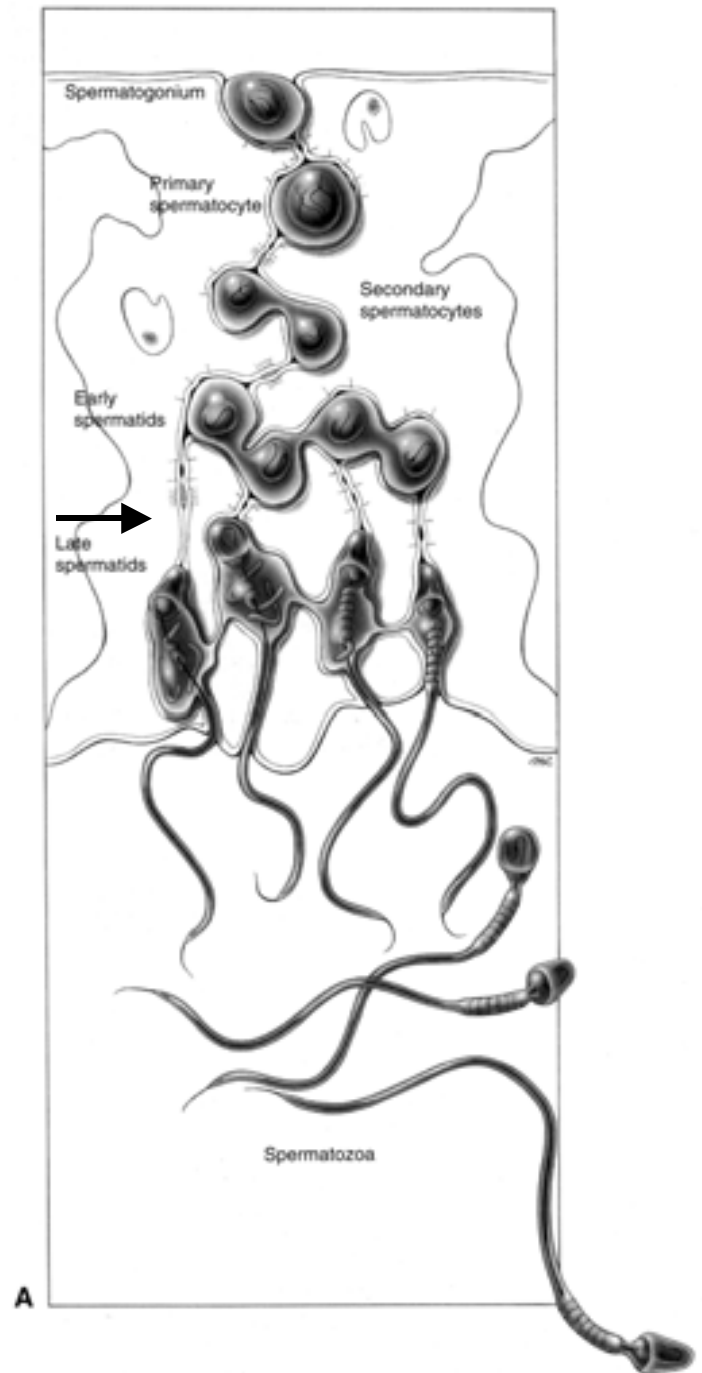


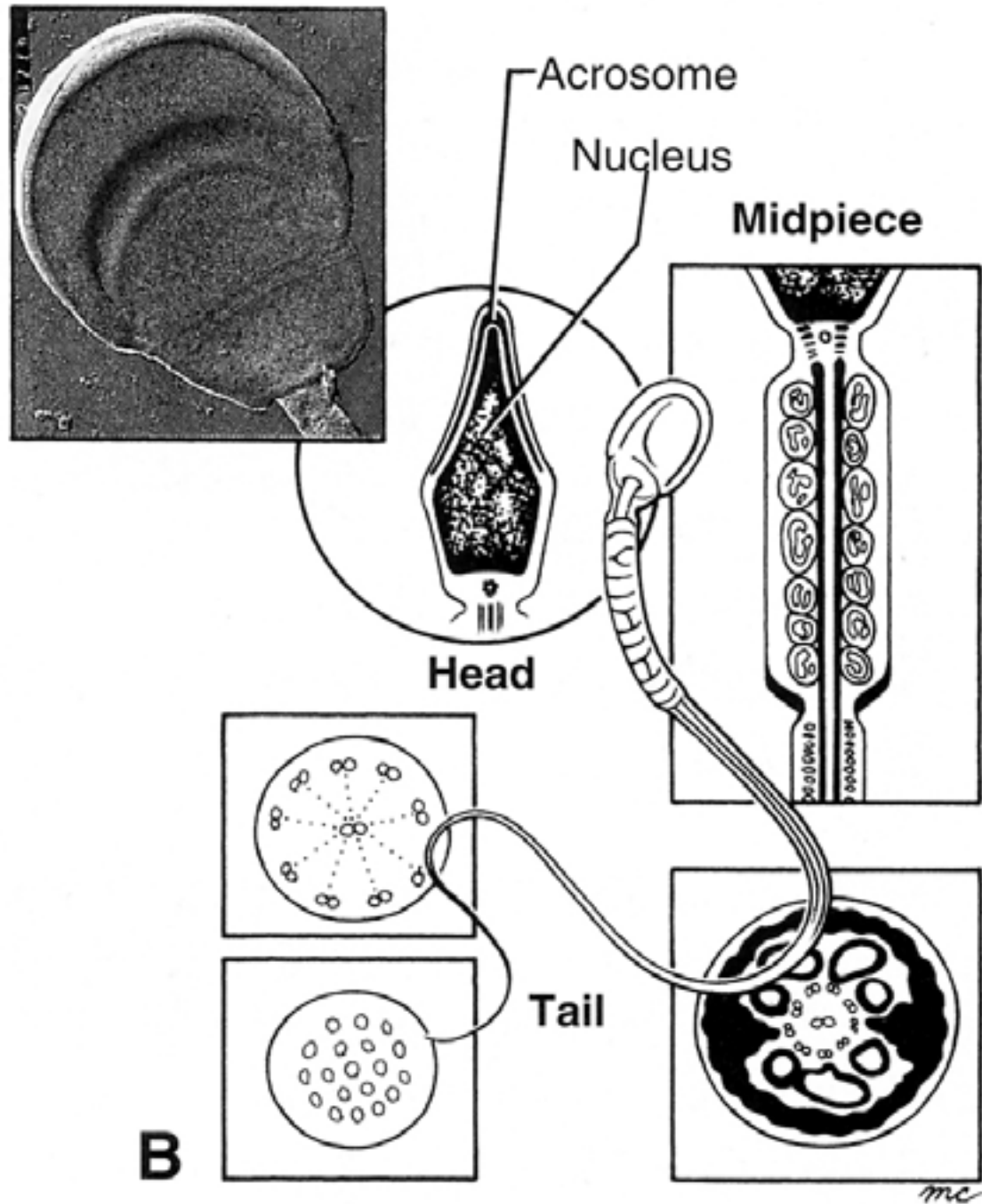
Dr. Ann-Judith Silverman
Department Anatomy & Cell Biology
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From Fertilization to Gastrulation

Sperm differentiation:

1. Meiosis of the begins post-puberty in the testes.
2. Following meiosis, spermatocytes are remodeled to spermatids and finally to spermatozoa.
3. Note the presence of tight junctions (arrow) between Sertoli cells forming a blood-testes-barrier





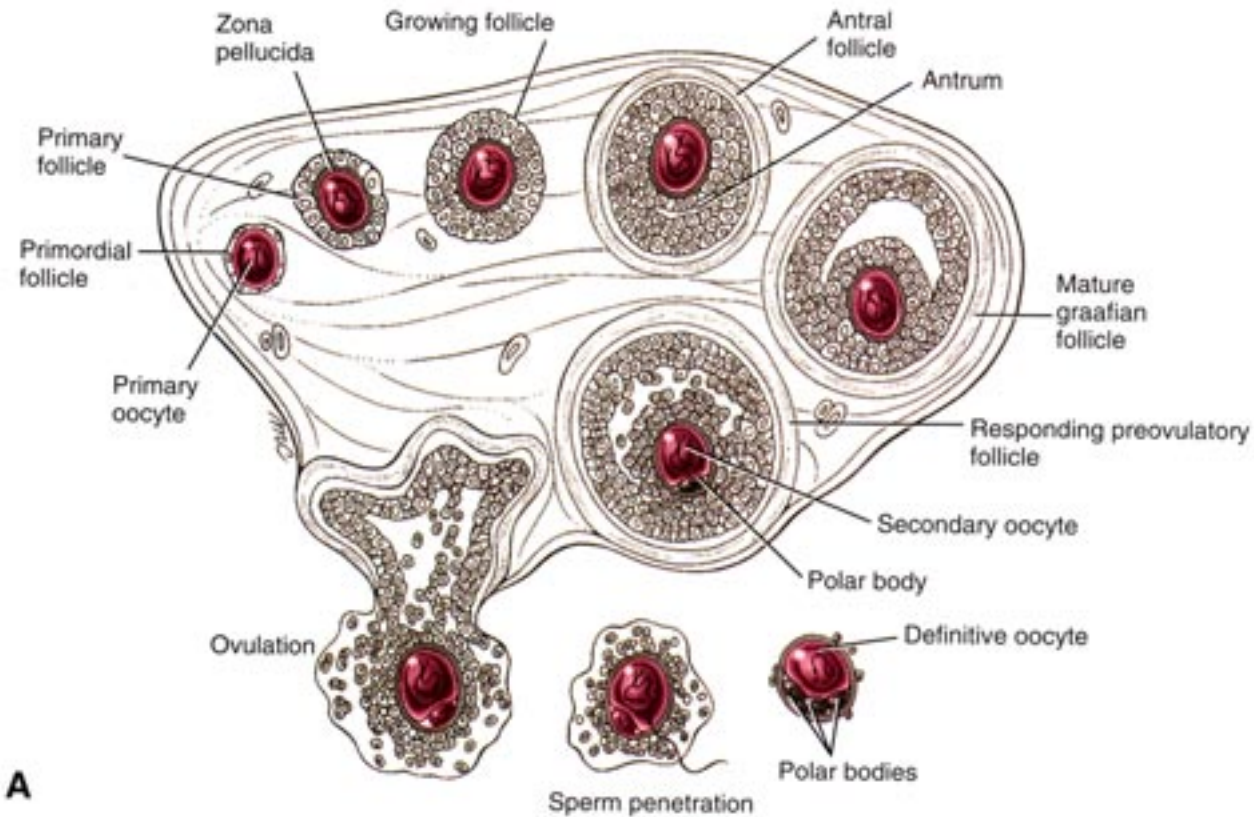
Final phases of sperm maturation.

1. “Education” of sperm in epididymis (3 wks).

