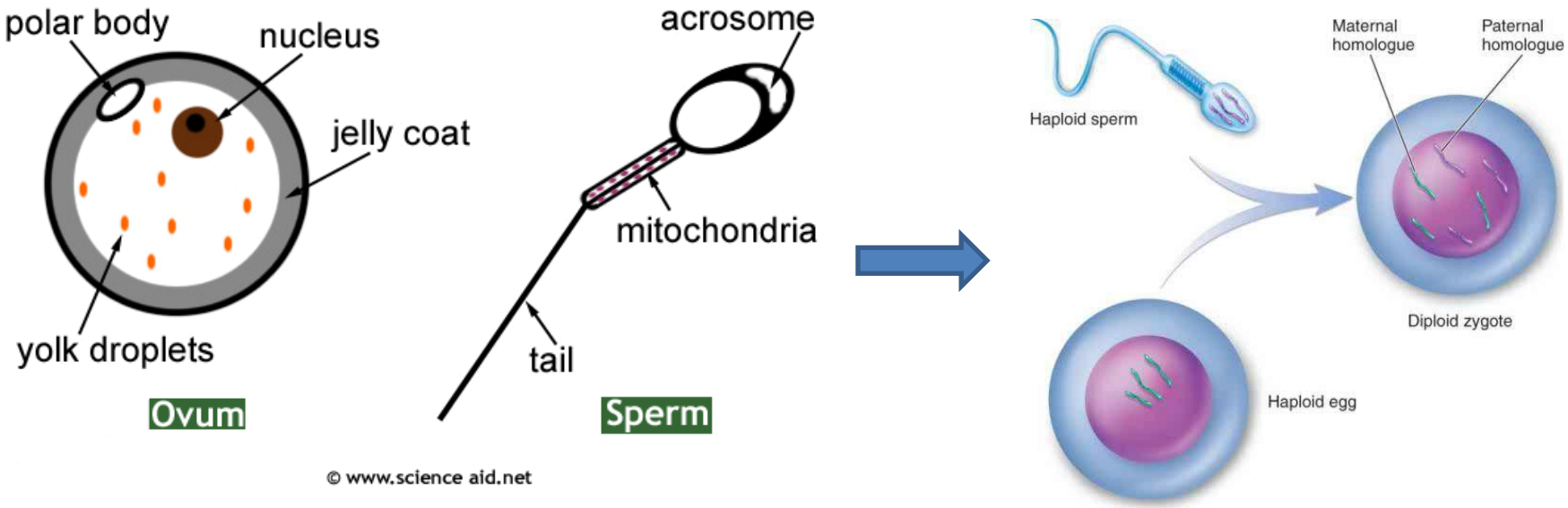
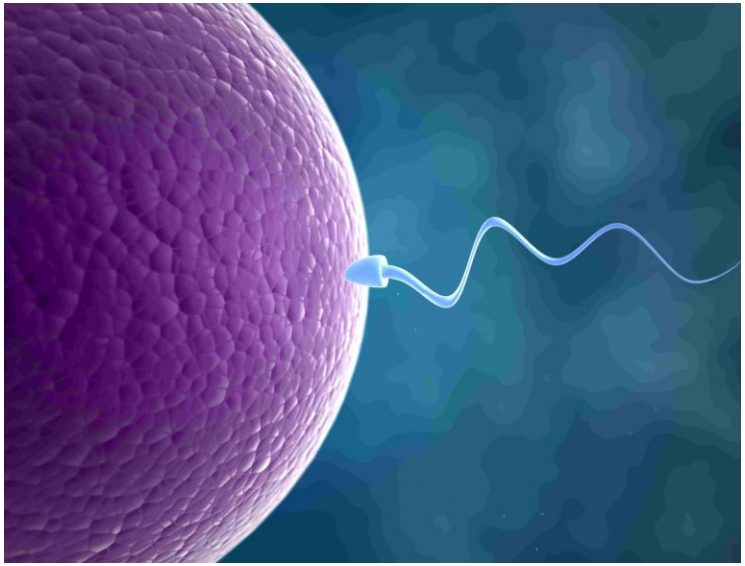
Fertilization: Fertilization is the fusion of two gametes (sex cells), a male and a female one, followed by the joining together of the nuclei of the two gametes.



There are two independent aspect of fertilization: one is activation of egg, the other is the intermingling of the paternal and maternal hereditary characters in the offspring. The later aspect of fertilization is also known as amphimixis.



Fertilizin:

During fertilization, the properties of spermatozoa become change in the egg water due to the presence of substance which dissolve in the surrounding water. It is believed that this substance come from the either egg itself or from egg membrane.

Antifertilizin:

During fertilization, one kind of substance produce from the surface layer of the cytoplasm of the spermatozoon due to heating, thawing and acidifying of the water.

The remarkable peculiarity of the ferilizin and antifertilizin is that they combine in a specific way; that is, the egg fertilizin of any species reacts best with the sperm fertilizin of the same species.

The mechanism of penetartion is chemical. The spermatozoon produces substances of an enzymatic nature, known under the general name of sperm lysins, which dissolve the egg membranes locally and make the path clear for the spermatozoon to enter the perivitelline space and reach the egg.

In mammals, the ovulated ripe egg is surrounded by the folicle cells which in the ovary were nearest to egg, and at the time of fertilization they surround the egg as the corona radiata.

