various radium centers have been considered and assessed by the commission, the allocation of national supplies of radium will be commenced. Orders have already been placed by the trust for 10 gm exclusive of the 4-gm bomb, and it is anticipated that the whole of this should be available before the autumn of 1930. It has been decided to install a radon plant at the National Physical Laboratory for the purpose of supplying (under proper safeguards) radon to hospitals or other institutions which otherwise could receive no direct assistance from the commission for radium therapy.

DISCUSSION

ENVELOPING MEMBRANES OF ECHINODERM OVA

THE fertilization membrane of Echinoderm ova has been made a subject of discussion in two recent communications to SCIENCE, one by A. R. Moore, "The Function of the Fertilization Membrane in the Development of the Larva of the Sea Urchin,"[1] and the other by E. E. Just, "The 'Fertilization' Membrane of Echinid Ova."[2]

The former is a statement of certain facts from which a rather sweeping conclusion is drawn, while the second cites observations on one kind of ovum to refute the conclusion of the former dealing with another kind of ovum.

Moore, using the ova of *Strongylocentrotus purpuratus,* found that eggs treated with urea and subsequently fertilized form no fertilization membranes, and when segmentation sets in the blastomeres fall apart. He concluded that membrane formation (by which he evidently means the fertilization membrane) is of fundamental importance to the development of organisms consisting of closely associated groups of cells. He should have restricted this conclusion to urea-treated Strongylocentrotus eggs.

It is to be deplored that Just makes no mention of the species on which he bases his conclusions. Presumably he has reference to the Woods Hole Echinids *Arbacia punctulata* and *Echinarachnius parma.* In addition to using data of his own on the removal of the fertilization membrane Just gives credit, albeit dubiously, to the micro-dissection method by means of which the vitelline membrane has been removed from the uninseminated eggs of both these species.[3] Such eggs, when subsequently fertilized, segment and develop into normal embryos with no fertilization membranes.

Hence, both investigators are correct if only they had restricted their divergent conclusions to the particular species with which they worked; namely, when the Strongylocentrotus ovum is divested of its fertilization membrane by means of urea its blastomeres do not hold together to develop into an embryo, while the Arbacia and Echinarachnius eggs, on the other hand, are fully capable of normal development without fertilization membranes.

I have not worked with the Strongylocentrotus egg, but from Moore's observation I judge that it closely resembles the Woods Hole Asterias egg in regard to the cohesive properties of the blastomeres. In the Asterias egg the early blastomeres are loosely distributed within the fertilization membrane and only by careful observation can one detect a delicate, secondary membrane, investing the outer borders of the blastomeres and extending between them. This membrane, which develops on the surface of the egg several minutes after the fertilization membrane is lifted off, is too weak to hold the blastomeres together so that they would fall apart if it were not for the externally investing fertilization membrane. Moreover, this secondary membrane is formed only when a bivalent electrolyte (Ca or Mg) is present in the surrounding medium.

In the Arbacia and Echinarachnius egg a similar secondary membrane is formed, the so-called hyaline plasma layer, and it is strong enough to hold the blastomeres firmly together without the aid of the fertilization mebrane. This secondary membrane can be torn with micro-needles, in which case the blastomeres fall apart.[4] This and the fertilization membrane constitute the anatomical structures (quite apart from the true plasma membrane of each individual cell) which Moore rightly concludes are necessary to permit normal development by keeping the cells closely associated.

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THE ELECTRON AND RADIATION

THE electron has been shown[1] in several ways by me to possess certain fundamental properties. It is of course desirable that this result should be obtained in as many ways as possible, and one more will therefore be given here.

Consider a closed chamber with perfectly reflecting walls whose total mass is infinitely large so that they may withstand any pressure. Suppose that the chamber contains a single free electron, and a par-

[1] 70: 360, October 11, 1929.
[2] 71: 243, February 28, 1930.
[3] Chambers, *Biol. Bul.,* 41: 318, 1921.
[4] *Anat. Rec.,* 25: 121, 1923.
[1] *Phil. Mag.,* 7: 493, 1929; SCIENCE, 70 (1820): 479, 1929.