2. In female reproductive tract:

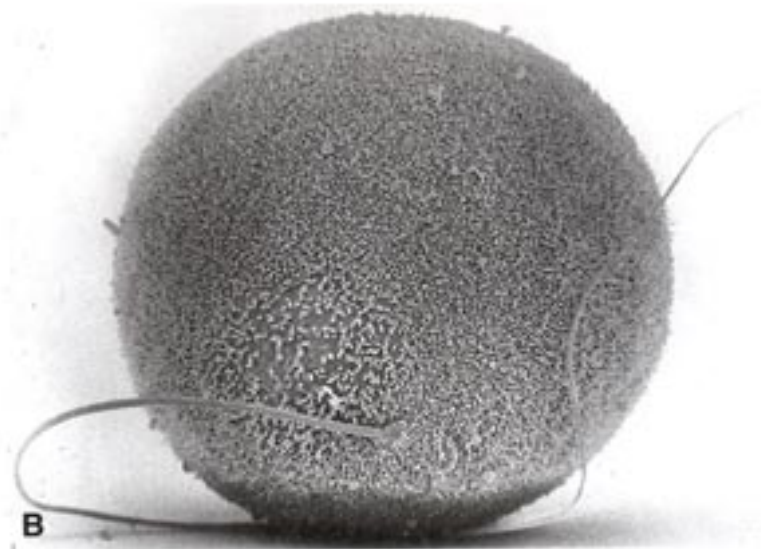
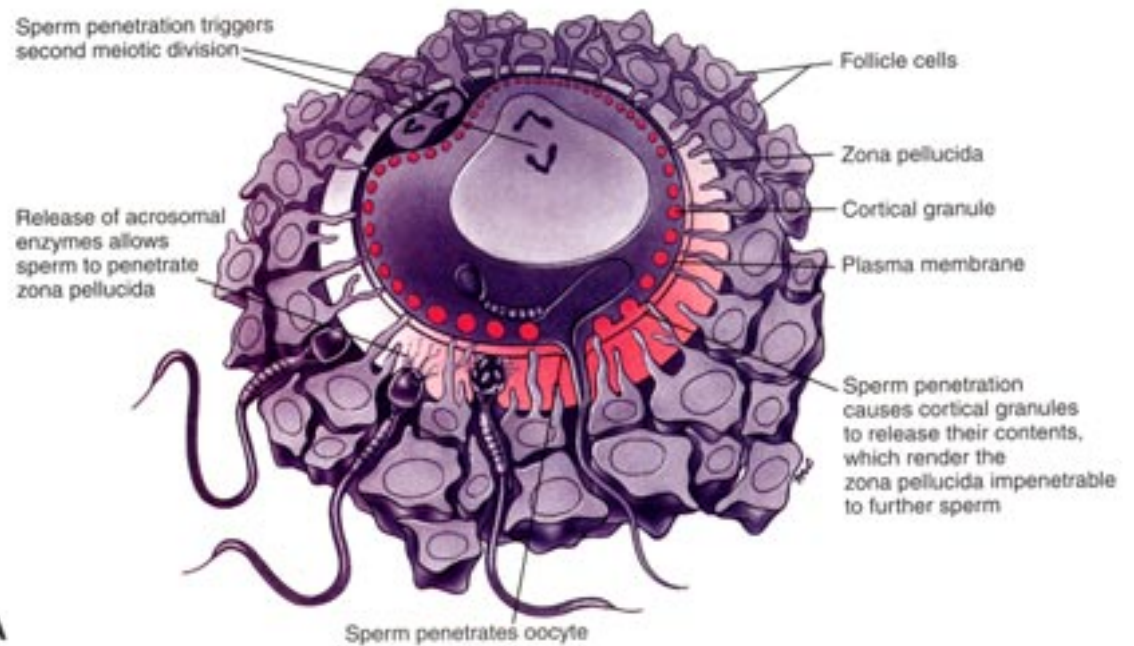
Capacitation: able to fertilize an egg.

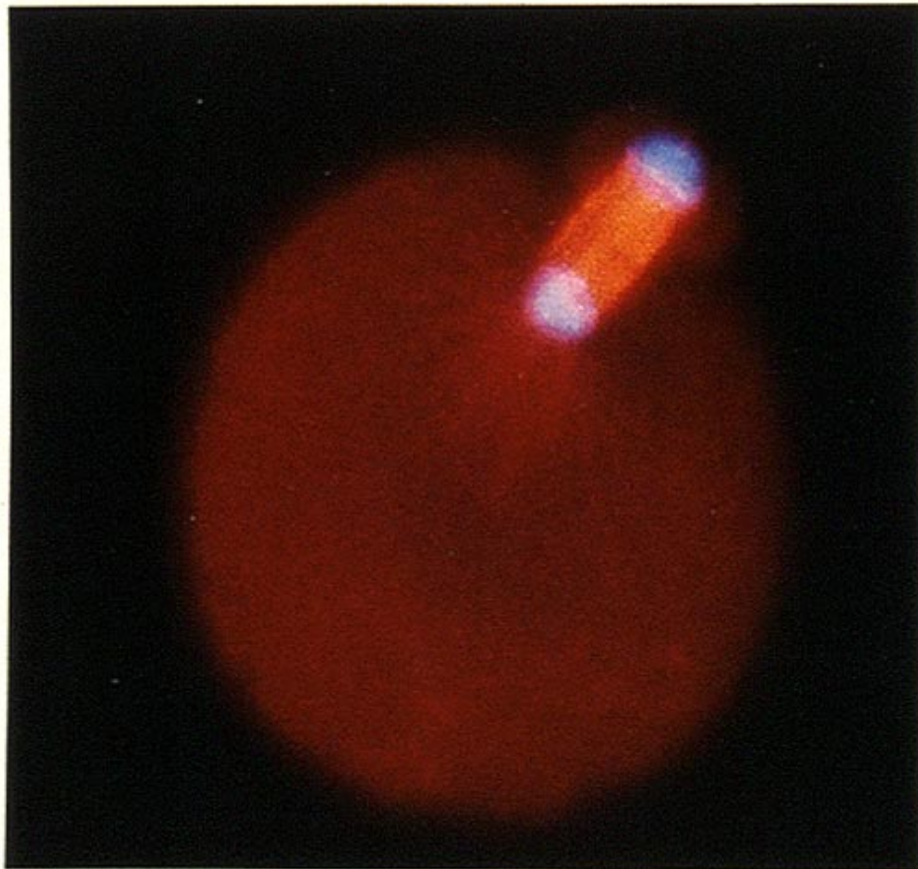
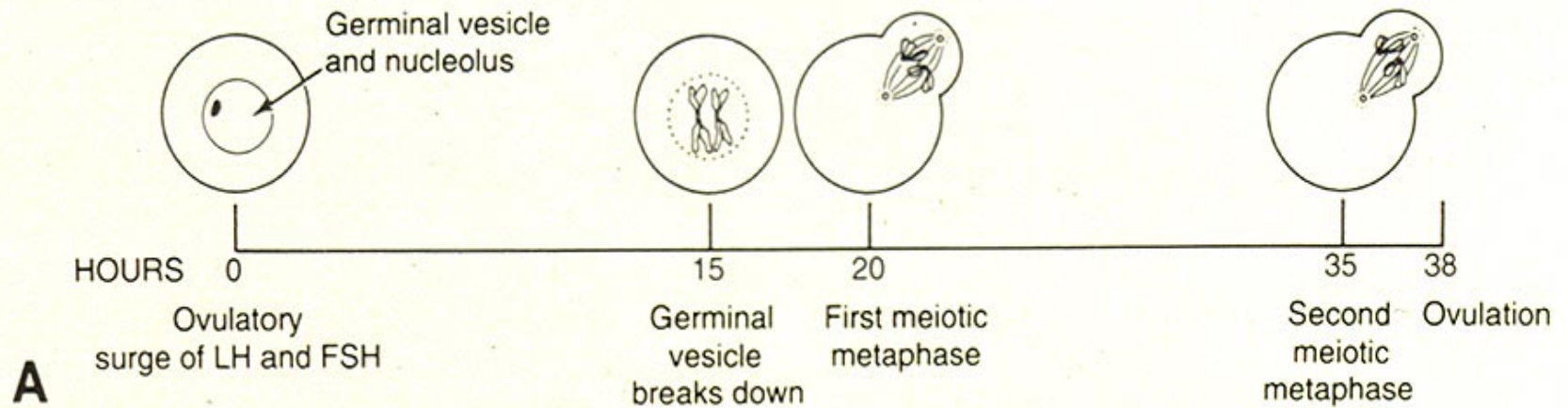
^a **Acrosome reaction:** fusion of apical vesicle membrane (acrosome, modified lysosome) with sperm’s plasma membrane. This releases hydrolytic enzymes to penetrate zona pellucida (extracellular material) surrounding the egg.



1. Ovum begins meiosis in fetal life and is held in prophase of first meiotic division.
2. Meiosis re-initiated at ovulation.
3. Meiosis is only completed if ovum is fertilized.

1. Many sperm try but only 1 “makes it”.
2. Polyspermy prevented by exocytosis of cortical granules.

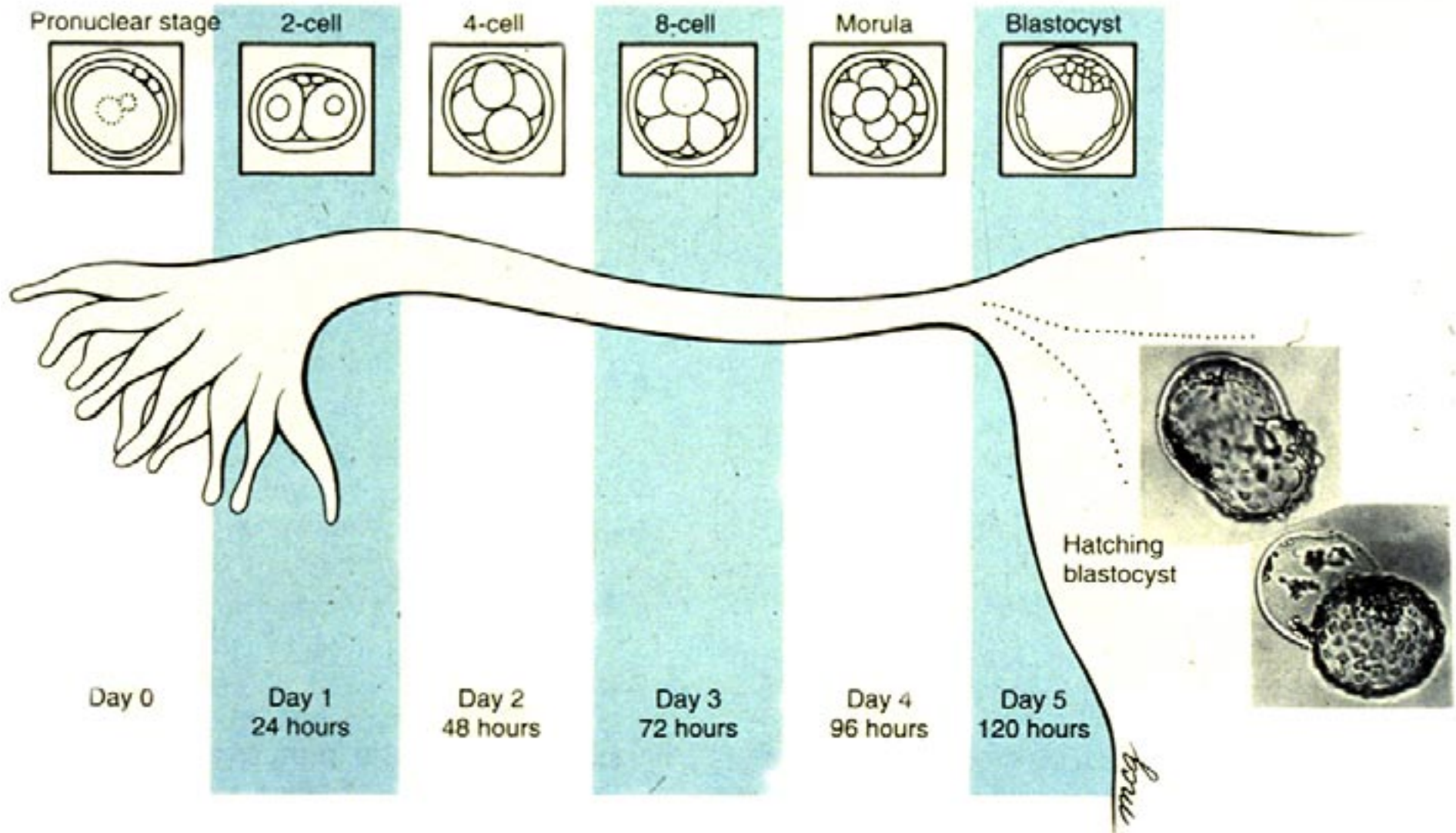




1. Plane of meiotic metaphase is asymmetrical.
2. This results in 3 polar bodies (little cytoplasm and 1 large ovum).

Nuclei are blue
 Microtubules of spindle are red.