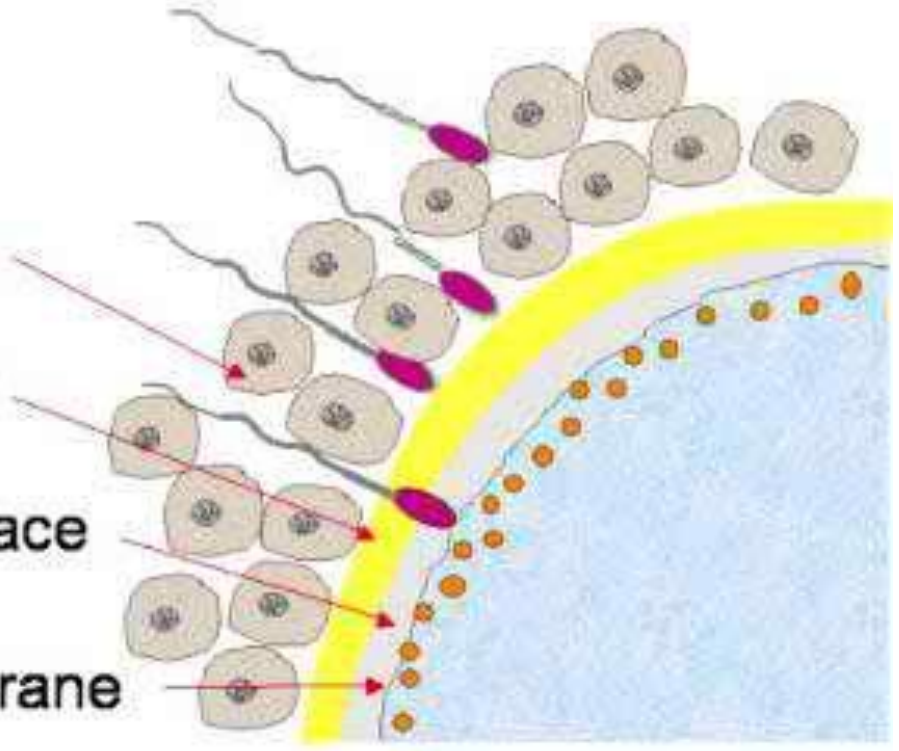
In the case of egg with very thick and resistant membranes, such as the chorion of fishes, the sperm can not reach the egg at any point but must penetrate through a special canal called Micropyle.

1. the corona radiata

2. the zona pellucida

3. the perivitelline space

4. the vitelline membrane

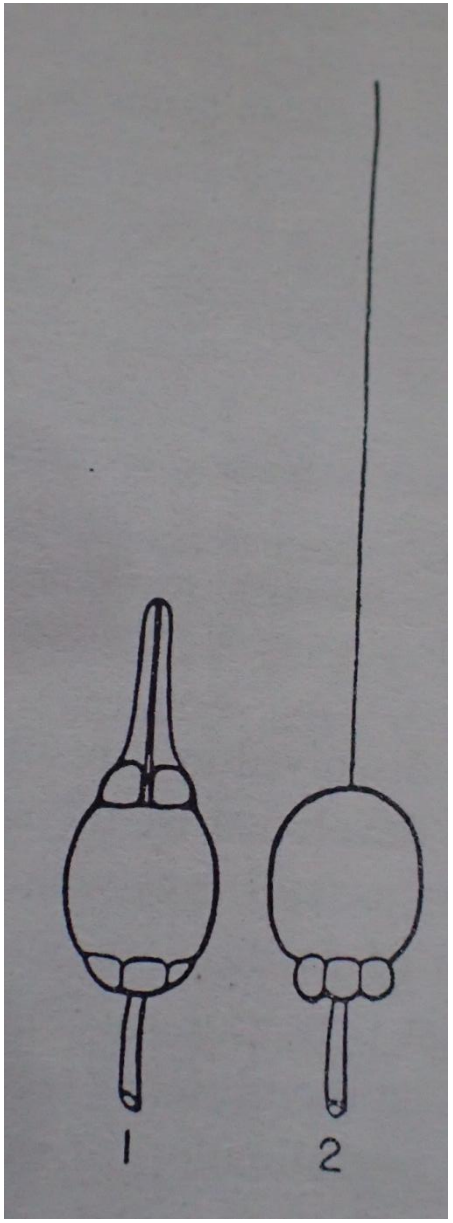


Acrosomal filament:

The central part of the acrosom, which appears rather transparent in electron micrographs, elongates and become transformed into a long (1-75 μ) thin filament, or possible a tube, which has considerable rigidity and protrudes forward from the head of spermatozoon.

Immediately after the acrosomal filament of the spermatozoon touches the surface of the egg, the cytoplasm of the egg bulges forward at the point of contact, producing a process of hyaline cytoplasm, the fertilization cone.

Fig. Change in the structure of a Mollusc (*Mytilus edulis*) spermatozoon caused by “egg water”. Left: Untreated spermatozoon and right:2activated” spermatozoon with acrosomal filament.



