rapidly than it can be replaced by the normal metabolism, and in consequence, the ear-lobes, the beak and the legs become pale by this subtraction of pigment.

A. F. BLAKESLEE,
D. E. WARNER
CONNECTICUT AGRICULTURAL COLLEGE,
STORRS, CONN.

PROCEEDINGS OF THE ANNUAL MEETING OF THE AMERICAN SOCIETY OF ZOOLOGISTS HELD IN PHILADELPHIA 1914

THE American Society of Zoologists, in conjunction with the American Society of Naturalists and Section F of the American Association for the Advancement of Science, held its twelfth annual meeting (the twenty-fifth annual meeting of the society since its establishment as the American Morphological Society) in the zoological laboratory of the University of Pennsylvania, Philadelphia, Pennsylvania, on December 29 and 30, 1914.

At the session for transacting business, held on the afternoon of December 30, the following officers for the society were elected for the year 1915:

President—William A. Locy, Northwestern University, Evanston, Ill.

Vice-president—William E. Ritter, Scripps Institution, La Jolla, Cal.

Member at large of the Executive Committee—D. H. Tennent, Bryn Mawr College, Bryn Mawr, Pa.

Upon the recommendation of the executive committee the following persons were elected to membership in the society:

Cora J. Beckwith, assistant professor of zoology, Vassar College; Ralph V. Chamberlain, museum of comparative anatomy, Harvard University; Margaret H. Cook, instructor in zoology, Wellesley College; J. A. Detlefsen, assistant professor of genetics, University of Illinois; Howard E. Enders, associate professor of zoology, Purdue University; Nathan Fasten, instructor in zoology, University of Washington; Richard B. Goldschmidt, in charge of department of genetics, Kaiser Wilhelm Institut für Biologie, Berlin (Yale University); Joseph Grinnell, director, museum of vertebrate zoology, University of California; Carl G. Hartman, adjunct professor of zoology, University of Texas; Mildred A. Hoge, instructor in zoology, Indiana University; A. G. Huntsman, lecturer in biology, University of Toronto; B. F. Kingsbury, professor of histology and embryology, Cornell University; F. H. Krecker, assistant professor of zoology, Ohio State University; K. S. Lashley, Adam T. Bruce Fellow, Johns Hopkins University; W. H. Longley, professor of botany, Goucher College; Elmer J. Lund, instructor in zoology, University of Pennsylvania; Roy L. Moodie, instructor in anatomy, University of Illinois; Julia E. Moody, instructor in zoology, Wellesley College; Anna H. Morgan, associate professor of zoology, Mount Holyoke College; T. S. Painter, instructor in biology, Yale University; B. M. Patten, instructor in histology and embryology, Western Reserve Medical School; B. H. Ransom, chief, zoological division, Bureau of Animal Industry, Washington, D. C.; E. E. Reinke, instructor in zoology, Rice Institute, Houston, Texas; Lucy W. Smith, instructor in zoology, Mount Holyoke College; A. H. Sturtevant, Cutting Fellow, Columbia University; Shiro Tashiro, instructor in physiological chemistry, University of Chicago; Ernest I. Werber, assistant in biology, Princeton University; Paul S. Welch, assistant professor of entomology, Kansas State Agricultural College.

The secretary-treasurer of the society was authorized to prepare and print a list of the names, addresses, etc., of the members and officers elected at this meeting and any corrections or additions needed to be made to the published list of members, and to distribute copies of the same to all members. He was also instructed to secure and distribute to members reprints of the proceedings of the Philadelphia meetings when the same shall have been published in SCIENCE.

The committee on premedical education, appointed at the last annual meeting, submitted no report and it was continued with instructions to report at the annual meeting in 1915.

The executive committee, to which the "Matthews Plan for the Organization of an American Biological Society" was referred last year for consideration and report to a future meeting, asked and was granted more time for this work.

The question of holding a mid-year meeting of the society, as a whole, in San Francisco in connection with the Panama Exposition was considered and, upon motion by Professor R. G. Harrison, the society took the following action: "The American Society of Zoologists urges its members who reside on the Pacific coast to form a section of the society, such as is provided for by the constitution, and that this section cooperate in organizing and holding a zoological meeting in San Francisco in connection with the Panama Exposition, and it assures these members of the sincere interest and approval of the society in such an undertaking."

A committee on resolutions on the death of Professor Charles Sedgwick Minot and Professor Seth Eugene Meek, consisting of Professors Frank R. Lillie, R. G. Harrison and H. V. Neal, was appointed and instructed to prepare resolutions and publish the same in SCIENCE and to transmit copies to the families of the deceased members.