Cleavage divisions take place within the oviduct.
Embryo hatches out of the zona pellucida in uterus



I. PATTERNS OF DEVELOPMENT

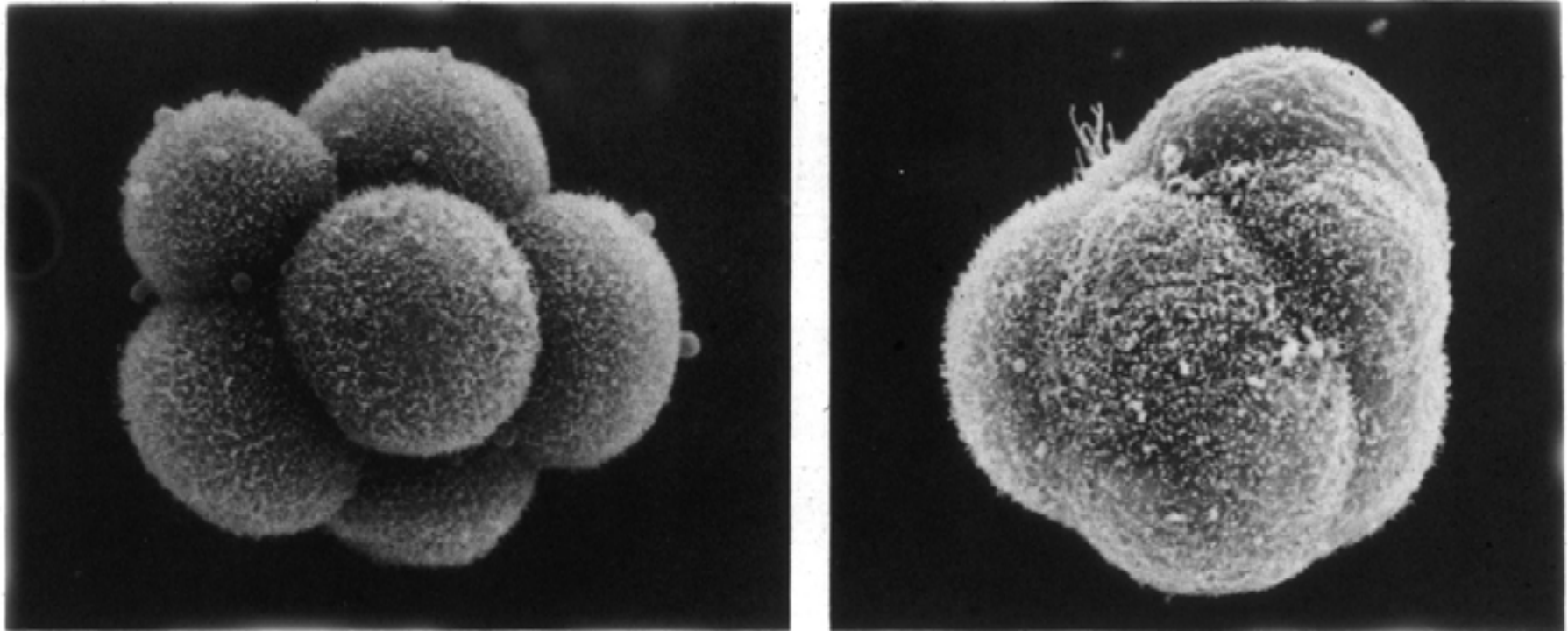
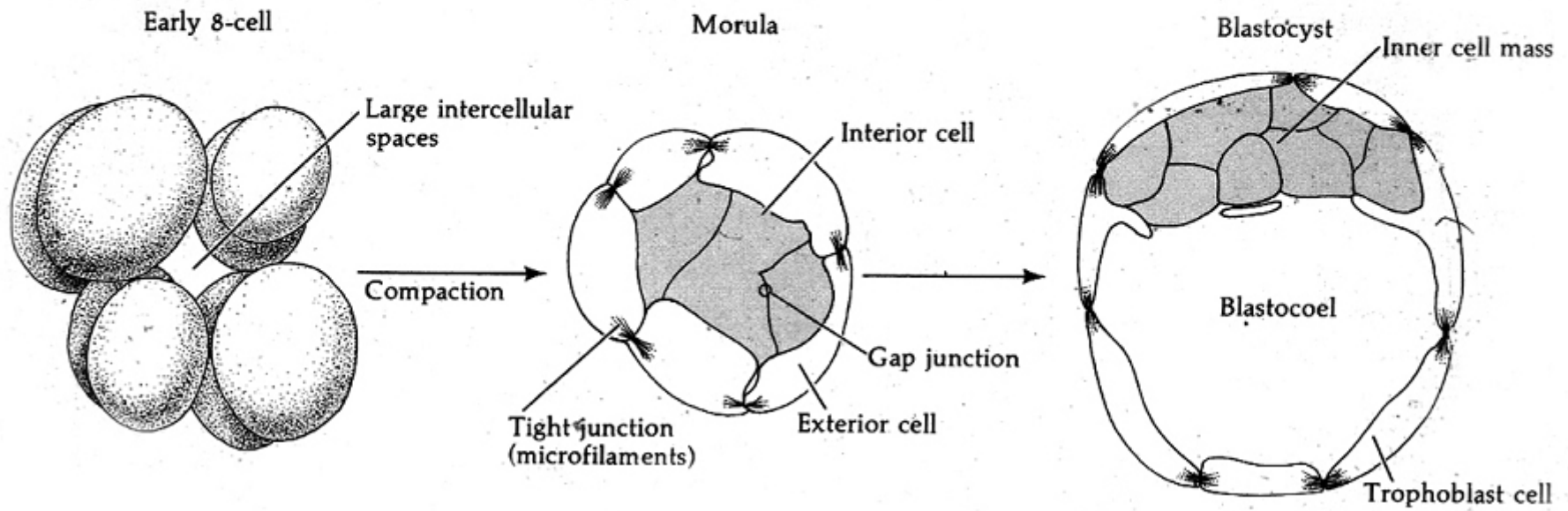


FIGURE 21

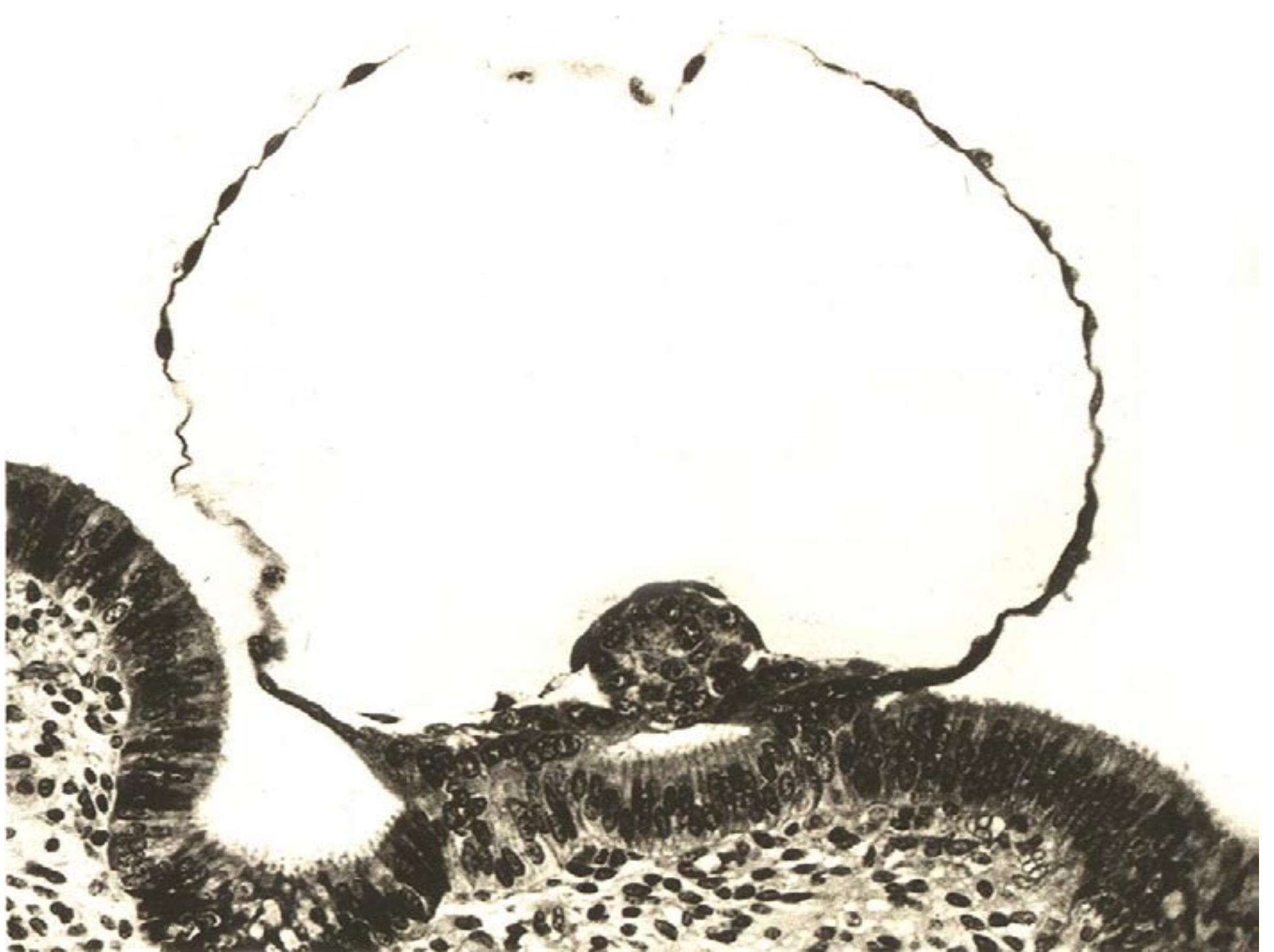
Scanning electron micrograph of uncompact (left) and compact (right) 8-cell mouse embryo. (Photographs courtesy of C. Ziomek.)