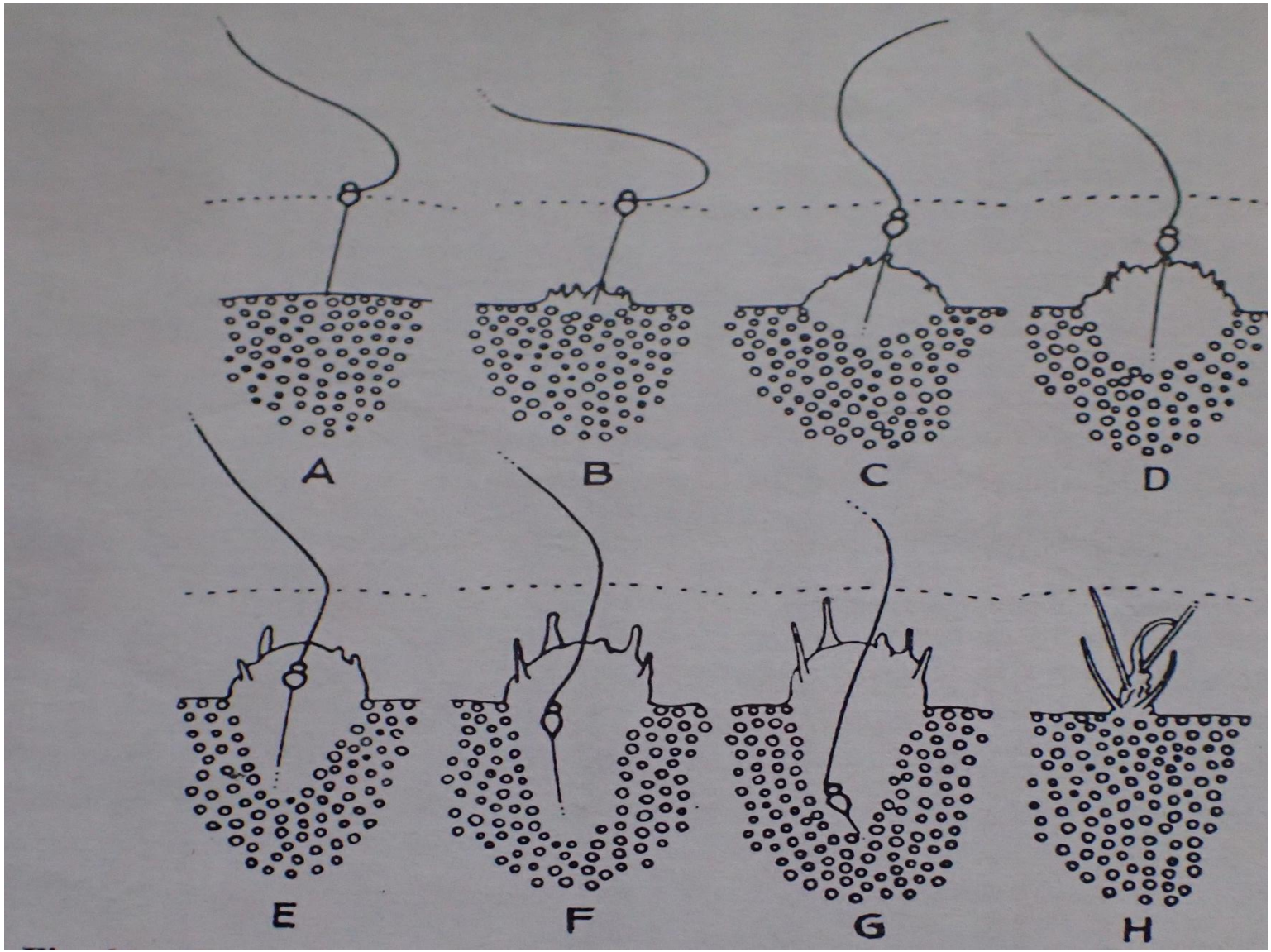


Fig. Sperm entry into the egg of sea cucumber (*Holothuria atra*) with formation of fertilization cone by the cytoplasm of the egg.

Egg activation:

After enter the spermatozoon in the interior of the egg, the egg shows sign that it has become profoundly changed, that it has been activated.

The following changes observed in the egg:

1) **A change in the surface of the egg cytoplasm which prevents the entry of further spermatozoa**
2) **The elevation of fertilization membrane.**

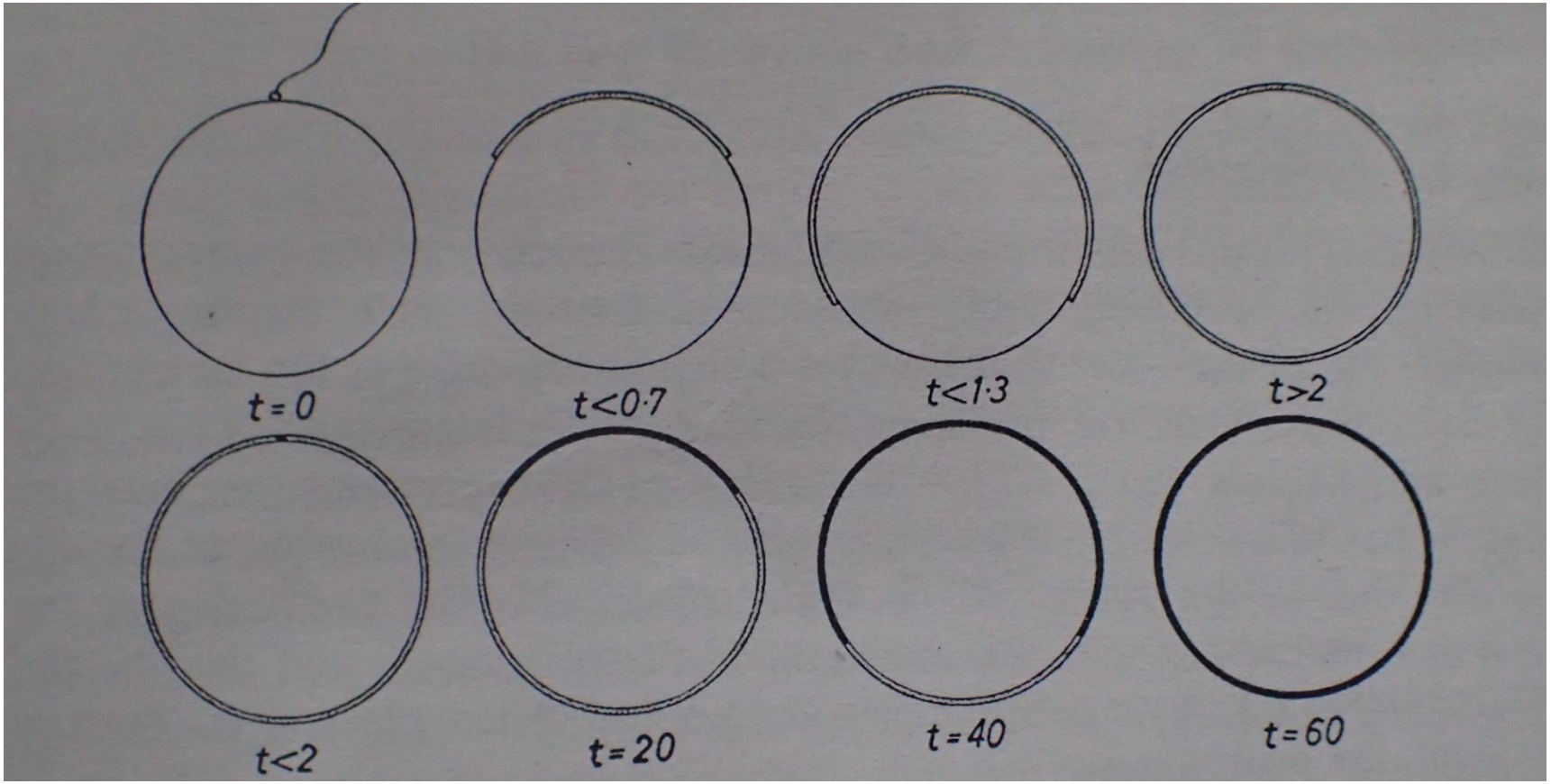
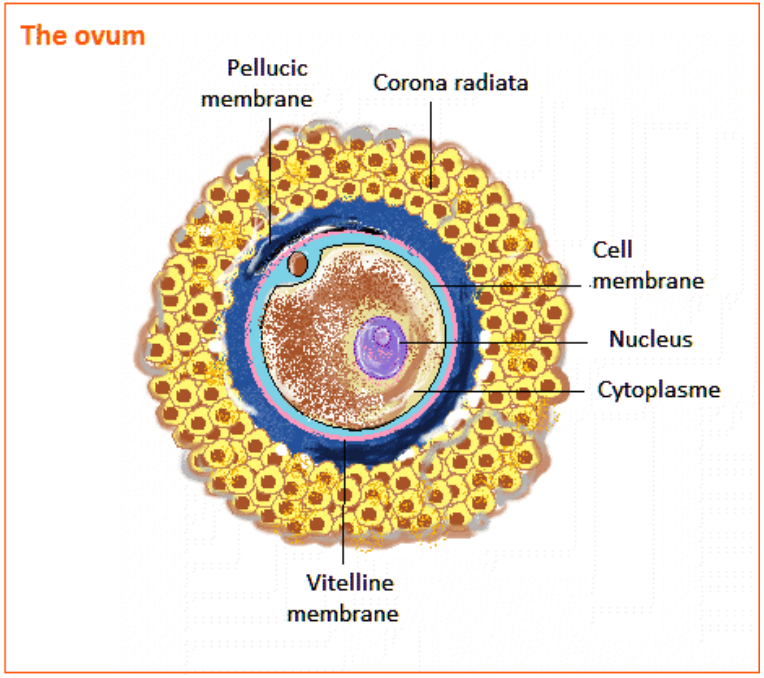


