1893 erschien, ist es mir unerklärlich, daß Professor Wierzejski und Dr. Zacharias sich die Priorität zuerkennen wollen. Daß bei der Identificierung der Formen in der That keine Schwierigkeit durch die Kürze meiner Diagnosen verursacht wurde, scheint mir unzweideutig aus dem hervorzugehen, was Prof. Wierzejski in dem von ihm im Bull. der Krakauer Akad. der Wissensch.[3] gelieferten Resumé äußert. Er sagt (p. 407): »Während der Correctur erhalte ich No. 407 des Zoologischen Anzeigers vom 12. December, enthaltend den Aufsatz von Jägerskiöld in Upsala ‚Zwei der *Euchl. lynceus* Ehrb. verwandte neue Rotatorien'. Es scheint keinem Zweifel zu unterliegen, daß die darin beschriebenen Arten: *Gastroschiza foveolata* und *G. flexilis* mit *Bipalpus lynceus* und *B. vesiculosus* identisch sind.« Auch dieser Grund, worauf sie wohl diesmal ihre Prioritätsansprüche eigentlich stützen sollten, scheint mir deshalb werthlos.

Ich räume aber bereitwillig ein, daß meine Äußerung, Professor Wierzejski habe *Gastroschiza foveolata* »ohne Weiteres« mit *Euchlanis lynceus* identificiert, nicht correct war. Irgend einen Einfluß auf die Beurtheilung der Frage selbst haben die zwei citierten Worte jedoch nicht herbeigeführt. Ich bedaure indessen, daß sie durch Übersehen in meinen Aufsatz einflossen.

Wie der Umstand, daß ein anderer Autor eine Form früher beschrieben hat, den Werth einer späteren, mehr detaillierten Abhandlung verringern oder von dem Ausarbeiten solcher abschrecken könnte, ist mir unbegreiflich. Die Priorität muß wohl demjenigen zukommen, der eine Art zuerst characterisiert hat, so daß sie sich ohne Zweifel identificieren läßt, und dessen Beschreibung zuerst erschienen ist. Und wenn ein Prioritätsgesetz existiert, muß es wohl auch respectiert werden.

Nur widerwillig habe ich mich genöthigt gesehen, mich von Neuem über diese Frage zu äußern, und ich habe es in der Hoffnung gethan, daß es das letzte Mal sein werde.

Upsala im November 1893.

2. Preliminary note on the Spermatogenesis of Bombyx mori, L.

By K. Toyama Nogakushi; Assistant in Zoology, Agricultural College, Imp. University, Tokio.

eingeg. 2. December 1893.

I have recently been enabled, through the kindness of Professor Ischikawa to study the spermatogenesis of the silkworm, our College

[3] Da der Aufsatz mir nur in Correctur zugänglich ist, kann ich nicht angeben, wann er erschienen ist.

offering special advantages for undertaking this investigation on account of the abundance of materials it commands. The same subject has been worked over by E. Verson and described in two papers, »La spermatogenesi nel *B. mori*, L.«, Padova, 1889, and »Zur Spermatogenesis« in this journal, XII. Jahrg. 1889.

The testes of the silkworm are kidney-shaped and being paired lie right and left over the alimentary canal, in the segment where the sixth stigmata open. Each testis, as Verson has already mentioned, consists of four conical blind tubes or testicular follicles and lies embedded in a common envelope, Tunica adventitia.

Even in the first larval stage, where the sexual differentiation of germ cells is not yet to be noticed, the difference of the shape of sexual glands is to be seen: the male gland is kidney-shaped while the female gland is triangular and smaller. Moreover, the vas deferens is found on the inner side of the male gland while the oviduct is attached to the outerside of the ovary.

The development of the genital elements.

On examining under a microscope the testis of a larva after the fourth moult, we are struck with varieties of cellular elements found in it. Near the blind end of each testicular follicle, we find a large cell around which small cells are arranged concentrically.

Before proceeding to describe the development of the genital elements, I shall say a word or two as to the nature of this large cell in the blind end.

Verson's interpretation of this cell is as follows: »In jedem Fache befindet sich nun eine einzige, große Keimzelle, und aus dieser nehmen nach und nach alle organisierten Bildungen ihren Ursprung, aus welchen der Inhalt des ganzen Faches besteht.«

In the embryonic stage, each of the paired genital glands of both sexes consists of only one cavity but as the development proceeds, three slight depressions appear in the follicular wall. These deepen until the genital gland shows four deeply cut lobes. When the first three depressions deepen a little, four new invaginations of the follicular wall appear in each of these lobes. Into each of these new depressions, a follicular cell enters, which soon enlarges and loses its cell-wall. The genital elements already present now arrange themselves around this follicular cell and in later stages it is clearly to be seen that there is a protoplasmic communication between this invaginated follicular cell and the genital cells. I have never found, as Verson states, this central cell in the state of division in tracing it

from the time when it is recognizable until after the copulation of the imago.

From all these, we come to the conclusion that the single large cell found in the blind end of each of the testicular follicles is not a germ cell, as Verson states, but it corresponds rather to the supporting cells of the testes of Vertebrates or the rhachis of the Ascaris egg-string in its function.

This supporting cell is not only present in the testes but also occurs in the ovary of the silk worm.

In other Lepidoptera such as the wild silkworm, *Papilio xuthus*, L., *P. machaon*, L., *P. alcinous*, Klug., I have found the similar large cell in the blind end of the testicular follicle but not in *Antherea yama mai*, Guér. Mén., *Caligura japonica*, Moore, *Rhodia fugax*, Butl. etc. From these facts, it seems evident that in the genital glands of Lepidoptera, this cell, although not constant, is not of rare occurance.