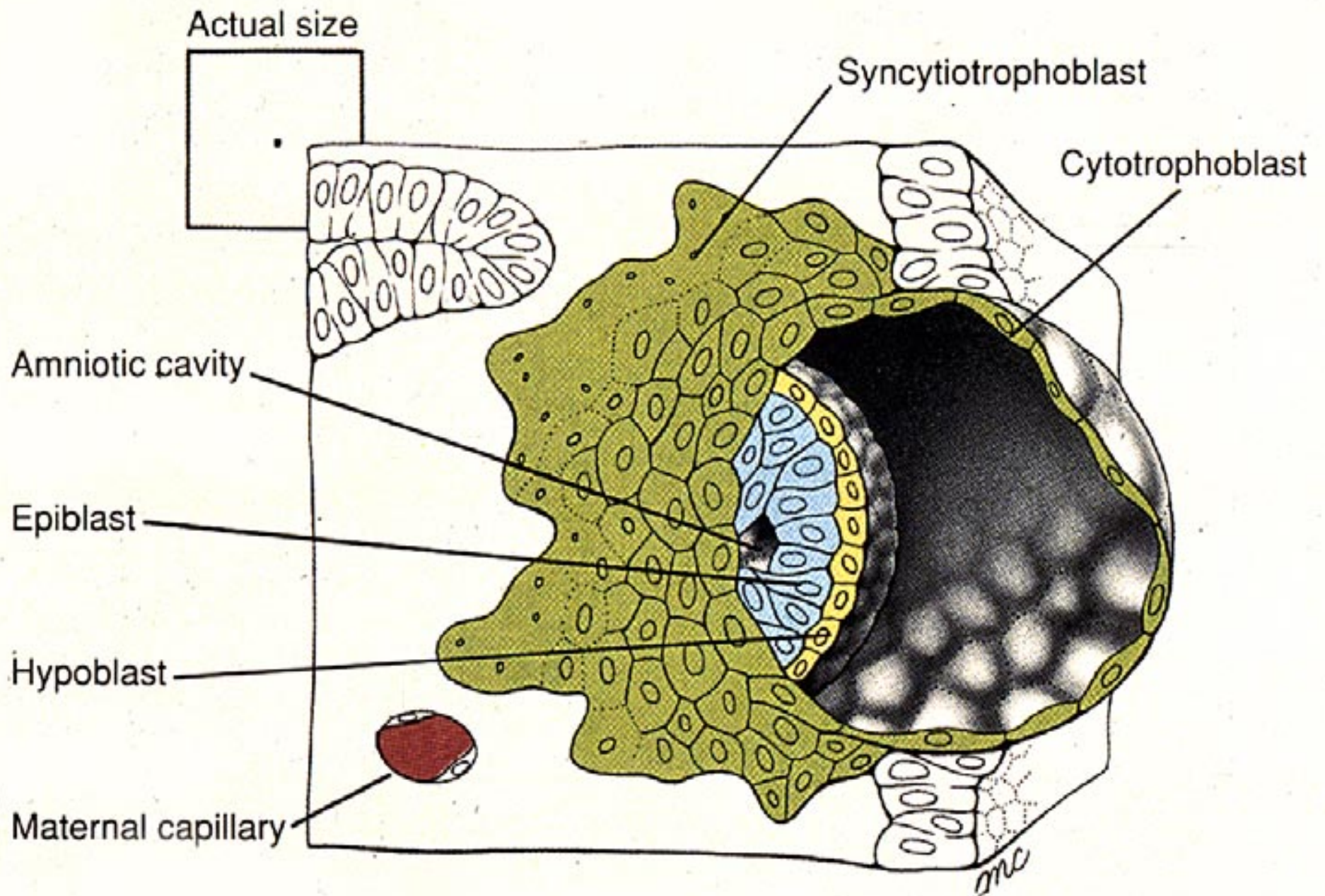
their behavior. They suddenly huddle together, maximizing their contact with the other blastomeres and forming a compact ball of cells (Figure 21). This tightly packed arrangement is stabilized by tight junctions that form between the outside cells of the ball, sealing off the

Fate:
Potency:
Commitment:
Differentiation:

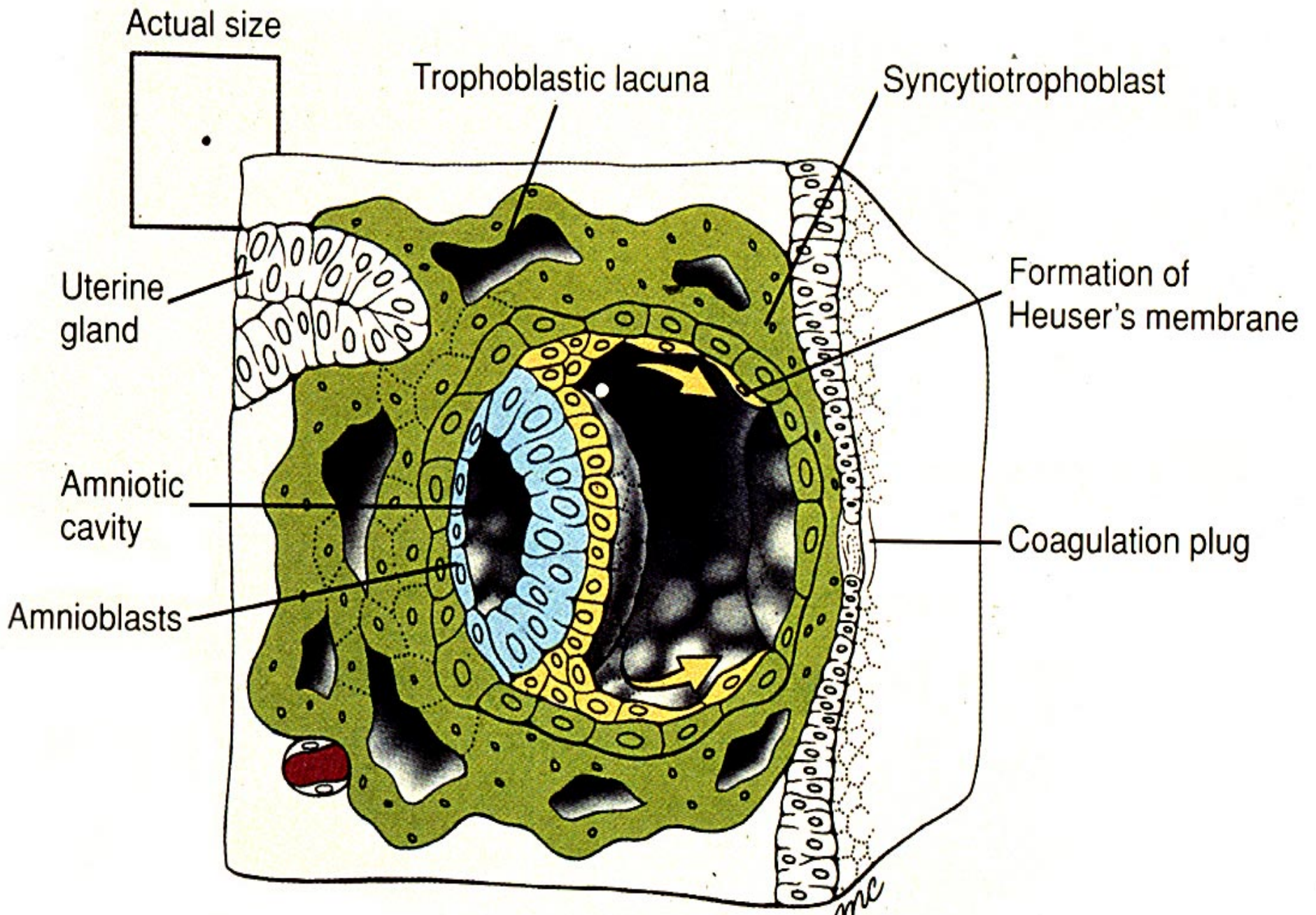


Implantation



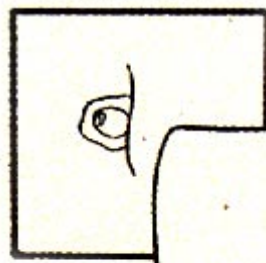


8 days



9 days

Actual size



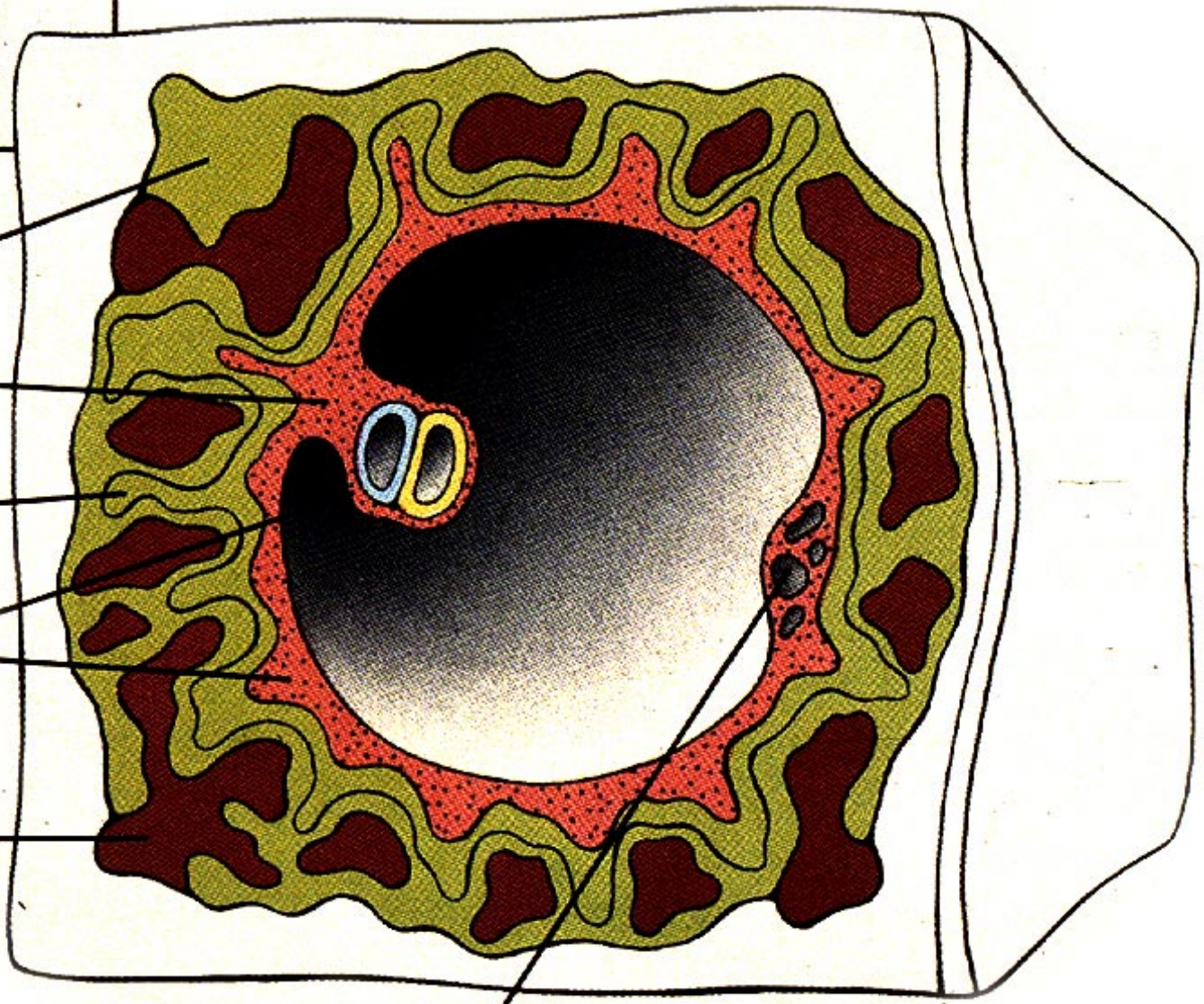
Syncytiotrophoblast

Connecting stalk

Cytotrophoblast

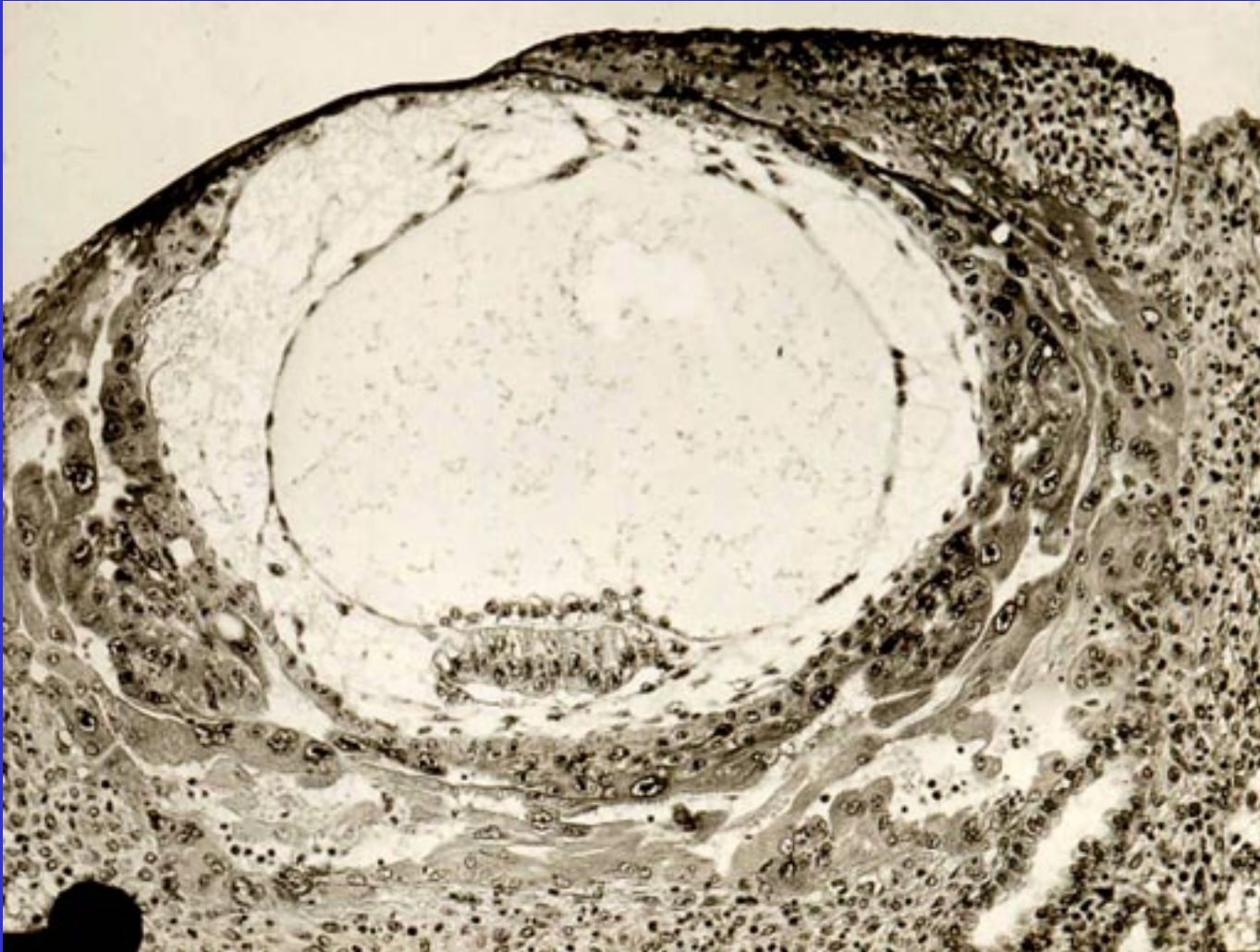
Extraembryonic mesoderm

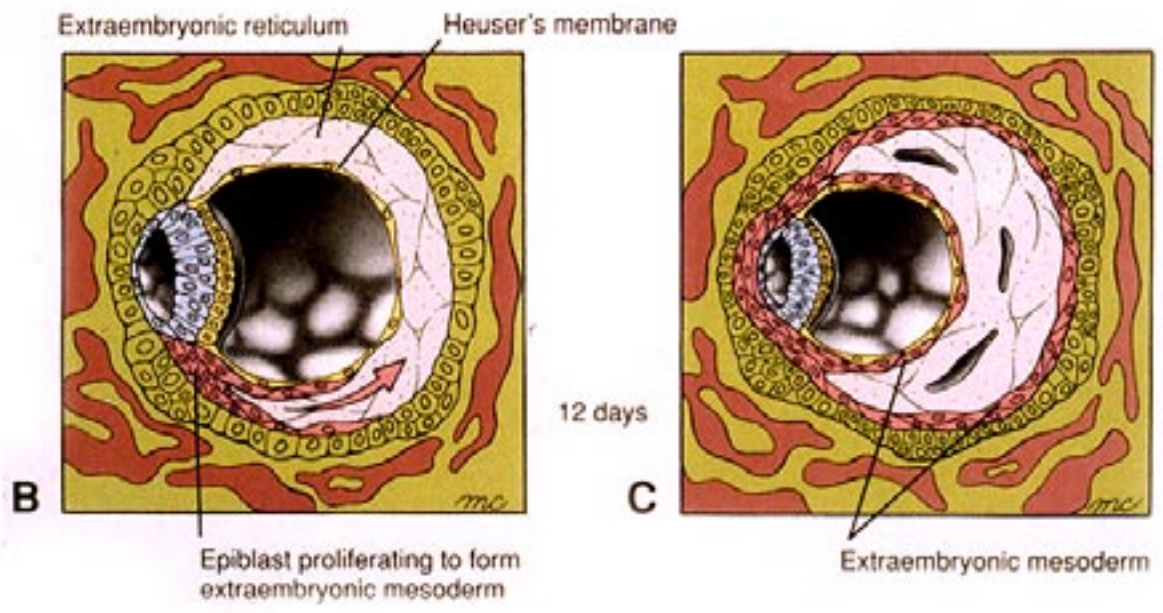
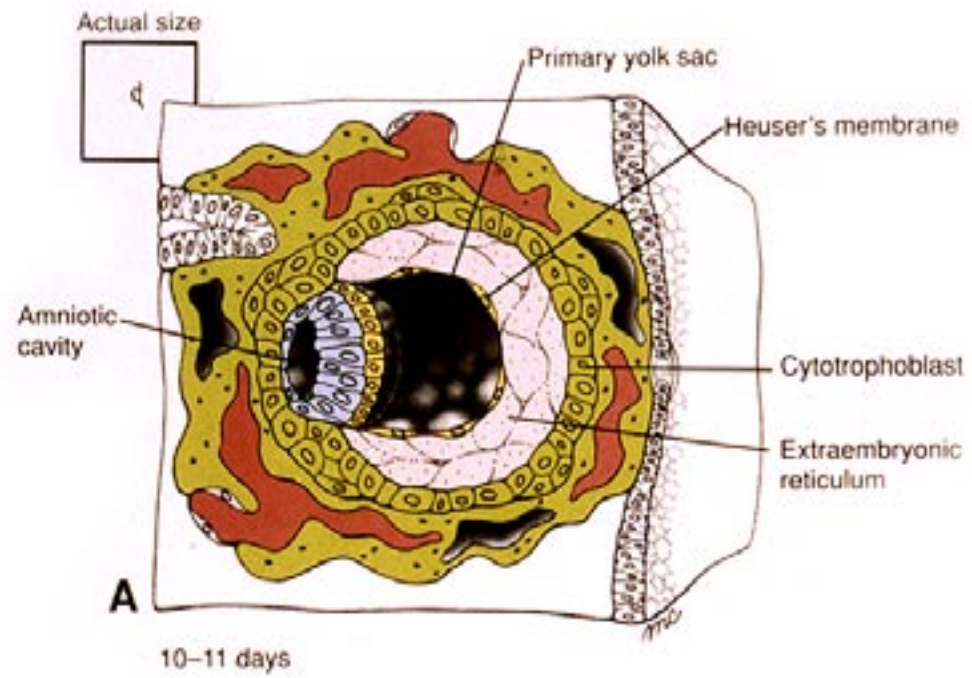
Trophoblastic lacuna