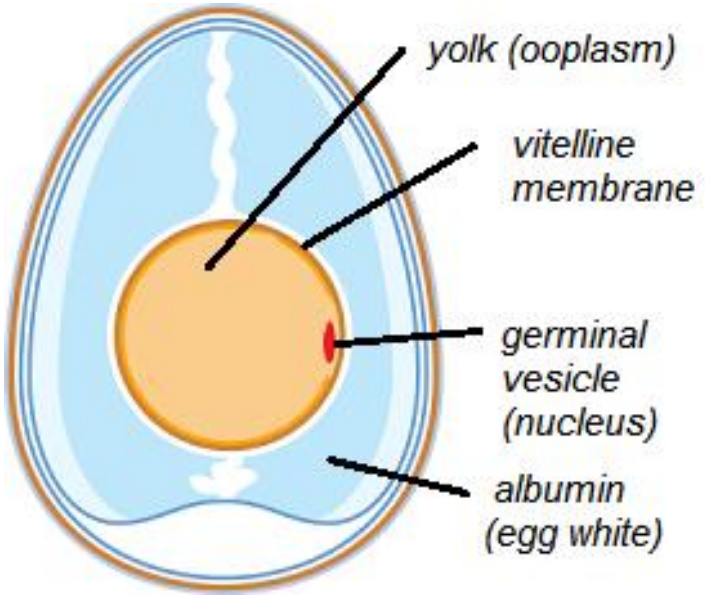
Fig. Propagation of the primary and secondary fertilization reaction over the surface of the sea urchin egg.

Vitelline membrane:

The vitelline membrane is a structure surrounding the outer surface of the plasma membrane of an ovum.

It is composed mostly of protein fibers, with protein receptors needed for sperm binding which, in turn, are bound to sperm plasma membrane receptors. The species-specificity between these receptors contributes to prevention of breeding between different species.