The secretary-treasurer submitted the following financial statement which, having been examined and found correct by the auditing committee, consisting of Professors A. S. Pearse and R. A. Budington, was accepted by the society.

Receipts

1914			
Jan.	1	Balance on hand (Eastern Branch)	$361.71
	18	Received from Treasurer Central Branch	235.51
		Received during the year annual dues from members	247.03
Feb.	14	Received first dividend from the Permanent Fund from the Custodian, J. H. Gerould	22.50
Oct.	13	Received interest on Current Funds on deposit with the Title, Guarantee and Trust Co., Baltimore	23.58
Nov.	11	Received second dividend from the Permanent Fund from Custodian, J. H. Gerould	15.00
		Total receipts	$905.33

Expenditures

Jan.	3	for "Smoker" supplies	$19.00
	14	for circular letter to new members	1.40
	22	for typewriting by-laws for executive committee	1.75
	26	for stamps for mailing the above.	.50
	26	for blanks forms for addresses, etc., of members	1.15
	28	for express on MSS. of Proceedings to Science	.25
	29	for typewriting circular letter to executive committee	.60
	29	for express on "files" from Secretary, Central Branch	1.00
Feb.	6	for 1,000 special stamped (2 c.) envelopes	21.36
	11	for I. P. Binder and two packages *Journal* sheets	2.25
	28	for stamps	1.50
Mch.	31	for addressing and mailing due bills and circular letters	2.55
Apr.	13	for new journal	.50
May	30	for multigraphing blank forms.	1.50
June	6	for typewriting constitution, by-laws, list of members	5.85
	17	for express on files, typewriter and MSS. to Woods Hole	1.60
Sept.	17	for express on MSS. of List of Members to printer	.22
Oct.	1	for express of files and typewriter, Woods Hole to Baltimore	1.60
	24	for 500 copies printed constitution, by-laws, list of members, etc.	75.00
	26	for 500 Columbia Clasp envelopes.	3.50
	26	for 500 copies printed blanks for nominations of new members.	2.75
	26	for mailing copies of Constitution, etc.	7.46
Nov.	4	for 300 copies announcement of Philadelphia meeting	3.25
	4	for mailing announcements to members	1.50
Dec.	4	for 300 copies "Preliminary Program"	18.10
	12	for mailing preliminary programs and map to members.	3.85
	18	for 280 special stamped (1 c.) envelopes	3.09
	26	for 500 printed programs for the annual meeting	10.40
	26	for 500 sheets typewriter paper.	1.90
	28	for R.R. fare of secretary to Philadelphia and return	4.80
	30	for expense incurred by the Secretary in attending the annual meeting	16.00
		Total expenditures	$216.18
		Total receipts	$905.33
Dec.	30	Balance on hand	$689.15

At sessions held during the forenoons and afternoons of December 29 and 30 the following papers were read either in full or by title:

In order to complete the program by the end of the fourth session and thus clear the way for adjournment to attend the session of the Naturalists scheduled for the forenoon of December 31, it was found necessary to provide for the simultaneous meeting of two sections of the Zoologists during the afternoon of December 30. At one of these sectional meetings papers grouped under *General Physiology* and some under *Miscellaneous* were read, and those under *Ecology* and the remaining *Miscellaneous* papers were read at the other. For the same reason practically no time was taken at any session for the discussion of facts and conclusions presented.

Comparative Anatomy

Nerve and Plasmodesma: H. V. NEAL. (With lantern.)

The present paper, based upon observations upon *Squalus* embryos preserved by the Bielchowsky-Paton method, attempts to give an answer to three controverted problems in nerve histogenesis:

1. Are connections between tube and myotome primary or secondary?

2. Are neuromuscular connections primarily undifferentiated plasmodesmata or are they primarily neurofibrillar?

3. Are neuromuscular connections effected by indifferent—neurilemma—cells or by medullary neuroblasts?

The answers given to these questions are:

1. Previous to the stage of 4.5 mm. there are no protoplasmic connections between tube and myotome in *Squalus* embryos.

2. Neurofibrillar substance is present in the first protoplasmic connections between tube and myotome. In the primary protoplasmic connections appear deeply staining neurofibrils which may be traced to bipolar neuroblasts within the neural tube. The claim that the primary connections consist of undifferentiated plasmodesmata therefore is based upon inadequate neurological methods.