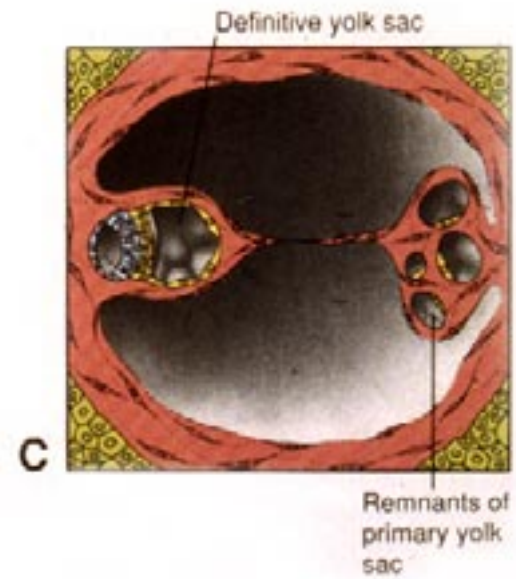
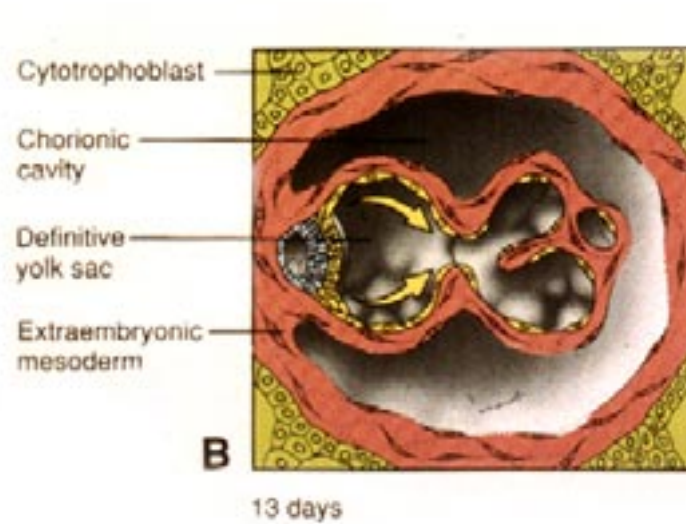
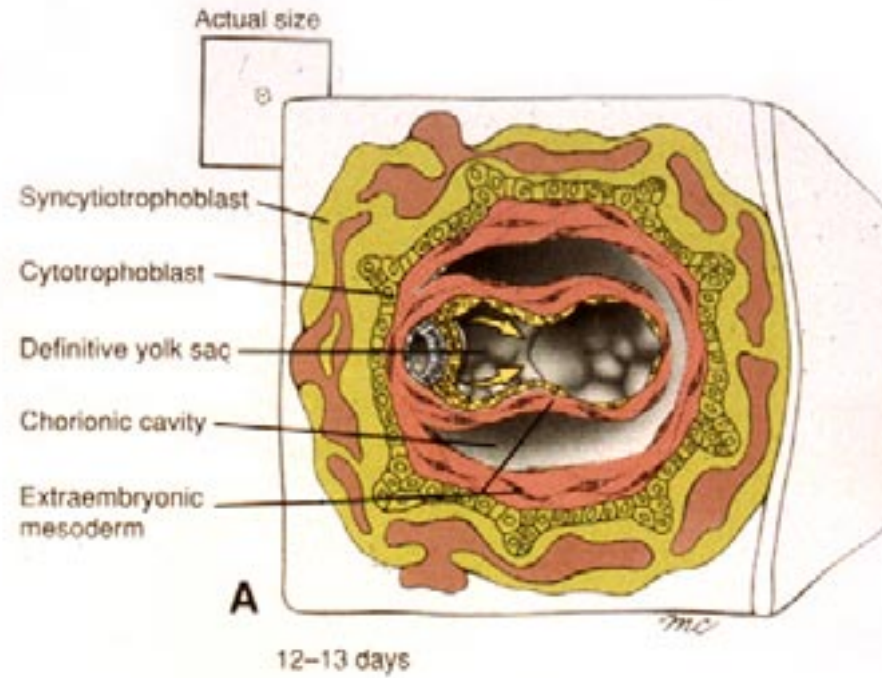


14-15 days

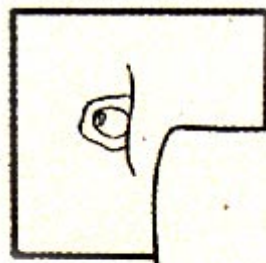
Remnants of primary yolk sac (exocoelomic cysts)







Actual size



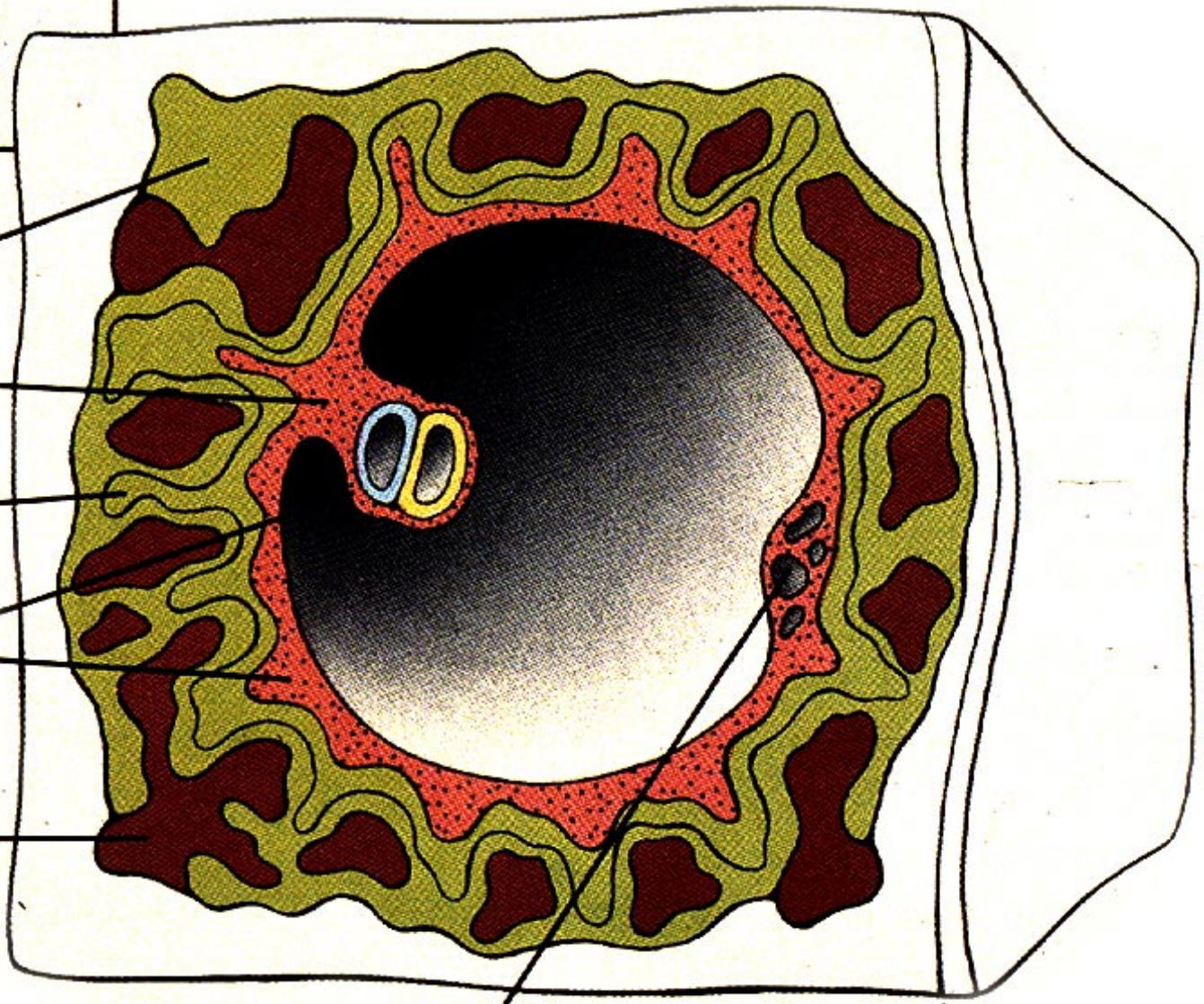
Syncytiotrophoblast

Connecting stalk

Cytotrophoblast

Extraembryonic mesoderm

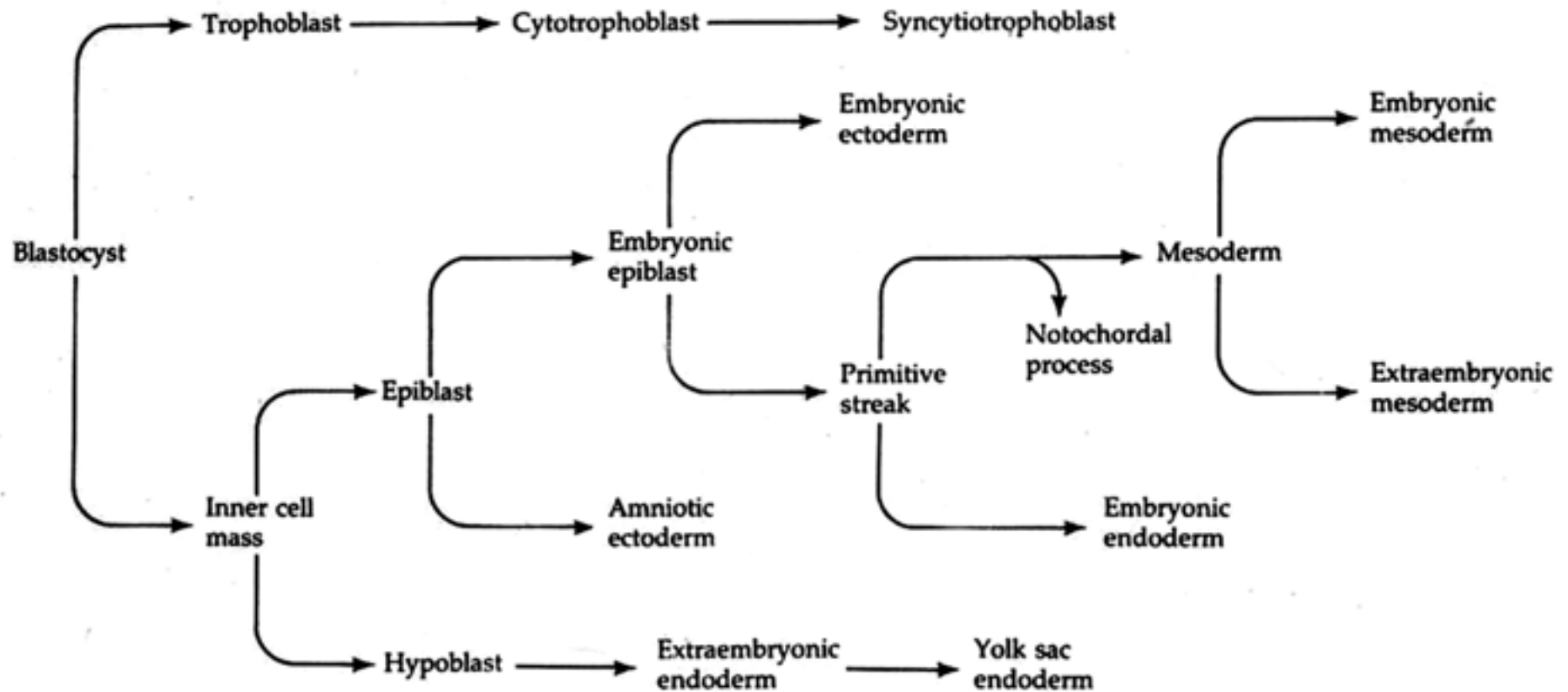
Trophoblastic lacuna



14-15 days

Remnants of primary yolk sac (exocoelomic cysts)

FIGURE 31
 Scheme illustrating the derivation of tissues in human and rhesus monkey embryos. (After Luckett, 1978.)