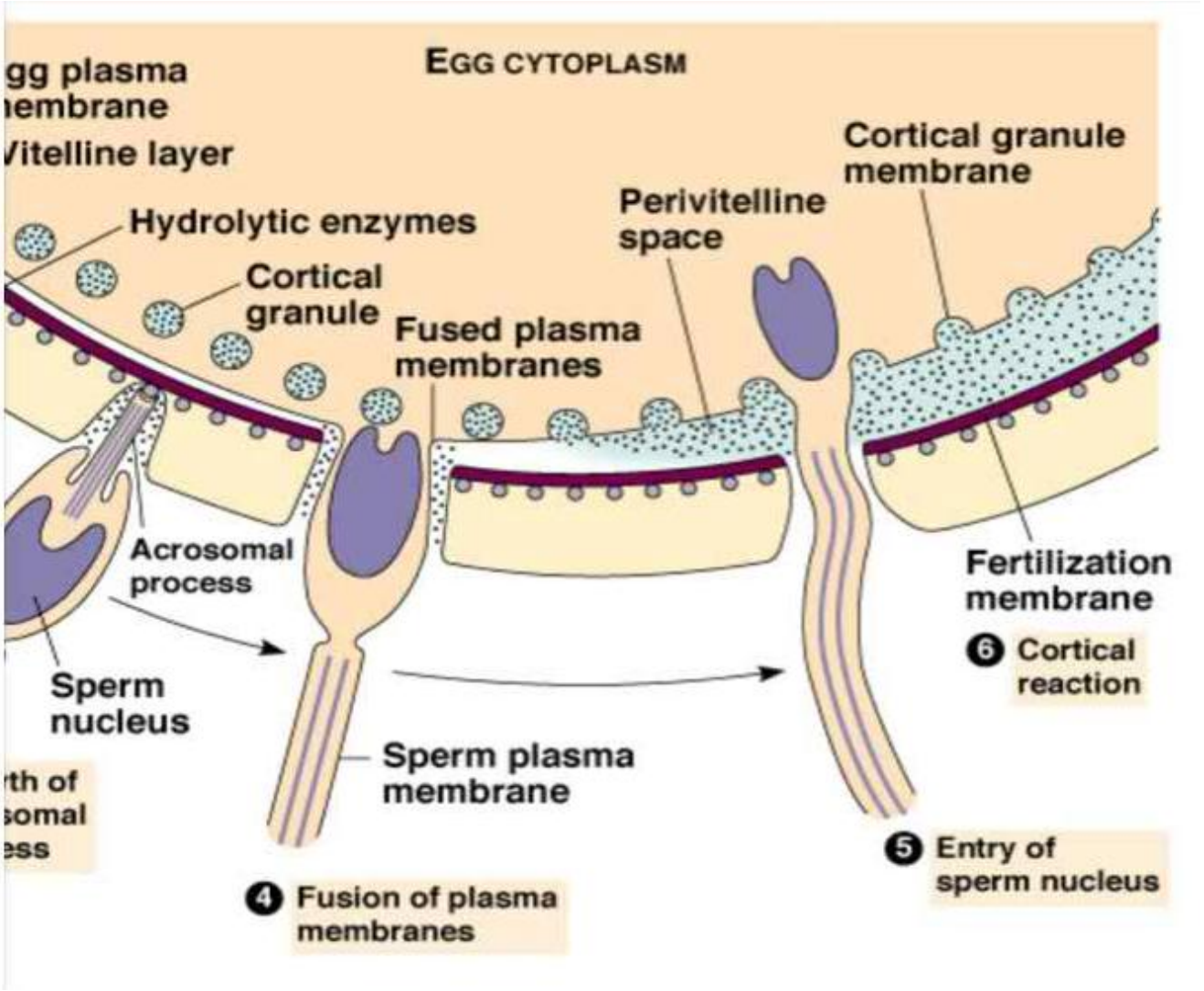


Fig. The process of fertilization

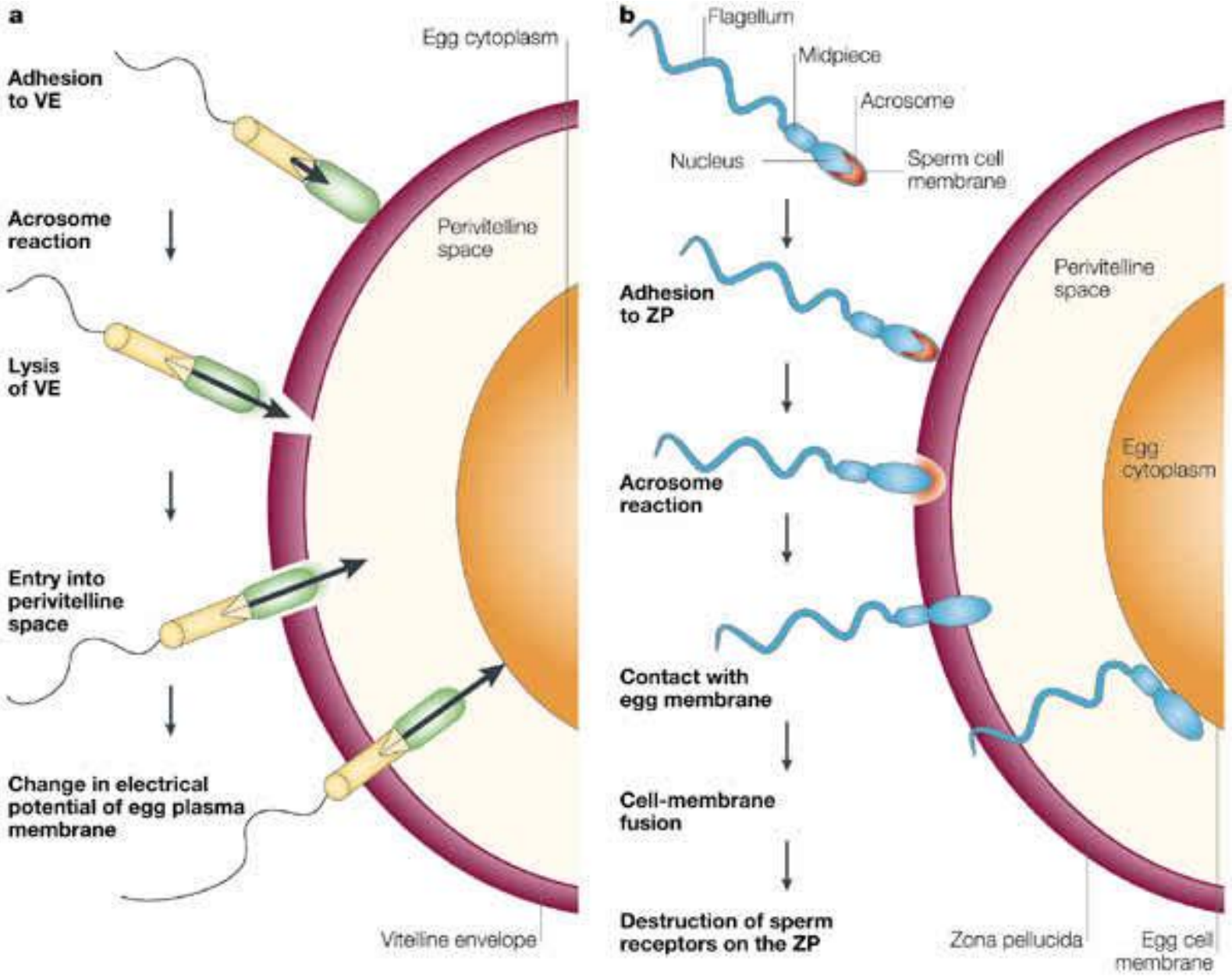


Fig. The process of fertilization

Nature Reviews | Genetics