3. In stages before protoplasmic connection between tube and myotome is effected certain medullary cells in zones where later the nerve anlagen make their appearance show in Bielchowsky-Paton preparations a deeply-staining neuro-reticulum. In slightly later stages when neuro-muscular connection is established similar neuro-reticular cells are found connected with neurofibrillæ extending into the nerve anlagen in the manner characteristic of medullary neuroblasts stained by specific neuro-fibrillar stains. The evidence of the presence of similar neurofibrillar substance in all parts of the nerve anlagen supports the inference that the neuromuscular connections are established—not by indifferent cells—but by medullary neuroblasts, as maintained by supporters of the Bidder-Kupffer theory. Indifferent cells participate in the formation of nerve anlagen only in more advanced stages by a process of migration from the neural tube.

The Components of the Fenestral Plate in Necturus: H. D. Reed.

In previous communications it has been pointed out that in certain urodele families the sound-transmitting apparatus consists of a single piece resulting from gradual growth during larval and early adult life. In such forms the plate is compound. The stylus represents columella or the extraotic element, while the plate itself arises from chondrification within the fenestral membrane and therefore otic in nature.

The fenestral plate in *Necturus* has been considered as *columella*. It arises outside the ear capsule and gradually comes to lie against the fenestral membrane over the cephalic portion of which it spreads through growth eventually filling the fenestra at this level. Caudad the plate tapers coming to a point at about the middle of the fenestra. The plate thus formed is soon encased in bone. About the margin of this triangular columellar plate cartilage is formed by chondroblasts which arise in the fenestral membrane. The matrix which is soon secreted is invaded by bone deposited in continuity with the previously formed bony case. Thus cell by cell the definitive structure is completed by additions to the margin of the columellar plate. The fenestral plate is to be considered, therefore, as a compound structure possessing both otic and extraotic elements and must be looked upon as a morphologic intermediate of the condition found in *Ambystoma* and the Plethodontidæ.

Variations in the Rays of Ten Thousand Star-Fish, Asterias Forbesii: Franklin D. Barker. (With lantern.)

A New Dignetic Trematode from the Crayfish: John W. Scott.

In 1827 Von Baer described a fluke from the crayfish to which he gave the name *Distomum cirrigerum*. Warren ('03) described its anatomy and development, and Sulowiow ('11) discussed its structure and systematic position. During the past two years trematodes from American crayfish have been secured; these are all encysted, sexually mature, individuals. In certain points they are quite similar to the European form, but the differences are so striking as to place them in different species. Wright ('84) appears to have been the first to observe the fluke in this country, but mistook it for *D. nodulosum*. Linton ('92) gives a brief description of immature specimens, and calls attention to Wright's mistake. The American species differs from the European in the following particulars. It has no conical or plate-like cuticular scales; it has two lateral palp-like extensions of the oral sucker, and four papillæ; the esophagus is short, the gastric coeca arising in front of the genital pit; the yolk glands extend nearer the anterior end of the body; both testes are median, or nearly so, and one lies in front of the other; small cuticular denticles are found on the oral sucker; the cerebral ganglia are wider apart, the prostate gland better developed, and the excretory bladder of somewhat different shape.

A full description of the new form, with a discussion of its probable systematic relationship, will soon be published.

The Reflex "Bleeding" of the Coccinellid Beetle, Epilachna Borealis: N. E. McIndoo.

The Gland of the Clasper in Sharks: E. W. Gudger.

In the claspers of sharks, on the inner and dorsal surface the tissues are modified to form a

groove. This is continued forward between the skin and the pelvic arch where it enlarges to form a sac, which in its turn is extended forward as a tube between the skin and the belly wall. Each tube ends blindly near the median line, in some extending nearly to the pectoral girdle. The function of this organ is entirely unknown.

These structures were described from *Hypoprion brevirostris* and *signatus*, and from the tiger shark, *Galeocerdo tigrinus* captured at Key West and at Tortugas, Florida. The longest gland (one foot, 7¾ inches) was found in a 4 foot, 10 inch specimen of *H. signatus*.

The scanty literature of this organ from its discovery by Andrew Smith in 1849 was briefly sketched. The full data will be given later in an article in "Papers from the Tortugas Laboratory," published by the Carnegie Institution of Washington.

Pre-Otic Somites in Cyclostomes: H. V. NEAL. (With lantern.)

Concerning no other criterion of the metamerism of the vertebrate head do observations so fully agree as with regard to the mesodermic divisions discovered by Van Wijhe ('82) in Selachian embryos. His discovery has been confirmed by Miss Platt ('91), Hoffman ('94), Neal ('96), Sewertzoff ('98), Braus ('99) and Johnston ('09). Moreover, Sewertzoff showed that the more numerous "micrococlic" divisions described by Dohrn ('90) and Killian ('91) in *Torpedo* embryos secondarily unite to form the somites of Van Wijhe. Furthermore, a mesodermic segmentation which may be compared with that of Elasmobranchs has been discovered by Miss Platt ('97) in Amphibia and by Koltzoff ('02) in Cyclostomes.

