells. When discharged they contain a fully formed embryo with unforked intestine and simple subterminal sucker at posterior end. The body of the embryo is covered in part by a simple epithelium bearing distinct tufts of cilia.

*Studies in Earthworm Chlorogogue.* W. J. Rice. Read by title.

*A demonstration of slides illustrating the Compound Oösphere of Albugo bliti, as published in the Botanical Gazette, September and October, 1899.* F. L. Stevens.

The simultaneous mitoses of the oögonial nuclei, the multinucleate oösphere and antheridial tube, the extrusion of many male nuclei into the oösphere, the fusion of the male and female sexual elements in pairs to form about fifty fusion nuclei as well as the new cell organ, the *coenocentrum* were abundantly illustrated by slides. The peculiar feature of this work lies in the fact that while this species presents a compound oösphore and a multiple fertilization, other related species seem to show only a simple oösphere and a simple fertilization.

*Gametes and Gametangia of the Phycomycetes.* B. M. Davis. Read by title.

*Suggestions toward a classification of plant societies based on topographic development.* H. C. Cowles. Read by title.

*The early stages of development of ventral nerves in Cyclostomes and Selachians.* H. V. Neal, Knox College.

Problem—Is there a difference in the modes of development of ventral nerves in the lower and the higher vertebrates? Investigators differ in their results. Observations on embryos of Squalus and Petromyzon preserved and stained by the raw Roth-Pyrogallic acid method have given some positive results, while such methods as the Golgi, Gold Chloride, Corrosive Sublimate, Palladium Chloride and others fail in the early stages when the nerves are first formed. The raw Roth-Pyrogallic acid

method is advantageous in staining deeply cell boundaries and axis cylinder processes in early stages. The results obtained by the use of this method are: 1. Ventral nerves in Squalus and Petromyzon embryos arise primarily as axis cylinder processes of cells lying in the ventral horn of the neural tube. 2. There are secondarily added to these processes cells from two sources: (*a*) cells which have migrated out from the neural tube in the region of the root of the nerve; and (*b*) cells from the mesenchyma through which the nerve passes. At first these cells take a peripheral position with reference to the bundle of axis cylinder processes (= nerve fibers), but in later stages they migrate into the midst of these processes. 3. The cells thus added secondarily to the nerves do not form nerve fibers as has been held by several investigators, but form simply the primitive or Schwann's sheath. The nerve fibers are from their beginnings the processes of cells lying in the ventral wall of the neural tube as stated above. The mode of development of the medullary sheath has not been determined.

Thus the ventral nerves of these Anamniote forms differ in their development from the same nerves in Amniota only in deriving some of the sheath cells from the neural tube. The sheath cells in Amniota appear to be derived wholly from the mesenchyma (His, Kölliker and others).

The conclusions of Balfour, von Wijhe, Dohrn, Beard, Kupffer and others, that cells migrate from the neural tube into the ventral nerves of Amniote embryo is thus confirmed. The inference that these cells form the nerve fibers is not correct.

*On the existence of accessory optic vesicles, based on new observations.* W. A. LOCY. Read by title.

*New observations on the primary segments of the vertebrate head.* CHARLES HILL. This was presented by Dr. Locy.

*The development of the adhesive organ and hypophysis in Amia.* JACOB REIGHARD. (In conjunction with MISS PHELPS and MR. MAST.)

An account of the development of the adhesive organ appeared in the report of the New York meeting (1898) of the American Morphological Society, published in SCIENCE. The hypophysis develops as an ectoblast thickening connected with the anterior neuropore and lying, in early stages, between the neuropore and adhesive organ. Its subsequent history does not differ essentially from that described for other vertebrates by Haller. It is at no time connected with the entoblast, and unlike the hypophysis of Acipenser, does not, therefore, afford support to Kupffer's interpretation of the hypophysis as a paleostome.

*Exhibition of figures for a Normentafel of Amia with an account of methods of photographing the embryo.* JACOB REIGHARD.

The method consists in the use of a long focus lens (80 mm. projection lens of Leitz), together with a long camera—the large photomicrographic camera of Zeiss—attached to the wall vertically. This arrangement allows of great focal depth, together with a magnification of 10–20 diameters. The microscope stands on a base-plate provided with leveling screws. Focusing at a distance is accomplished with a device which works the coarse adjustment. Reflectors for regulating the intensity of the shadows and a means of marking the embryo in order to obtain a sharp focus were described.

*The breeding habits of Amia.* JACOB REIGHARD.

The nests are premeditated structures and are prepared sometime in advance of spawning by the male fish, by biting or tearing away the bottom vegetation. They are not accidental, or mere concomitants of the act of spawning. They may be near or

remote from one another according to the character and extent of the available bottom. Spawning is intermittent and usually covers a period of several hours.

*Notes on a Dakota Axolotl.* H. L. Osborne.

A new *Axolotl* was found in March, 1899, in Amenia, North Dakota, an occurrence farther north than heretofore known. The body proportions are those of an *Amblystoma*. Its total length is 312 mm. It possesses the following larval characters different from previously known *Axolotls*: (*a*) a dorsal fin beginning on the level of the second body ring, 8 mm. high, running around the abdomen to the cloaca; (*b*) a smooth area of the skin on each side of this in the dorsal region; (*c*) a skin beyond the smooth area in the trunk region minutely warty-roughened, and marked with scattered circular dark spots; (*d*) eyes located one-fifth of the distance from the angle of the mouth to the origin of the third gill; (*e*) the longest of the three gills as long as the head; (*f*) the gills all broadly spatulate and flattened and the margin divided distally. The following characters of the adult are present: (*a*) all the four limbs are completely formed; (*b*) the lungs are fully developed; (*c*) the oviducts are much enlarged and filled with eggs ready for deposition. Characters of the skin, the size and form of the gills distinguish it from either the Mexican form or from the *Siredon lichenoides* of Baird and Girard from New Mexico.