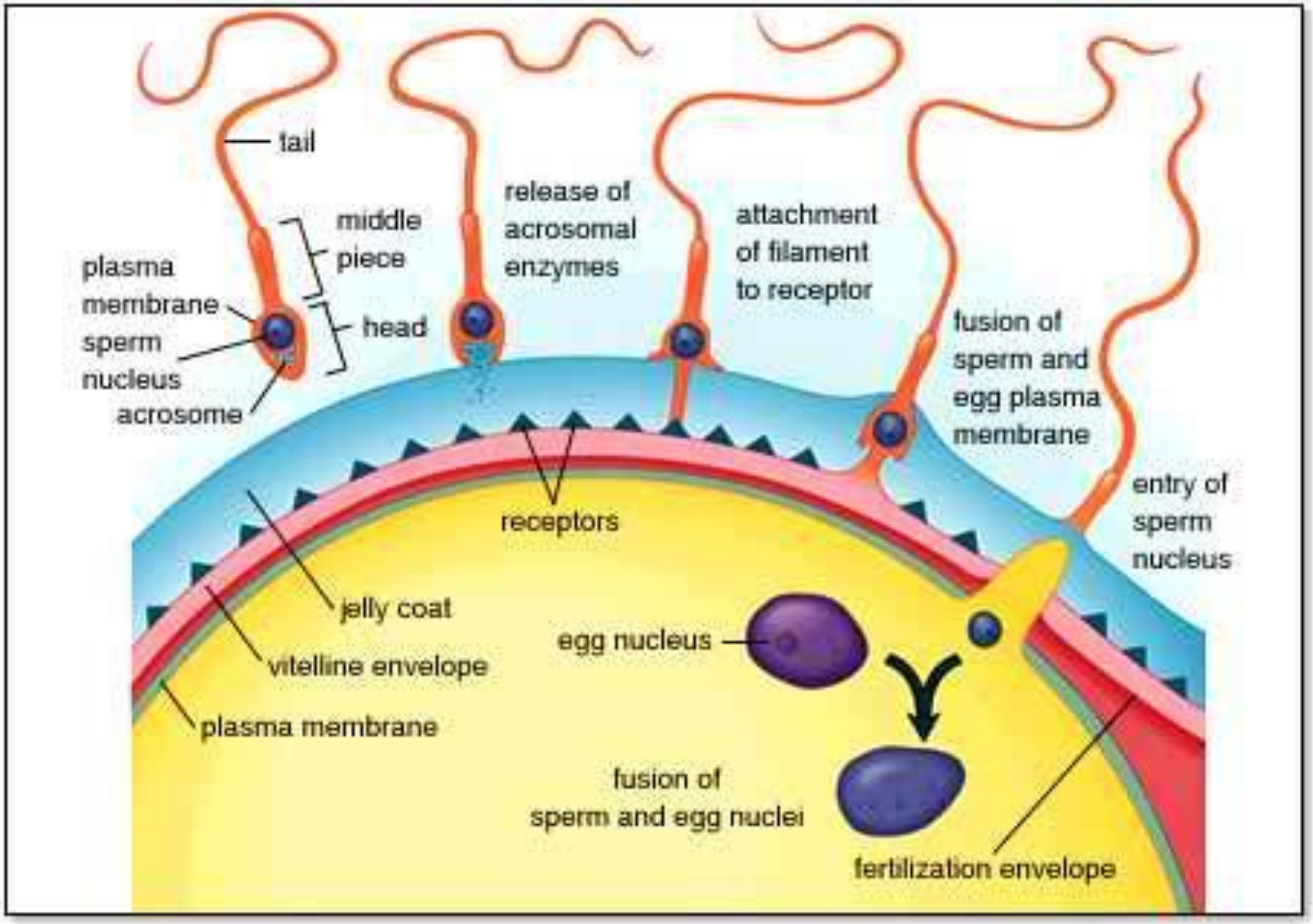


Fig. The process of fertilization

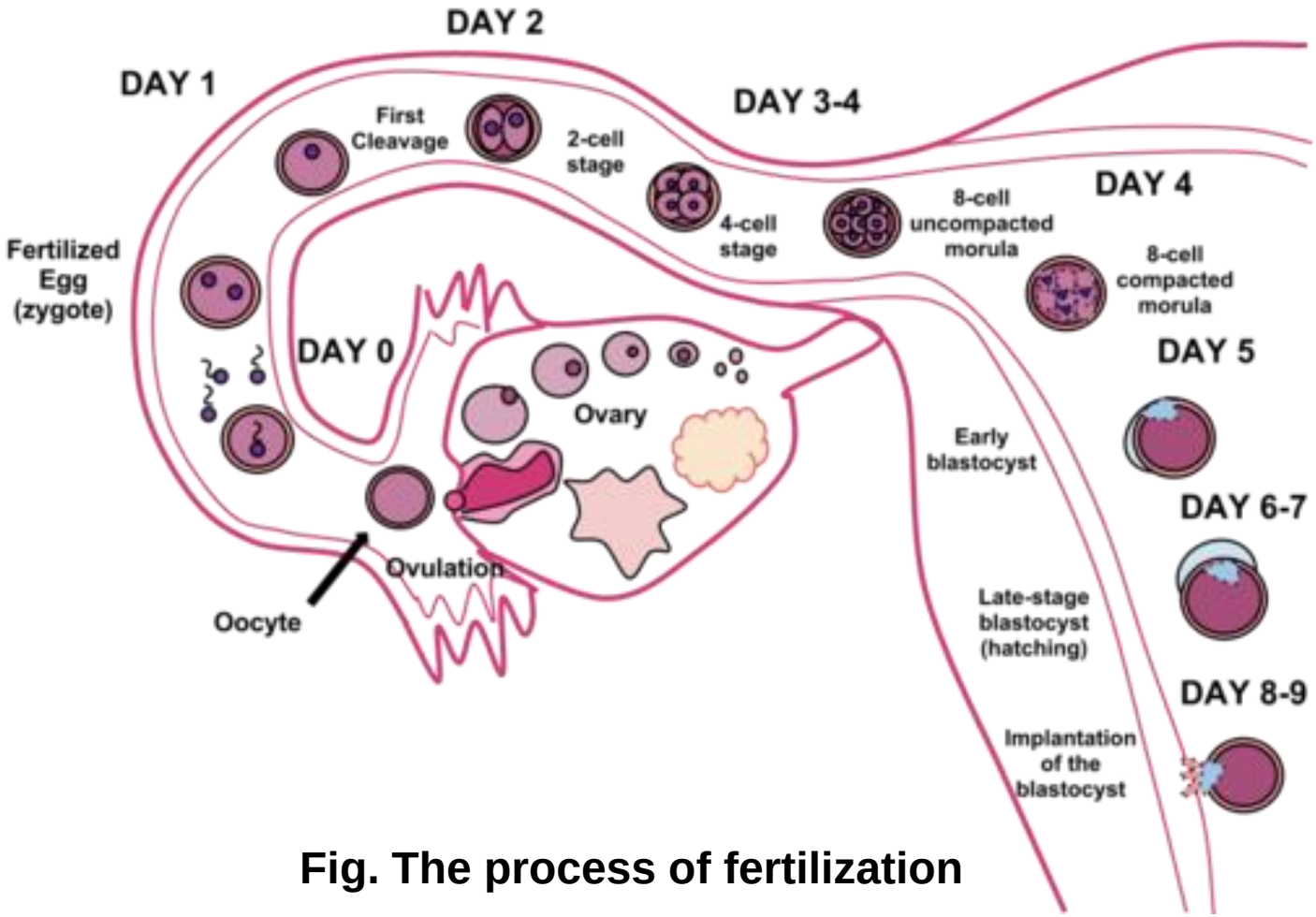


Fig. The process of fertilization