The mesodermic segmentation discovered by Koltzoff ('01) in *Petromyzon* embryos is especially significant and important, since in this animal according to Koltzoff the segmentation of the head mesoderm is complete as in *Amphioxus* and the somites develop as dorso-lateral diverticula of the endoderm. Thus *Petromyzon* is in this respect as in others intermediate between *Acrania* and *Gnathostomata*. Koltzoff finds that the three anteriormost somites give rise to the eye muscles as they do in the Elasmobranchs.

The importance of the evidence as bearing on the past history of the vertebrate head has led me to examine sections of *Petromyzon* embryos in the hope of confirming Koltzoff's results. In at least two series of eight-day *Petromyzon planeri* embryos the evidence presented seems to bear out Koltzoff's contention that the pre-otic segmentation of the mesoderm is comparable with that of Elasmobranch embryos. The anterior head mesoderm is completely segmented as Koltzoff has asserted. No homologue of Miss Platt's "anterior" somites, however, is present in the Cyclostome.

The Absence of Male Reproductive Organs in Trematodes: FRANKLIN D. BARKER. (Lantern slides and demonstrations.)

Does Amphioxus Eat with His Left Ear?: H. V. NEAL. (With lantern.)

It was Van Wijhe ('93) who first suggested the homology of the larval mouth of *Amphioxus* with the left spiracle of Selachians and asserted that "Amphioxus can not hear; he eats with his left ear and consequently has lost his mouth." The homologue of the craniote mouth in *Amphioxus* is, according to Van Wijhe, the pre-oral pit.

The present paper raises the problem: Are we to accept the homology of the mouth of *Amphioxus* with the spiracular cleft of *Craniotes?*

The homology suggested by Van Wijhe is based on the following grounds:

1. The mouth of *Amphioxus* is an organ of the left side as evidenced by its development, its left-sided innervation and its topographic relations to the club-shaped gland, which Van Wijhe regards as the antimeric gill-pouch.

2. The relations of the larval mouth of *Amphioxus* to the second mesodermic cavity and to the splanchnic muscles derived from it are similar to those of the left spiracle of *Craniotes* to the second mesodermic head-cavity.

Van Wijhe's homology may not be accepted on the following grounds:

1. Since all median openings of *Amphioxus* are asymmetrically displaced, the left-sided position of the mouth is not significant.

2. The left-sided innervation is likewise indecisive. If the homology suggested by Van Wijhe were the correct one, the velum should be innervated by the left nerve of the third pair. It is actually innervated by the left nerves of the 4–7 pairs. Primary nerve relations are obviously disturbed and inferences from innervation precarious.

3. The club-shaped gland and its duct represents a pair of gill-pouches and not a gill-pouch of the right side only, as Van Wijhe's homology would require. The club-shaped gland represents the second pair of gill-pouches and the endostyle anlage the first pair of gill-pouches of *Amphioxus*.

4. The chief objection to the homology maintained by Van Wijhe is the fact that the anterior endodermic diverticula of *Amphioxus* are homologous—not with the pre-mandibular head cavities of Elasmobranchs as assumed by Van Wijhe—but with the "anterior" head cavities. The homologues of the pre-mandibular cavities of Elasmobranchs (the first permanent myotomes) are the first permanent myotomes of *Amphioxus*.

Amphioxus does not eat with his left ear. The homologue of the left spiracle is the first transient gill cleft of *Amphioxus*. The mouth of *Amphioxus*, however, is not homologous with the mouth of *Craniotes*. If it is homologous with any organ of the *Craniotes*, that organ is the hypophysis.

Embryology

Internal Factors Producing the Swarming of the Atlantic Palolo: Aaron L. Treadwell.

Previous explanations of the swarming of annelids have been based on the influence of the external factors such as light, tidal pressure, etc. At the Carnegie Laboratory in the Dry Tortugas I was able with the cooperation of Dr. Tashiro to test the hypothesis that an internal factor cooperates in producing this effect. Since all the eggs of the Atlantic palolo are laid at one definite time, it is possible to test the eggs at any desired interval before the time when they would normally be laid. Testing with his biometer, Dr. Tashiro found that five days before laying each egg gave off 0.000,000,07 grams of CO_2 per minute; two days before laying 0.000,000,083 grams, while eggs taken from the body of a swarming female were eliminating 0.000,000,13 grams per minute. All eggs were taken from the body without mixture with sea water. This indicates an increase in metabolic activity as the time of swarming approaches, and the conclusion follows that this furnishes an internal stimulus of importance in producing the swarm. Probably a similar stimulus is operative in ordinary egg laying.

