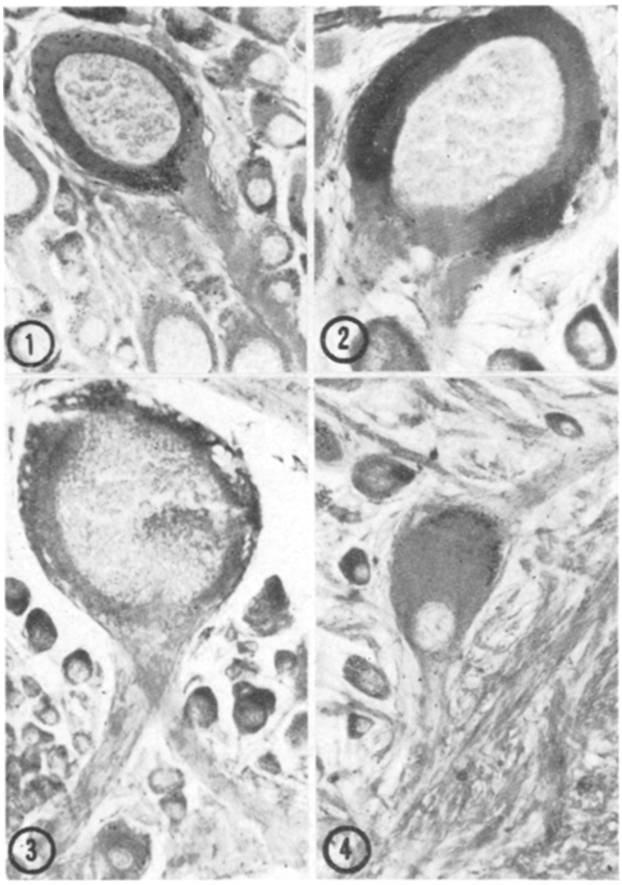

Fig. 1. A typical monopolar giant neuron of the abdominal mass ganglia of land snail *Cryptomphallus aspersa*. Small neurosecretory granules appear in the axon hillock. × 1090.

Fig. 2. A bipolar neuron with both processes near one another. Observe the presence of 2 clusters of neurosecretory granules near each axon hillock. × 1090.

Fig. 3. Another bipolar neuron with both processes originating at the same point of the perikaryon. × 1090.

Fig. 4. A medium-size neuron with 2 processes coming from opposite sites. Here neurosecretory material appears in one axon hillock. × 1090.

As mentioned above, these bipolar neurons are far less numerous than the unipolar ones.

TAUC[3] described in the giant neurons of *Aplysia* an intermediary segment, where the action potential originates. In this case, the soma of the giant neuron can be removed, and the activation of the intermediary segment still produces the firing of all the axonic processes. Besides this type of neuron, TAUC and HUGES[8] have described another one in which the intermediary activator segment does not exist. These are cells in which the activation of an axonal branch cannot invade other branches without a previous somatic action potential.

It may be assumed that the bipolar neurons described here (Figures 2, 3 and 4) correspond to the last neuronal group proposed by TAUC and HUGES. It may be postulated that in such bipolar neurons each axon acts as an isolated unit, and that the activation of the perikaryon is the condition needed for the synchronic function of both axonal processes[9].

Resumen. Se describen en la masa ganglionar ventral del molusco *Cryptomphallus aspersa* (Gasteropoda, Pulmonata) la presencia de varios tipos de neuronas bipolares entremezcladas con las típicas unipolares. Estas observaciones morfológicas se discuten en relación a los hallazgos obtenidos previamente con técnicas electrofisiológicas por otros autores.

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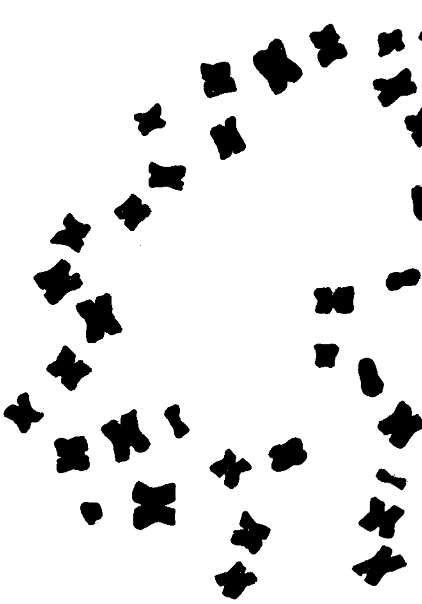
Centromere Nature of the Chromosomes of *Ranatra* (Heteroptera)