In the testicular follicle of the silkworm, as in the genital follicles of other Lepidoptera, the more developed sperm elements always lie near the vas deferens, while the younger elements lie near the blind end of the follicle round the central supporting cell.

By this arrangement, we can find a series of various developmental stages, and in consequence of this we may distinguish various zones as van Beneden, O. Hertwig, C. Ischikawa and others have done in other animals. I shall designate these zones as 1) the Formative zone, 2) the Growing zone, 3) the Ripening zone and 4) the zone of Metamorphosis.

I. The Formative zone. In the first part of this zone, the germ cells (»Ursamenzellen«) are somewhat conical in shape and are connected with the protoplasm of the supporting cell. The nucleoli of the germ cells usually consist in their resting stage of two, three or more granules. As in the »segmented skein« of Flemming, the chromosomes split longitudinally before the formation of the spindle figure and the division of the nucleus takes place in the ordinary manner. In this stage, we are not able to make out the exact number of chromosomes in consequence of the small size of the cells, but it seems to be 26—28. The same mode of division takes place two or three times in this zone and the germ cells become two-thirds or less of their original size.

II. The Growing zone. This zone is very conspicuous in the testicular follicles owing to the groups of large cells contained in it. The nuclear elements of these cells have the usual arrangement in their resting stage. When about to divide, the chromosomes become

gradually coarser and longer, and form the skein stage. Hand in hand with this change, the cell body with its nucleus conspicuously enlarges and attains a size double that of the first primary germ cell (»Ursamenzellen«), or larger. After the skein stage, the chromosomes present a ring-like arrangement as Carnoy, Henking, vom Rath etc. have stated in other animals, each ring consisting of four round chromosomes. With the appearance of the centrosome, the spindle figure etc. they begin to divide.

I may perhaps introduce here some remarks about the nucleolus, the spindle fibre and the »Nebenkern«.

As above described, the nucleolus is not homogeneous, but consists of small granules. Before the division of the cell, granulation becomes finer than before and finally disappears completely from the nucleus at the exact time when the centrosome appears in the cell. This behaviour of the nucleolus corresponds very well with the description of O. Hertwig who says: »Bei den Samenmutterzellen von *Ascaris*, die mit schwachem Flemming'schen Gemisch gehärtet sind, verliert das Nuclein seine Färbbarkeit, während die Nucleolen in Säurefuchsin dunkelroth tingiert werden. Hier sah ich nun, daß in den Vorbereitungsstadien der Nucleolus in mehrere Stücke zerfällt, daß von diesen sich kleinste Kügelchen ablösen, daß solche hochroth gefärbte Kügelchen sich auch auf den Kernfäden aufgelagert finden. Wenn im weiteren Verlauf die Kernsegmente fertig angelegt sind und der Nucleolus ganz verschwunden ist, dann sind erstens an der Oberfläche des Kerns die Polkörperchen sichtbar geworden, und zweitens ist in jedes Kernsegment ein dunkelroth gefärbtes Korn eingeschlossen, das nach seinem Verhalten gegen Farbstoffe wie Substanz des Nucleolus aussieht.« Although I had not any opportunity to find out the formation of the centrosome from the nucleolus as Wasielewski and Brauer had, the coincidence in the time of the appearance of the centrosome and the disappearance of the nucleolar substances seems to indicate that there is some genetic connection between these two bodies.

Before the appearance of the centrosome a granulated spot occurs in the cell protoplasm. This gradually elongates and forms a bundle of fibrous matter. This seems to be the origin of the spindle fibre.

The »Nebenkern« makes its appearance in the protoplasm stained with Böhmer's Haematoxylin. Its structure is either granular or homogeneous. I can not say anything about its further changes. In the germ cells of this zone, no yolk granule is seen.

III. The Ripening zone. In this zone, the reduction of the chromosomes takes place in the germ cells and form the spermatides of

La Valette St. George. The germ cells are very large and the number of chromosomes can be determined with certainty. Normally there are twenty-eight chromosomes although in rare cases we find them to be twenty-six or twenty-seven. They arrange themselves not in two rows as Henking and vom Rath state, but in a single row and their division takes place transversely to their longitudinal axis as Ischikawa first observed in *Diaptomus*. After this division, the daughter cells prepare to divide with no resting stage. In this second division, »each chromosome does not become divided into two as usual, but remains undivided during the division« (Ischikawa), so that fourteen of the twenty-eight go bodily into one cell and the other fourteen into the other. Consequently, the daughter cells of the second division contains only fourteen chromosomes, which is half the number of the original.

IV. The zone of Metamorphosis. After this second division, the chromosomes arrange themselves like a moniliform ring round the periphery of the nucleus and form the head of a spermatozoon.

A large »Nebenkern« also appears and forms together with the cell protoplasm the tail of a spermatozoon. This »Nebenkern« consists of the remains of »Verbindungsfäden« after division, and is different from the »Nebenkern« of the germ cells in the growing zone.

A mitosome is clearly to be seen in preparations stained with Böhmer's Haematoxylin. This is formed from the coalescence of a few small granular spots appearing in the cytoplasm, showing its origin from the cytomicrosomes. Meanwhile, the chromosomes coalesce into a single mass and the »Nebenkern« elongates and a spermatozoon with a spindle shaped head and an elongated tail is formed, while the mitosome gradually becomes fainter and fainter till at last it disappears.

A full account of this investigation with plates will, I trust, be shortly published in the Bulletin of our College.

Tokio, 26th October 1893.

3. On a new Balanoglossus Larva from the coast of California, and its Possession of an Endostyle.

By Wm. E. Ritter, Ph.D., Assistant Professor of Biology, University of California.

eingeg. 12. December 1893.

During the summer of 1893, the marine biological laboratory of the University of California was located at Avalon, on the island of Santa Catalina, about twenty-five miles off the coast of Southern California.