Are the Taste-buds of Elasmobranchs Endodermal in Origin?: Margaret H. Cook. (Introduced by H. V. Neal.)

An attempt to determine the origin, whether ectodermal or endodermal, of taste-buds in *Squalus acanthias*. A study was made of sections of embryos of 7 to 80 mm. supplemented by dissections of "pup" and adult stages.

Taste-buds in this species are limited to the region of the pharynx, which in all stages of ontogenesis is lined with endoderm. No marked encroachment of the ectoderm is perceptible even in the mouth region.

Scales similar to those which characterize the outer skin arise in late stages of ontogenesis in both the floor and roof of the pharynx. Thus two kinds of organs usually classed as ectodermal, viz., taste-buds and placoid scales, appear to arise from the endoderm of the pharynx of *Squalus acanthias*. To assert that the pharyngeal taste-buds and scales of *Squalus* are ectodermal would necessitate the assumption that the endodermic lining of the pharynx completely disappears during ontogeny and is replaced by ectoderm. Evidence of such substitution is wholly lacking.

These results extend to the Elasmobranchs the conclusion of Johnston ('98 and '10) that the taste-buds of Teleosts and Amphibia are derived from endoderm. They also add to the structures derived from the endoderm the pharyngeal scales which have hitherto been assumed to be ectodermal, and thus add another exception to the law of the specificity of the germ-layers.

On the Larval and Post-larval Development of the Coral, Agaricia Fragilis, Dana: J. W. Mavor. (With lantern.) (Introduced by E. L. Mark.)

Tissue and Organ; Their Rôles in Morphogenesis: Herbert W. Rand.

Definiteness of form is the essential characteristic of an organ. Tissue is without form. Our attempt to discover the factors immediately responsible for the form of an organism will be furthered if we clearly distinguish the parts played by organic units of the several grades. How far does a given formative event depend upon cells acting as uncoordinated individuals, how far does it depend upon a system of cells coordinated into a tissue, and how far does it exhibit the impress of organization higher than that of tissue?

In the wound-closing activities of tentacles of actinians, cells, as such, play a minor and probably unessential part. The definitive structural closure is an autonomous tissue process. Accompanying activities of the neuro-muscular complex afford temporary protection and favor the carrying out of the tissue process. In these activities and in other reactions of the neuro-muscular complex, we observe polarity and a variety of definite relations to the form of the organism. These bespeak for the neuro-muscular complex a degree of organization higher than that of mere tissue, probably corresponding to the organism as a whole.

The neuro-muscular complex may be regarded as standing at a threshold of organization. Morphologically standing at the level of a tissue, it exhibits the physiological definiteness and differentiation which characterize an organ. Thus, in a sense, function anticipates structure.

(Based upon a paper now in press in *Archiv für Entwickelungsmechanik der Organismen.*)

The Form of the Stomach in Embryos of the Cat, Albino Rat, Pig and Sheep: CHESTER H. HEUSER.

Utero-gestation in the Sheep-nosed Shark, Scoliodon Terranovæ: E. W. GUDGER.

In a 37½-inch specimen with a girth of 13½ inches taken at Tortugas, Florida, the left ovary was twice as long as the non-functional left lobe, while the oviducal apparatus was paired, symmetrical, and had both sides functional. The eggs, each enclosed in a thin yellow shell with its long pointed ends curiously folded and plaited, lay in crypt-like lateral "nests" formed in the mucous lining of the uteri. The structure of the uterus and the formation of the "nests," with the relation thereto of the curious shells, were described and illustrated, as were also the young and their connection with the yolk and finally with the uterine wall. In all respects the eggs and their shells together with the uteri containing them are in close parallel with similar structures in the bonnet-head shark, *Sphyrna tiburo,* reported on by the speaker at the Princeton meeting of the society in 1911.

An article giving all the data at hand and illustrated by photographs will appear later in "Papers from the Tortugas Laboratory" of the Carnegie Institution of Washington.

Experimentally Fused Larvæ, with Special Reference to Changes in Polarity, Symmetry, Synchronity, Etc.: A. J. GOLDFARB.

Experiments in Cleavage: T. S. PAINTER. (Introduced by R. G. Harrison.)

Cytology

A Study of the Maturation Period in the American and European Molecrickets: F. PAYNE.

Regenerative Potencies of Dissociated Cells of Hydromedusæ: CHARLES W. HARGITT.

