DIFFERENCES IN SIZE OF SPERMATIDS OF VARIOUS ORTHOPTERA

In Text-figs. 13–14, somewhat diagrammatically are four spermatids—Fig. 13 (*Pachyrhamma*), Fig. 14 (*Romalea*), Fig. 15 (*Hemideina*) and Fig. 16 (*Locusta migratoria*). In both *Romalea* and *Locusta*, as indeed in all other insects known to the writer, there is one or more acroblasts (dictyosomes destined to form the acrosome) which usually occupy the position (GA) in Figs. 14 and 16, and move up later, both parts together, and deposit the acrosome bead in the correct or nearly correct position at X in Fig. 14. This is to say that the production and deposition of the acrosome is one operation, and the acrosome goes up accompanied by the dictyosome, which later drifts down as the rejected acroblast or Golgi remnant.

Turning to the two raphidophorids in Figs. 13 and 15, we find an early acrosome secretion at the correct position at (A1), but this is followed by the production at (A2) of a much larger second acrosome which passes up by itself to the position of (A1), leaving its parent dictyosomes behind at A2. These later slough off the ripe spermatozoon.

DISCUSSION

In the locustid *Melanoplus* (R. Devine, communicated) it has been shown that the acrosome becomes fixed to cell membrane away from its proper locus, and the nucleus revolves a certain distance to make engagement at the correct position possible. But in the majority of insects and other animals studied, the acroblast (plus acrosome) floats up to very nearly its correct position. Of course the writer does not believe that the acroblast is a natant organ. As with the free isolated acrosome of *Pachyrhamma*, the dictyosomes acting as the acroblast must be transported within the cell by some form of orderly and purposeful protoplasmic streaming. In the same way the congregation of the mitochondria into their correct place from the furthermost parts of the cytoplasm must be carried out by similar protoplasmic currents. But how the latter shepherd mitochondria from all directions towards their proper position on the flagellum is not understood. The same applies to the centriole, which is the smallest of the cell inclusions which can ordinarily be resolved by the light microscope. In the end the centriole must be regarded as the prime mover and perhaps controller of the complicated movements which bring about the formation of the spermatozoon. That such a small hollow tube is so powerful in these processes is astonishing.

The significance of the formation of two acrosomes in the two raphidophorids examined cannot at present be explained. The first acrosome is deposited earlier than in any other orthoptera known to the writer. The second acrosome appears at much the same period of spermatid development as in other orthopterans, but it does not arise quite so close to the lamellated Golgi bodies as in all other known Orthoptera. In such forms as the cricket *Nemobius*, and in Orthoptera and Hemiptera in general, the acroblast floats in the cytoplasm embracing the formed acrosome, first at the posterior pole of the nucleus; then later the combined acrosome and acroblast pass towards the anterior pole, and the former is deposited nearly but not always in its proper site on the anterior pole in the long axis of the cell. But in the case of *Hemideina*, the acrosome is always deposited to one side of the central longitudinal axis of the cell and nucleus—that is to say, at 30° from the posterior pole. Since the acrosome is out of its proper place in this position, it has to migrate up to its correct locus. In *Pachyrhamma* this migration appears to take place without special contact with the nuclear membrane, but in *Hemideina* the acrosome remains on the nuclear membrane, presumably sliding over it, on its way upwards to the anterior pole.