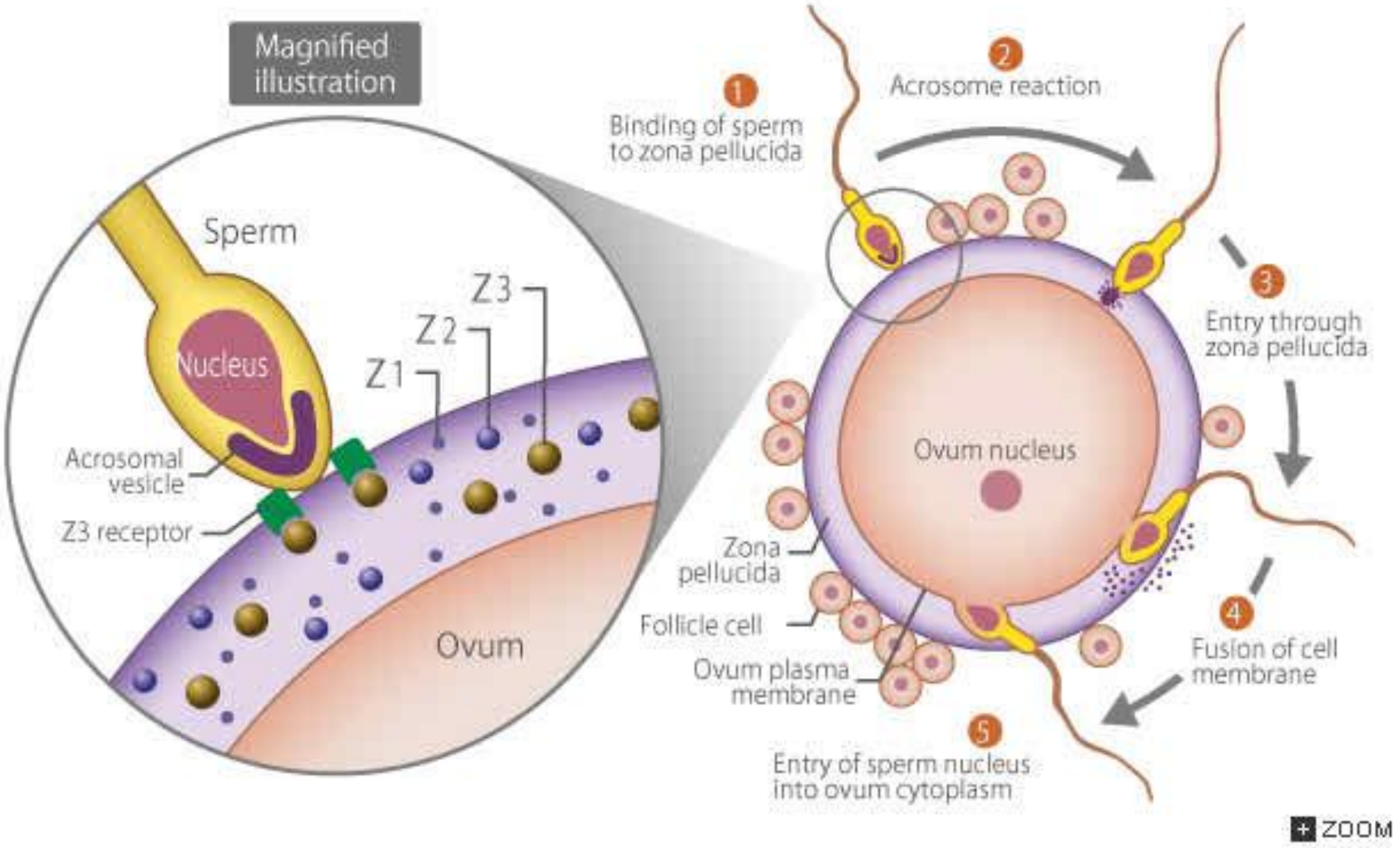


Fig. The process of fertilization

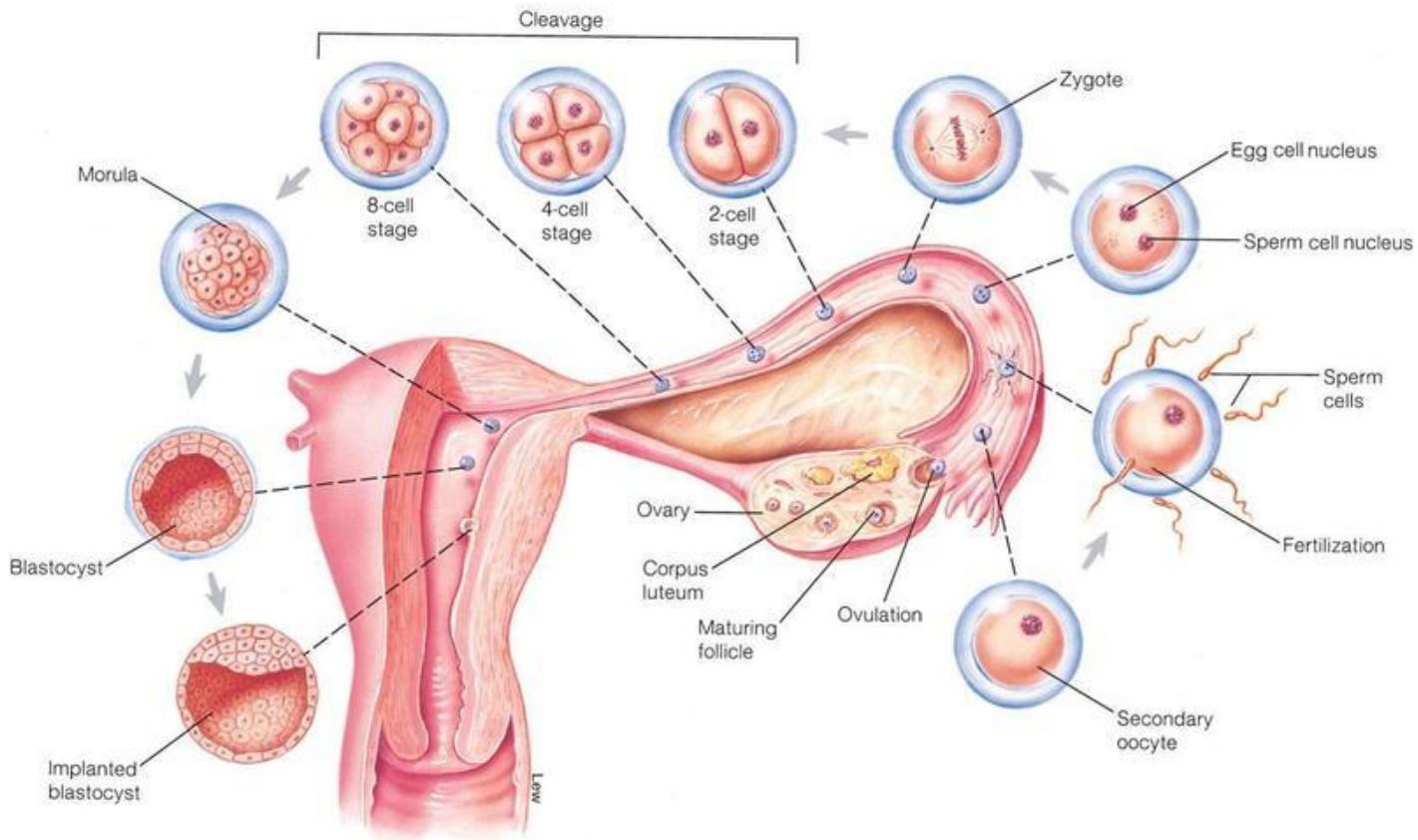
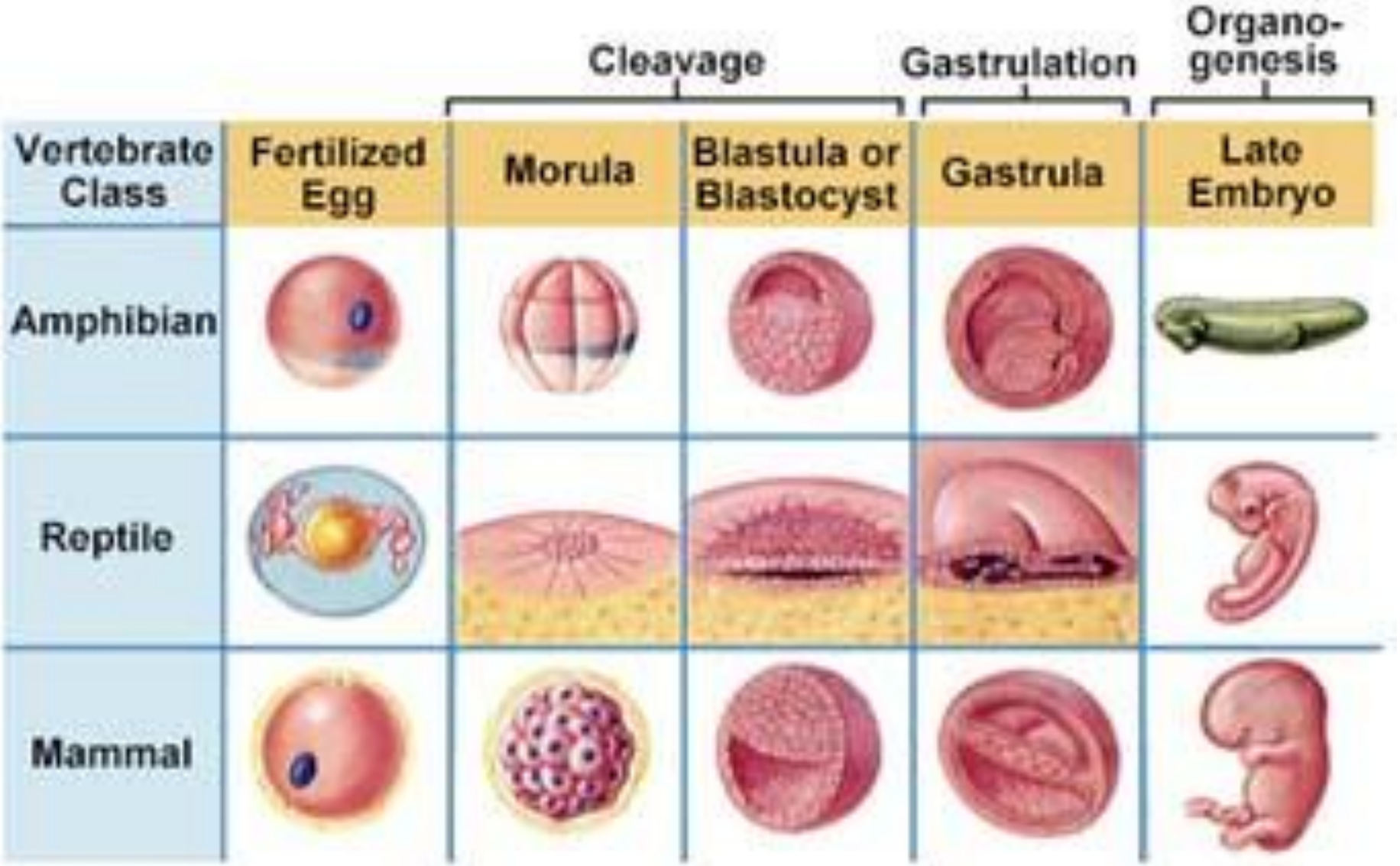


Fig. The process of fertilization and further steps of embryo development


Cleavage
Gastrulation
Organo-genesis
Vertebrate Class
Fertilized Egg
Morula
Blastula or Blastocyst
Gastrula
Late Embryo
Amphibian
Reptile
Mammal