The paper describes experiments made at the Zoological Station, Naples, several years ago. About a dozen species of hydroids, and one species of medusa were experimented on, and with results which in the main confirm those of H. V. Wilson, published since my own were made. The paper also briefly reviews a series of similar experiments made by DeMorgan and Drew.[1] These latter experiments are the immediate occasion for giving publicity to my own work, as they appear to imply some doubt as to the conclusiveness of Wilson's work. Their experiments were made upon two species of *Antennularia,* and while serving to confirm earlier phases of those of Wilson they never gave rise to new hydranths. The authors declare "our experiments have resulted in the production of masses that are certainly abnormal and pathological, but nevertheless we would submit that the segregation and rearrangement of the cells after isolation, and the considerably long duration of life of the tumor-like masses to which they give rise, are facts of considerable theoretical interest."

The paper will show that the assumption as to the abnormality and pathological conditions apparent are not warranted by the more extended knowledge of facts from these and other sources. Indeed, many facts concerning the behavior of these organisms in development and regeneration seem to prove that fundamentally there is neither abnormality nor pathological process involved.

Microdissection Studies on the Physical Properties and Behavior of Cell Structures, Especially in Orthopteran Spermatogenesis: ROBERT CHAMBERS, JR.

Cells studied were of Orthopteran gonads, plant-root tips and pancreas of frog. Fresh material corroborates in many interesting details nuclear structures observed in fixed material. Mitochondria and the cytoplasm, however, largely show artifacts with fixatives.

Puncture of a cell by a needle generally causes irreparable injury. Slight injury hastens the normal reversible changes in the physical states of the colloids in the cell, but soon transforms them to an abnormal condition which leads to death.

Injury to the cell is followed by swelling accompanied by an increased imbibition of water.

Physiological salt solutions are more or less injurious to cells normally bathed in organic fluids.

A tension exists in the cell during division which is lost when any part of the cell is torn.

Janus green (Hoechst) stains mitochondria rapidly. In the nucleus it is reduced to safranin, which kills the cell.

[1] *Jour. Marine Biol. Assoc.,* Plymouth, October, 1914.

Janus green produces coagulation phenomena in living protoplasm and therefore should not be used to identify mitochondria.

The mitochondria are rigid structures. In the Orthopteran germ they all change from granules to strands, they coalesce, they disappear and reappear and may be expressions of changes in the physical states of the cytoplasmic colloids.

The chromosomes behave almost as do the mitochondria. In the hyaline resting nucleus they appear in the form of granules ranged about a hyaline resistant core. The granules coalesce to form the homogeneous body of the metaphase chromosomes. In telophase the chromosomes swell and disappear. Some internal chemical condition may exist which so regulates the physical states of the nuclear colloids that a constant number of chromosomes periodically appears.

Spermatogenesis in Paratettix: MARY T. HARMAN.

1. The chromosomal complex of the spermatogonial divisions of *Paratettix leuconotus—leucothorax* consists of thirteen rod-shaped chromosomes which may be divided into two groups, one consisting of four large chromosomes and the other of nine smaller ones.

2. Eight of the smaller chromosomes are straight rods; one of the smaller ones and all of the larger ones are U-shaped. The chromosomes do not form equal pairs.

3. In the metaphase stage the chromosomes are at right angles to the spindle fibers, but in the anaphase they are parallel to them.

4. One chromosome is always far to the center of the spindle. Sometimes it is completely surrounded by the others and sometimes merely one end is at the center of the spindle. It is never the bent chromosome but is always one of the larger ones of the group of nine.

5. In the early prophases is always a mass of chromatin which never takes on the reticular condition, but has a more compact consistency and stains more intensely than the remainder of the chromatin material.

6. At the beginning of the growth period the nucleus becomes large, and some of the chromatin takes on the reticular condition and stains lightly, but there is one mass that is compact, stains intensely and has the appearance of a nucleolus. It forms the accessory chromosome.

7. In synizesis there is no polarization of the chromatin thread.

8. In the primary spermatocyte are always six dumb-bell-shaped chromosomes but two are much larger than the others.

9. The first spermatocyte division is always a cross division. The accessory chromosome always lies near the periphery of the spindle and passes to one pole undivided much in advance of the others.

10. All the chromosomes divide in the second spermatocyte division.

Synapsis and the Individuality of the Chromosomes: D. H. WENRICH.

In attempting to determine whether synapsis in this Acridid grasshopper is end-to-end (telosynapsis) or side-by-side (parasynapsis), it was found that the only method by which conclusive evidence could be obtained was that of following the history of individual chromosomes.