*The degeneration of the eyes of the cave Salamanders.* C. H. Eigenmann.

Will be published shortly in full in Science.

*The arrangement of the single and twin cones in the retina of fishes.* C. H. Eigenmann.

Will be published shortly in *The American Naturalist.*

*Notes on the Natural History of Polyodon.* C. A. Kofoid.

In the Illinois River and its adjacent waters, *Polyodon* is pelagic in habit. Its food is typical plankton, chiefly Entomostraca and the larger Rotifera and Protozoa, with no evident admixture of bottom rubbish or sedentary organisms. In swimming the mouth is held wide open, without the rhythmical respiratory movements common in most fishes, though it is occasionally closed energetically. The plankton is thus strained from the water by the long gill-rakers, and *Polyodon* is a living plankton net. The fish was never observed to use the bill to stir up the bottom or in any mechanical way. It quickly perceives plankton or ground fish added to the water of the tank, and, when feeding, circles repeatedly over the same path, at times dragging the lower fins upon the bottom. The bill is abundantly supplied with sensory structures and serves as an expanded sense organ and not as a mechanical aid in feeding.

*On Platydorina caudata.* C. A. Kofoid.

This new genus of the Volvocidae has been found in the Mississippi, Illinois and Wabash basins in summer and fall months. It consists of a plate of 16 or 32 similar biflagellate cells arranged in a horse-shoe shaped cœnobium, which bears at its posterior end 3 or 5 tails formed of the matrix and sheath. The two faces are exactly alike, alternate cells upon either face presenting the flagella to the surface. The plate is slightly twisted in a left spiral and the rotation of the colony in locomotion is predominantly from right over to left. The polarity of this genus is the most pronounced in the family being structural as well as physiological. The two transverse axes are also established though their poles are not differentiated. Asexual development is similar to that of *Eudorina* with a subsequent flattening of the ellipsoidal cœnobium and an intercalation of the cells of the two sides. Sexual development not known.

*Variation in the sea anemone Sagartia Luciæ.* GERTRUDE C. DAVENPORT.

*Sargartia Luciæ* is conspicuously marked by a varying number of orange colored bands which run longitudinally. These orange bands were counted in 751 individuals at Cold Spring Harbor. Their number varied from 0–20. The largest proportion had 12 stripes. Secondary maxima occurred at 8, 4, 1 and 16. Longitudinal division was observed in which the twelve stripes were apportioned to the two resulting individuals as follows: 9–3; 4–8; 5–7. Also such divisions as 3–3; 7–1 were noted. Hence the variation in the number of stripes is dependent upon fission. Division, so far as observed, was aboral-oral and was usually accomplished within of 24 hours. By feeding to repletion, division already begun could be delayed, even apparently prevented. When cut longitudinally into halves regeneration was rapid. Even small fragments artificially obtained reproduced normal individuals. Normal division was observed only in diglyphic types. Monoglyphic individuals are plentiful and occur as the result of division of diglyphic forms. Basal budding and fragmentation are believed to be very common method of multiplication of this species.

*Variation studies on Pectinatella magnifica.* C. B. DAVENPORT.

The number of spines on the statoblasts of *Pectinatella* from Chicago was counted in over 800 cases. The law of distribution of frequencies was deduced by quantitative methods. The skewness is positive, that is there is an excessive tendency toward large numbers. This fact of variation in the form-unit agrees with the fact that the other races of *Pectinatella magnifica* and the other species of the genus have a larger modal number of spines. The ontogenetic causes of the variation and of abnormalties was considered.

C. B. DAVENPORT.
*Secretary.*

*SOME OF THE PROBLEMS OF LIMNOLOGY.**

IF the object of science is to correlate and state the results of observation in such a way as to produce mental economy, it can hardly be said that limnology has developed very far as a science. It is certainly still true that much of our knowledge regarding lakes is in that condition of detailed statement whose mastery involves great mental exertion. Through this stage all sciences have passed and signs are not lacking that limnology will soon reach the position now occupied by older branches of biological science. To secure this result the student of lake life must attempt to solve problems rather than merely to state facts.

Two classes of problems present themselves to the limnologist: the first, scientific; the second, practical. The first comprises the problems raised by the study of the lake as a unit of environment. The second class concerns itself with the question of the lake as a unit of economic production. The answer to the practical question depends on the correct solution of the scientific problems.

In attempting to solve these problems the limnologist finds himself constantly hampered by the lack of knowledge through which he may interpret the results which he reaches. The acquirement of this knowledge seems to me the first and most necessary step toward bringing exactness and comprehensiveness into our views of lake biology. We count the constituents of the plankton, but are not able to state the significance of the results which we reach. Laborious and slow as the process of counting is, I see no escape from the conclusion that it will remain for a long time the only exact way of ascertaining the facts regarding the assemblage of plants and animals which constitute the plankton. For the

* Address in opening discussion on 'Methods and Results of Limnological Work,' at the meeting of Naturalists at Chicago, December 28, 1899.