THE SPERMATOGENESIS OF ANASA TRISTIS, PP. 223-271

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SPERMATOGENESIS OF ANASA TRISTIS

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BY
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Introduction.

The following paper contains the results of a study of the male germ cells of *Anasa*, one of the Heteroptera, corroborating in the main an earlier work by Henking on *Pyrrochoris*, although a number of new points are brought out to supplement the excellent work of my predecessor.[1]

Henking ('91) described the structure of the spermatogones and the preparation of the chromatin for the spermatocyte divisions, and though many of the details escaped him, he certainly, it seems, made a correct estimate of the value of these divisions. His description of the formation of the spermatid is especially good, and with the exception of what are probably merely specific variations, the process in *Anasa* approximates very closely to what he has described. Henking was also the first to describe the peculiar chromatic body in the spermatocytes to which particular attention has been paid in this paper under the name of the small chromosome.

Wilcox ('95, '96), the only author besides Henking who has followed the entire history of the spermatozoa in the insects, found that in *Caloptenus*, one of the Orthoptera, the process varies in many essentials from that in the Heteroptera, the most fundamental difference lying in the fact that he finds no longitudinal splitting in the spermatocytes; and although tetrads are formed (by conjugation), both subsequent divisions are transverse or "reducing" ones.

Besides these, several authors have given a partial account of the history of the spermatozoa. Perhaps the most important of these works is Vom Rath's ('92) on *Gryllotalpa*, where the chromatin changes, and especially the process of reduction,

[1] A considerable number of observations have been made on other species of Hemiptera-Heteroptera, the results of some of which have been already described (Paulmier, '98). Among the forms examined have been species of *Euchistus*, *Brochymena*, *Mormidea*, *Murgantia*, *Coenus*, *Podisus*, *Mineus*, and *Nezara* of the family Pentatomidae; *Chariesterus*, *Euthoctha*, and *Alydus* of the family Coreidae, and *Myodocha* and *Lygaeus* of the family Lygaeidae. From these observations it appears that there may be a very great difference in details between the various genera (*cf.* difference in tetrad formation described before, '98), but the main results are the same in all cases. Some observations on the spermatogenesis of *Papilio* gave interesting results which will be mentioned in the text.

were first carefully worked out. Platner ('89), on the other hand, confined himself to a study of the achromatic structures in the Lepidoptera.

Montgomery in three papers ('97–'99) has treated of the spermatogenesis of *Pentatoma* (*Euchistus*), one of the Heteroptera, carrying it, however, only up to the formation of the spermatid. His results differ in many respects from mine; in regard to the reduction question his conclusion is that while a longitudinal splitting of the chromosomes and consequently an equation division usually occurs in the spermatocyte divisions, both divisions may in some cases be transverse, and therefore both reducing. He gives an interesting account of the body which he calls the "chromatin nucleolus," and which I have described under the name of the small chromosome.

In the present work I have endeavored to follow the entire history of the male germ cells, from the spermatogones to the mature spermatozoa. Among the more important results may be mentioned the probable continuity of the centrosome throughout all stages, of interest on account of its bearing on the discussion as to whether or not the centrosome is a permanent organ of the cell; the occurrence of a longitudinal splitting of the chromosomes in the prophases of the first spermatocyte division and its relation to the formation of tetrads, a question of considerable interest in view of several works on insect spermatogenesis, and in which my observations point to an agreement with the copepod type of tetrad formation; the history of a chromatic body which has been described recently by several authors, and a suggestion as to its meaning, which is of interest as bearing on the theory of the individuality of the chromosomes; and a partial explanation of the giant spermatozoa.

I wish to express my best thanks to Professor Wilson for his advice and encouragement throughout the progress of this work. My thanks are also due to Dr. Calkins for his kindness in reading the manuscript of this paper.