Of the 12 haploid chromosomes present in this species, at least three were found to possess individual peculiarities by which they could be recognized throughout the growth period and the prophases of the first maturation division.

Parallel conjugation of the fine spireme threads of the early growth stages appeared to occur as a general rule, and different steps in the process could be followed for at least one of the differential chromosomes. Conjugation did not result in loss of identity of the uniting threads in the sense of forming "mixochromosomes," for the plane of separation between them remained visible throughout the spireme stages. However, pairs of granules often appeared to be fused into single ones. Spireme segments separate out as rods or loops with a single split, tetrads being formed by a second longitudinal split at right angles to the one already present.

Analysis of the spireme stages of one of the differential chromosomes revealed a seriation of granules (chromosomes) along its length, such that the relative size and position of the granules were constant not only in the cells of one individual, but in those of all the animals studied.

Chromosomes with peculiarities analogous to those found in the first spermatocyte could be recognized in the spermatogonia.

In the first maturation division the monosome passes to one pole undivided. The tetrads appear to divide equationally with one exception. In this tetrad the conjugants are very unequal and division is as often reductional as equational. When dividing reductionally the unequal dyads show, with reference to the monosome, a distribution according to the law of chance (Mendel's law).

The Orientation of the Nuclear Contents in the Motor Electric Cells of Torpedos: ULRIC DAHLGREN. (With lantern.)

The nucleus contains, besides the usual chromatin bodies, a large typical plasmosome and a somewhat smaller body, the para-nucleolus. These two are always oriented in a dorso-ventral position and the cause of this orientation was sought in either the electric current that passes through the tissue or in the influence of gravity. Electric currents of the same strength as those generated by the fish and when applied at right angles to or directly against the orientation in question failed to influence it even when applied for several hours. Stronger currents moved the nuclear contents, but also changed the structure and chemical composition of the parts. One fact seemed to be shown; that the plasmosome was not moved to either pole of the nucleus, but assumed a position between two materials that did occupy the two halves of the nucleus.

Gravity experiments were interesting and seemed to solve the question; at a lower rate of centrifugal force the plasmosome was moved to the side of the nucleus away from the force. At a higher rate the chromatin bodies were also moved, while with the greatest force used the paranucleus was also moved. The Naples torpedos possess no paranucleolus in these cells.

Genetics

Bristle Inheritance in Drosophila: E. CARLETON MACDOWELL. (With lantern.)

A race of *Drosophila ampelophila* has been established from wild flies that has extra thoracic bristles. Crosses with normal flies prove that the extra bristled condition is a recessive Mendelian character. The number of extra bristles that appear in this race varies. The first six generations from parents selected for increase in bristle number showed a steady rise in the numbers of bristles. For thirteen generations after this, selection was apparently ineffective.

Three interpretations of successful selection may be examined.

1. Determiners may be inconstant; higher grades of a character have higher grade determiners. This would not account for the thirteen generations of ineffective selection, nor the genetic uniformity in the later generations which is evidenced by, (*a*) high and low grade parents from the same family giving like offspring, (*b*) analysis of high and low grades by crosses, (*c*) absence of correlation between means of parents and offspring in whole generations after the sixth.

2. Selection may produce a more vigorous line, and this vigor may occasion the better development of the character. A large fly in the *extra* race is apt to have more bristles than a small one.

3. Multiple factors may exist which are reduced to a homozygous condition by selection. Extracted extra bristles have a lower distribution than the uncrossed *extras*, yet the high extremes of the selected race are equalled. This would be the result if selection had removed some accessory restricting genes. These facts do not agree with the second interpretation, whereas all observations are in accord with the third interpretation.

The Behavior of a Unit Character in the Grouse Locust, Paratettix: ROBERT K. NABOURS.

Size Dimorphism in the Spermatozoa and Its Relation to the Chromosomes: CHARLES ZELENY AND E. C. FAUST.

Further evidence has been obtained in favor of the view that the size dimorphism of the spermatozoa observed in several species by the authors is correlated with the chromosomal dimorphism of the spermatids. The ratio between the chromosomal volumes was calculated from published figures of the spermatogenesis in the three species, *Musca domestica, Alydus pilosulus* and *Anasa tristis*. From this ratio the expected ratio between the head lengths in the resulting spermatozoa was calculated on the assumption that the size of the heads is directly proportional to the amount of chromatin received and on the further assumption that the shape of the heads is the same for all sizes. The calculated ratios and the corresponding observed ratios are as follows: *Alydus pilosulus*, calculated 1.00:1.06, observed 1.00:1.055; *Musca domestica*, calculated 1.00:1.08, observed 1.00:1.07; *Anasa tristis*, calculated 1.00:1.11, observed 1.00:1.09. Complete data were given in the February, 1915, number of the *Journal of Experimental Zoology*.

