

out and take no further part in subsequent divisions. The spindles that form after this time are very small and resemble the central spindle described by R. Hertwig for other echinoderm-eggs. The experiment shows that the additional sodium chloride added to the sea water acts as a stimulus on the nucleus, starting in it a series of changes leading to a division and separation of the chromosomes. The effect lasts through a long series of subsequent divisions. The artificial asters, as long as present, seem to act as centers towards which the chromosomes move. The rays of the astrospheres that come in contact with the chromosomes change their structure in very much the same way as do the rays that form the spindle in the ordinary karyokinetic figure.

*Centrosome and Sphere in the Fertilized Egg of Unio.* F. R. LILLIE.

STARTING with the typical structure of the aster in the metaphase of either maturation spindle, viz.: A small centrosome with the radiations inserted in it, and surrounded by inner and outer strata of microsomes forming inner and outer spheres, it was shown that by fusion of the stratum of microsomes bounding the inner sphere and by peripheral accumulation of its ground substance, the inner sphere is converted into a vesicle during the anaphase and telephase of both maturation divisions. This vesicle is now the central area of attachment of the radiations; and the centrosome proper is attached to the wall of the sphere by fibers, which are not part of the general system of radiations.

It was shown further that the central spindle of the second maturation division is formed within the inner sphere, and that during the prophase the centrosomes increase greatly in size and fragment into a number of *centrosome granules*, one of which remains as the centrosomes of the later

stages (mother-star and later), while the others form in part the stratum of microsomes bounding the inner sphere, and in part become resolved into the ground substance of the inner sphere.

Combining these results with those announced before the Society in the winter of 1896 (SCIENCE, V., 114, March 5, 1897), the study of the maturation and fertilization of the egg of *Unio* was stated to offer the following evidence against the theory of the permanence and uniqueness of the centrosome:

1. A sperm amphiaster is formed, but it disappears utterly at the time of the metaphase of the first maturation spindle.

2. Entirely independently of the sperm and egg asters, there arises in the egg of *Unio* at the time of the metaphase of the second maturation spindle an accessory aster, in the center of which is a minute centrosome. This centrosome divides and a small amphiaster is formed, which entirely disappears at the beginning of the telephase.

3. After the formation of the second polar globule the egg centrosome goes the way of its kind (*i. e.*, disappears).

4. The two cleavage centrosomes arise independently of any of their predecessors, and apparently separately.

5. Fission products of the centrosomes become cytomicrosomes.

Thus the egg of *Unio* furnishes evidence, in the first place, that the centrosomes are not genetically continuous; in the second place, that a centrosome may arise *de novo* (accessory aster); and, in the third place, that products of division of the centrosome may become other formed elements of the cell.

A somewhat fuller statement is to appear in the *Zoological Bulletin*

*The Fertilization of the Egg of Molgula Manhattensis.* H. E. CRAMPTON, JR.