The chromosomes of the heteropteran insects were considered for long to possess a 'diffused' type of centromere[1-5]. PRASHAD[6], however, disagreed with this view. He regards the centromere of the chromosomes in Lygaeidae and Coreidae, to be neither of the diffused type nor of the typical localized 'monocentric' type. According to him, this 'atypical' centromere in these 2 families does not impair the abilities of the chromosomes to incorporate themselves into the spindle even though they undergo fragmentation. Hence despite repeated fragmentations, the broken chromosomes do not disappear from the populations. Therefore the 'diffused' or 'atypical' centromere nature of these chromosomes attains a special significance as it has much bearing upon the origin of multiple sex chromosomes and the supernumerary chromosomes in these insects. However, our observations on the chromosomes of another heteropteran insect, *Ranatra elongata* are not in agreement with either of the above-mentioned views.

R. elongata has extremely short and squarish chromosomes. The males have a diploid number, $2n$ as 43 consisting of 38 autosomes and 4 X and 1 Y (Figure 1). A careful observation reveals that these chromosomes are not merely irregular dot-like or oval bodies as shown in the works of DAS[1], and STEOPE[4], but have definite configurations. They are squarish in outline, each with a distinct constriction in the middle or so. Configurations of the early metaphase I chromosomes are of special



1

Fig. 1. Mitotic metaphase chromosomes of a spermatogonial cell. × 3600.

2

Fig. 2. Early metaphase chromosomes during meiosis I. × 3600. Note the metacentric nature of the sex chromosomes in particular.

significance. In some bivalents the chiasmata terminalization is complete; condensation of such bivalents is extreme. Hence no centromere constriction is visible. But in some others chiasmata terminalization is still incomplete; the partners of such bivalents exhibit typical separation bends suggesting the relationship between the spindle fiber and a definite segment of each partner of a bivalent. In addition, the centromere constrictions in all the sex chromosomes can hardly escape notice (Figure 2). Finally, during the anaphase these chromosomes invariably show the characteristic anaphase bends (Figure 3), that are typical of the monocentric chromosomes. It may be mentioned here, incidentally, that we

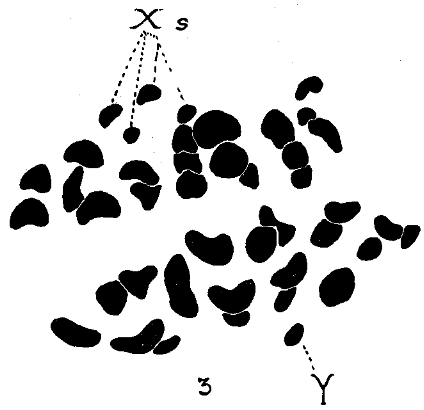


Fig. 3. Chromosomes during anaphase I. × 3600.

have observed exactly similar features in the chromosomes of 2 more species of *Ranatra* with 2 different haploid numbers. This leads us to propose that the chromosomes of *Ranatra* possess localized centromere, or they are typically monocentric chromosomes. Perhaps the X-ray experiments and experiments of induced fragments could check this point further.

Now one thing becomes evident that views regarding the centromere nature of the heteropteran chromosomes are quite diversified, polycentric according to the earlier view, 'atypical' but not polycentric in Lygaeidae and Coreidae according to PRASHAD[6], while typically monocentric in *Ranatra*. Therefore before anything be said too firmly about the centromere and its role in the evolution multiple sex chromosome mechanism and the origin of the supernumeraries in Heteroptera, it is highly desirable to study carefully the chromosomes of insects of many more heteropteran genera[7].

Zusammenfassung. Histologisch-cytologische Untersuchungen zeigen, dass die Chromosomen von *Ranatra* monozentrisch sind. Der Befund steht im Gegensatz zu Ergebnissen anderer Autoren an andern Heteroptera-Arten, die polyzentrische Chromosomen haben. Die Natur des Centromers ist also bei verschiedenen Arten der Heteropteren verschieden.

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