Sex Controlled by Food Conditions in Hydatina Senta: DAVID D. WHITNEY.

The cause of the erratic proportion of the two sexes in *Hydatina senta* has been found to be due to diet. When three pedigreed parthenogenetic races of these rotifers were reared in the laboratory on a constant and uniform diet of a colorless flagellate, *Polytoma*, through 181–288 generations in 14–22 months they produced 96 per cent. to 100

per cent. of female grandchildren, thus showing that uniform food conditions cause nearly all females to be produced. However, when these rotifers that were producing almost exclusively female grandchildren on a uniform diet were suddenly put upon a new diet of the green flagellate, *Chlamydomonas*, they almost ceased producing female grandchildren and produced as high as 83 per cent. of male grandchildren. Moreover, if the first few eggs of each female that were laid in the *Chlamydomonas* diet were discarded all the grandchildren were males, thus showing that a sudden change from a uniform diet to a new diet causes the total suppression of nearly all females and the production of nearly all males.

Parthenogenesis and Sex in Anthothrips Verbasci: A. Franklin Shull.

The life cycle of few species of *Thysanoptera* is definitely and completely known. In general, sexual reproduction has been inferred in species having abundant males, especially if mating has been observed in nature. Such a species is *Anthothrips verbasci*, the mullein thrips. However, adult females reared in isolation from pupæ, and placed on thrips-free plants, have given rise to offspring. These offspring must have been produced parthenogenetically. It is not safe, therefore, to infer merely from the abundance of males or the occurrence of copulation, that *any* species is sexual. Whether *Anthothrips verbasci* exhibits both parthenogenetic and sexual reproduction has not yet been determined.

Twenty-eight of the parthenogenetically produced young have reached stages sufficiently advanced to allow their sex to be recognized. All were males. This suggests that the same relation exists between parthenogenesis and sex as in the honey bee and some other Hymenoptera, though other explanations are obviously possible.

Sex Control and Known Correlations in Pigeons: Oscar Riddle.

Some Internal Factors Influencing Egg Production in the Rhode Island Red Breeds of Domestic Fowl: H. D. Goodale.

Multiple Human Births: G. H. Parker.

A Note on the Origin of a Color Variety of Mice: Clarence C. Little.

A Modification of the Agouti Factor in a Cavy Species Cross: J. A. Detlefsen. (Introduced by W. E. Castle.)

The agouti character of the wild Brazilian cavy, *Cavia rufescens*, acts as a single unit in heredity, when transmitted to hybrids between this species and the tame species, *C. porcellus*. This unit character, however, is often modified in the hybrids. The modification is essentially a weakening in the power to restrict black and brown pigments from the sub-apical portion of the hair. The weakened modified agouti character of the hybrids was found to be a recessive in crosses with the normal agouti guinea-pig. The normal agouti of the tame guinea-pig, the modified agouti of the hybrids, and non-agouti, are triple-allelomorphs.

The Effects of Long-continued Parthenogenetic Reproduction (127 Generations) upon Daphnids: A. M. Banta.

The writer has kept pure lines of *Daphnia pulex* reproducing continuously by parthenogenesis alone for over three years. Some of the lines have now reached the 127th generation. If the sexual cycle is a necessary and essential feature of reproduction in this species the fact should ultimately become evident in the reduced vigor in the parthenogenetic lines. In order to discover if any reduction in vigor had actually occurred some "wild" *Daphnia pulex* were obtained from out-door ponds. These "wild" lines were treated in every way identically (except that no selection was made with them as with the older lines) with the lines already under observation. The age of the mother at the time her first brood appeared, the number of individuals in the first brood and the interval until a second brood was produced were taken as measures of the vigor of the individual. Average values obtained from large numbers of mothers of the "wild" lines and of the selection lines constituted the data finally obtained.

Measured by these standards, the lines reproducing parthenogenetically from the 70th to the 92d generation under laboratory conditions possessed somewhat less vigor than wild lines descending from the 1st to the 23d generation under laboratory conditions. During the summer (1914) food conditions were quite unfavorable. "Wild" lines descending from the 2d to the 9th generation showed a *marked* superiority in vigor as compared with the lines which during the same descended from the 96th to the 103d generation. However on the return of normally favorable food conditions the lines long reproducing parthenogenetically under laboratory conditions actually on each of the three points of comparison appeared to have a superiority of vigor.

Caswell Grave,
Secretary-Treasurer

(*To be continued*)