Gastrulation

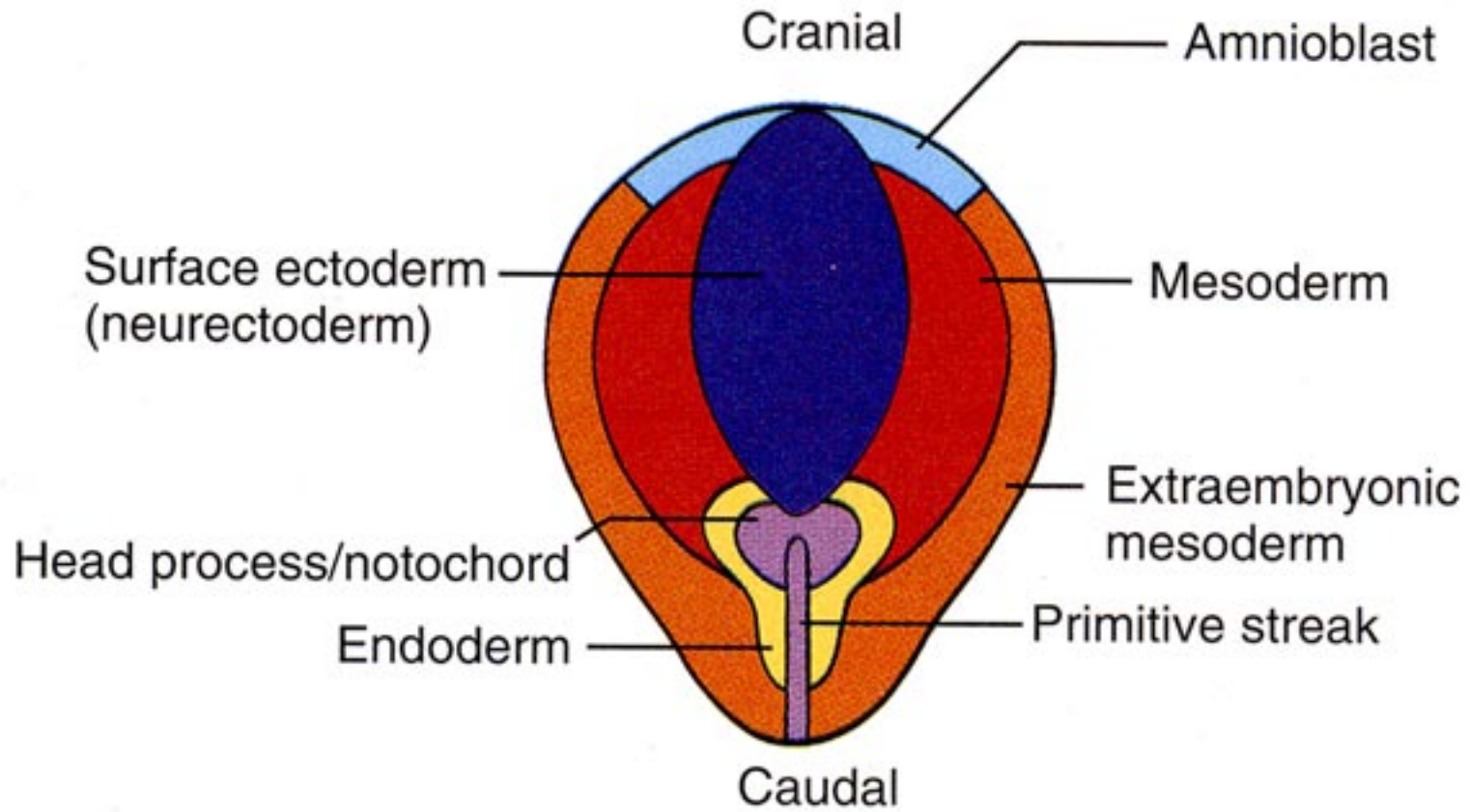
Formation of the 3 germ layers

Ectoderm: Epidermis and neural tissue

Mesoderm: axial, paraxial, intermediate and lateral plate

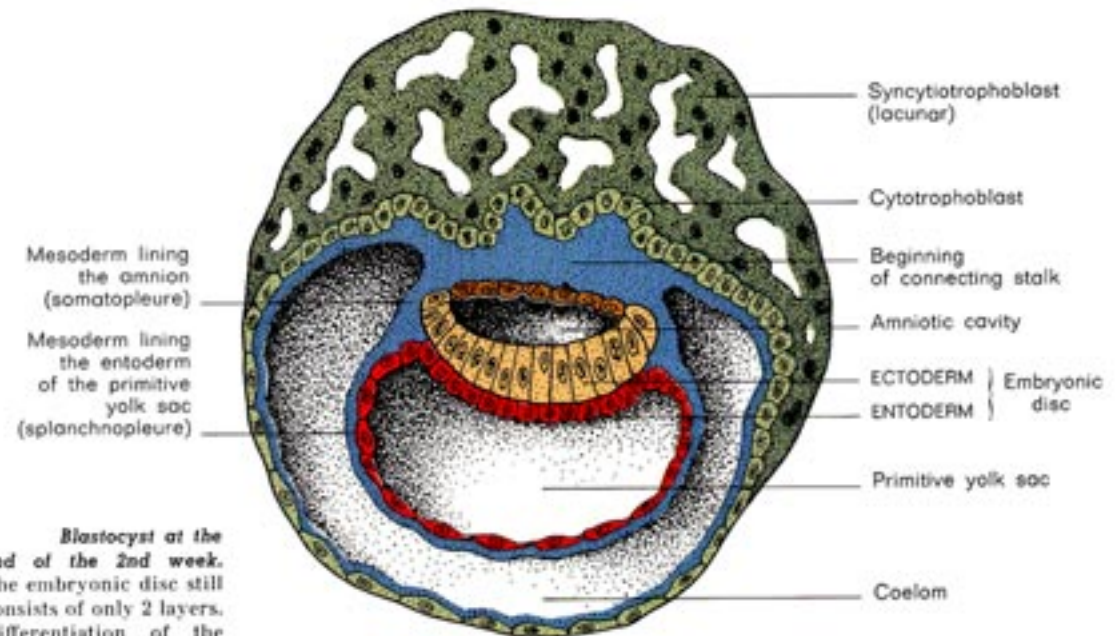
Endoderm: lining of gut and respiratory tract

Fate map of epiplast prior to gastrulation.

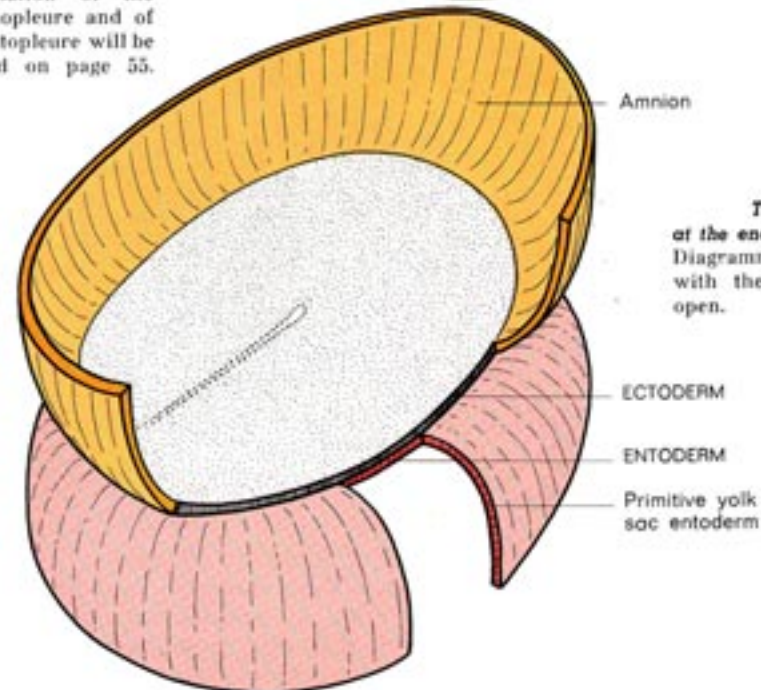


First sign of gastrulation is the formation at midline of primitive streak.

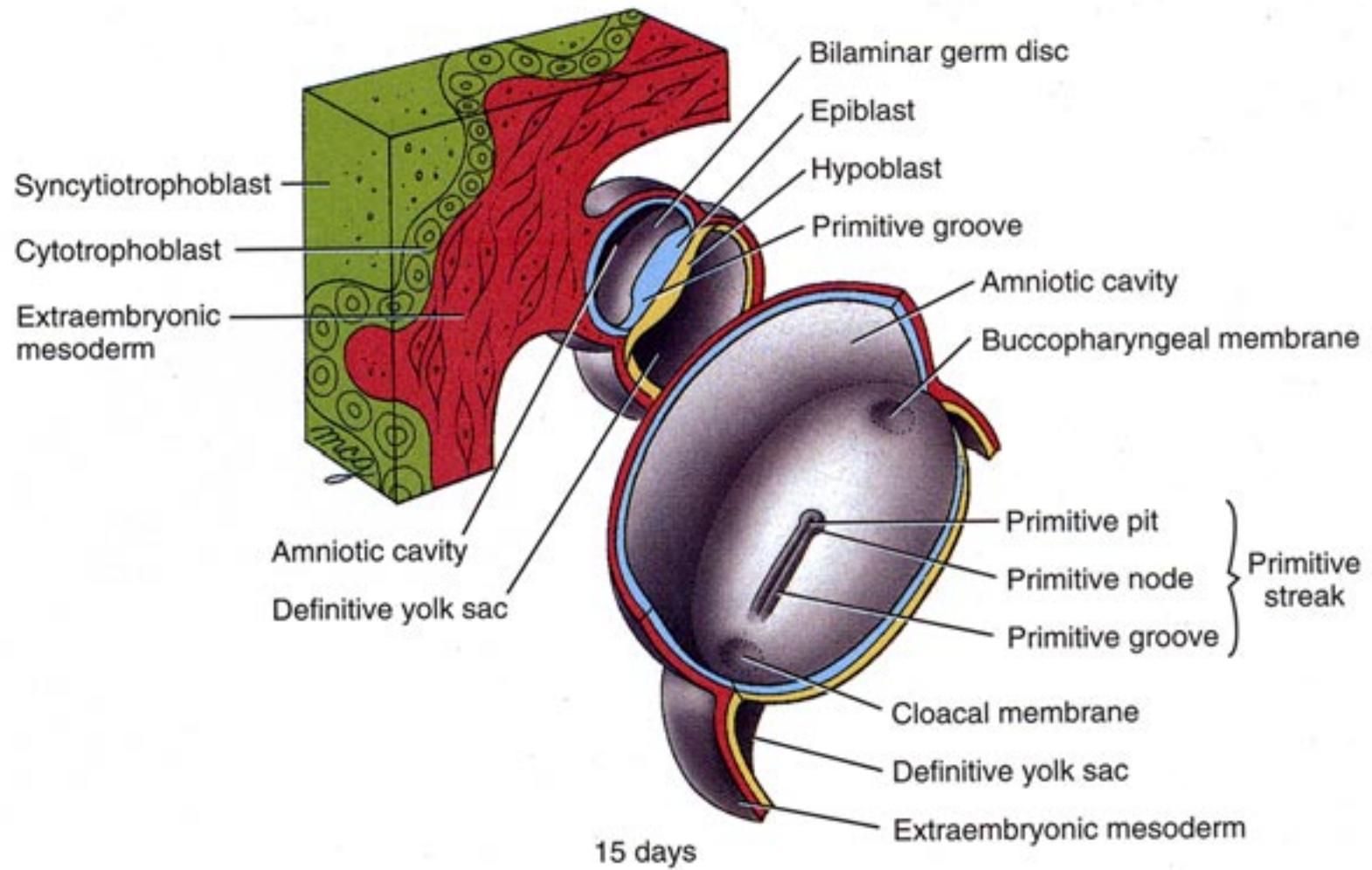
Formation of streak defines cranial and caudal axes.

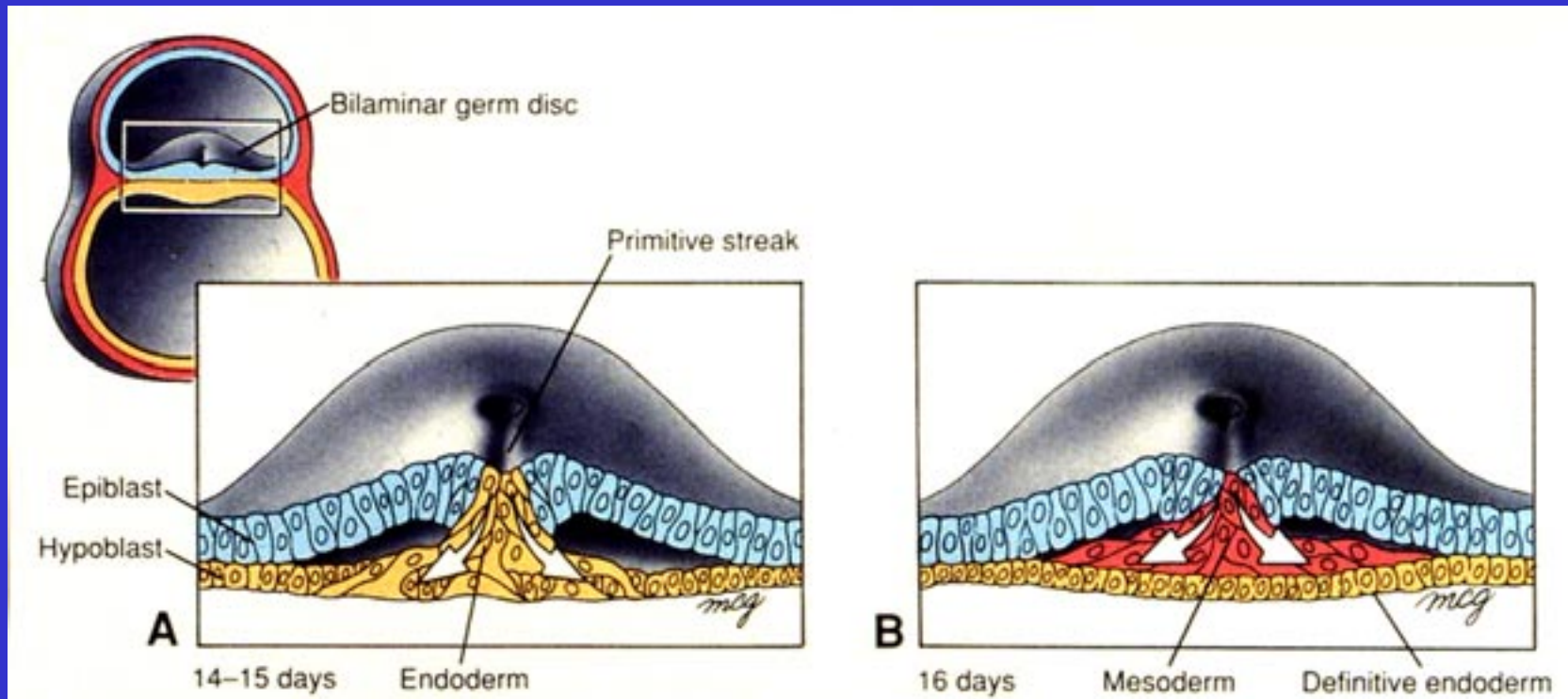


Blastocyst at the end of the 2nd week. The embryonic disc still consists of only 2 layers. Differentiation of the splanchnopleure and of the somatopleure will be explained on page 55.



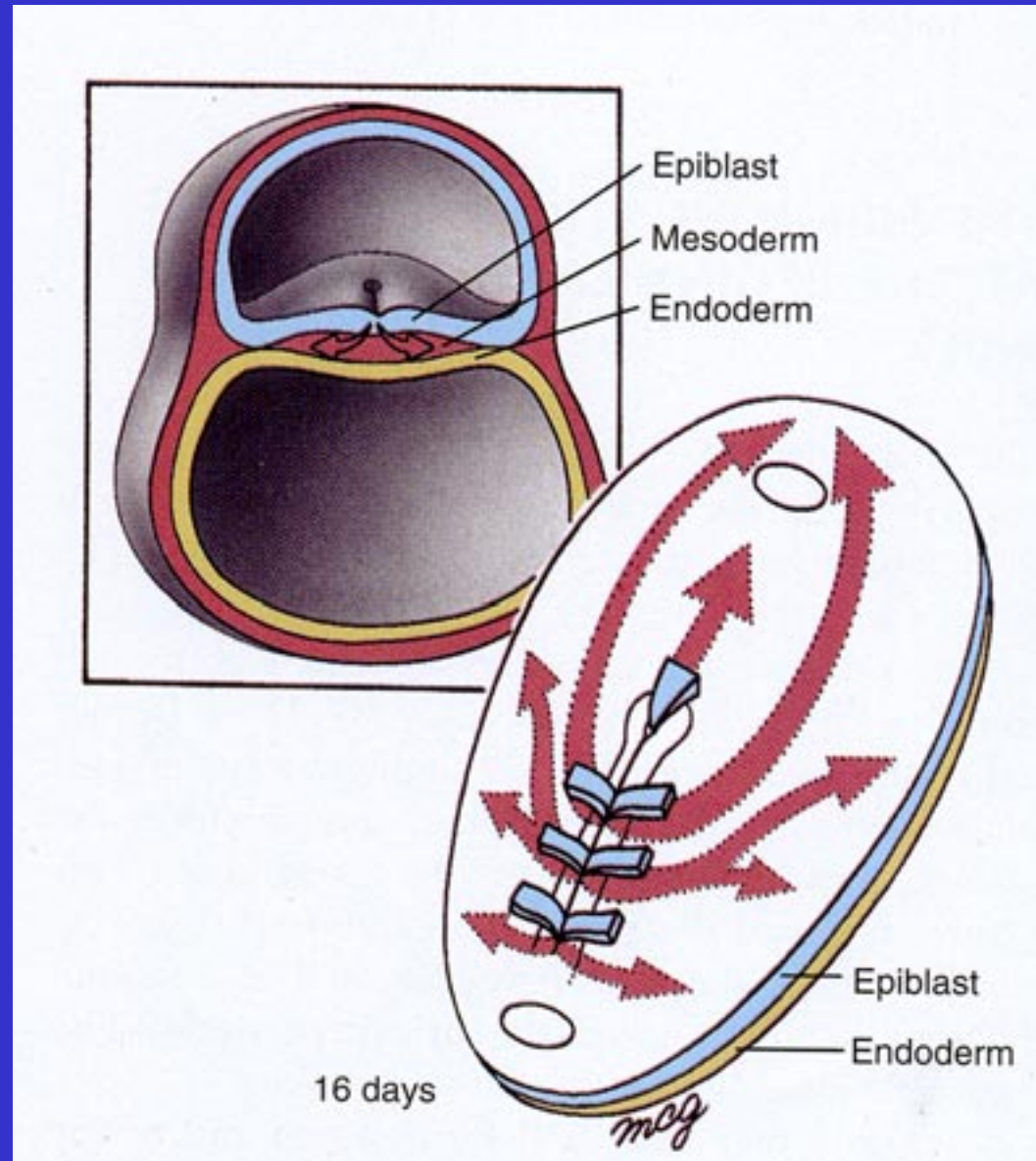
The embryonic disc at the end of the 2nd week. Diagrammatic dorsal view, with the amniotic cavity open.



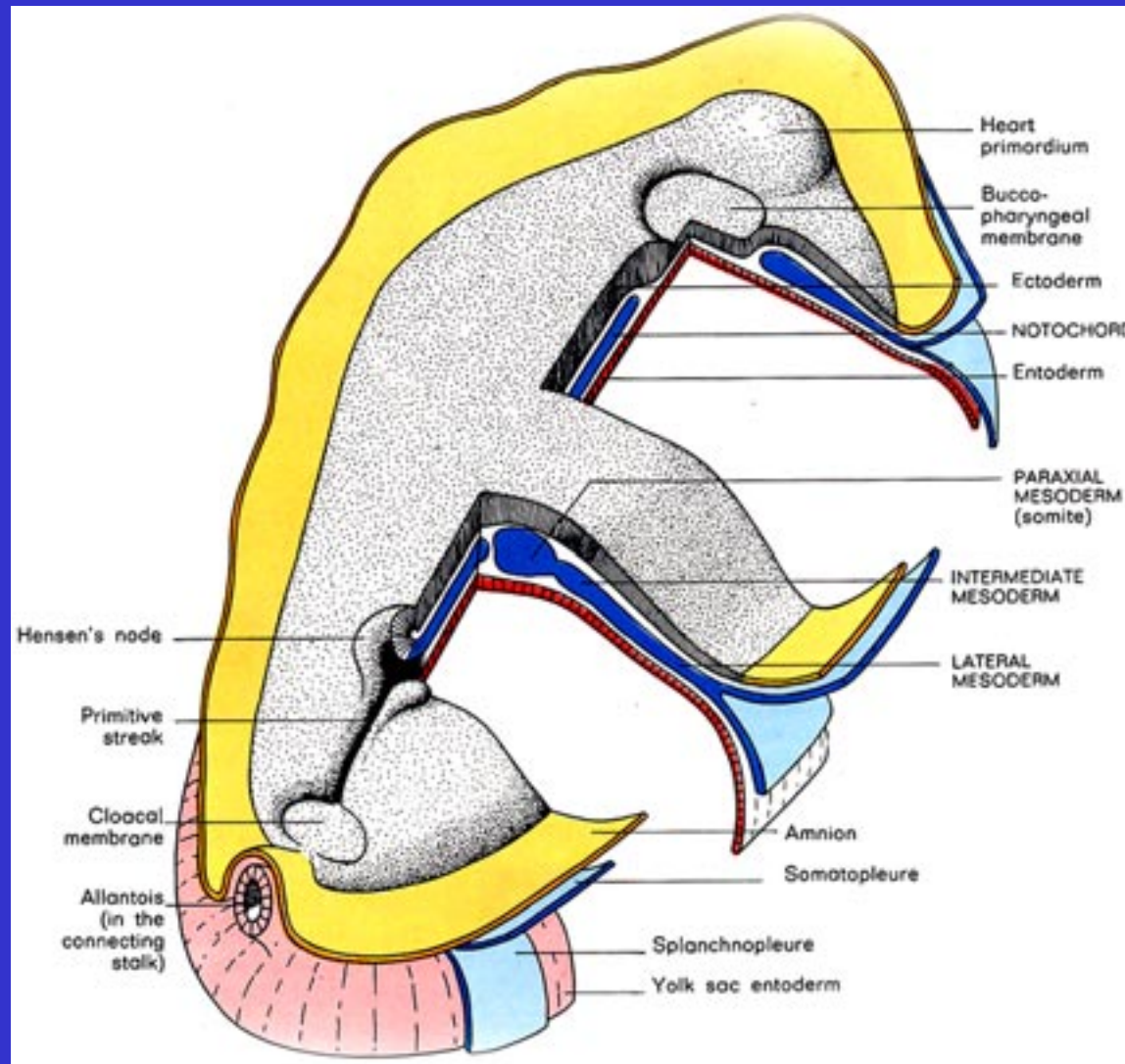


Cells of the epiblast gain access to the interior via primitive node and streak. Hypoblast is replaced by true endoderm.

Where and when epiblast cells enter the node or streak determines their fate.



At the end of gastrulation the primary germ layers are present.
The three axes of the embryo are established.
The embryo still touches extra-embryonic tissue on all edges.



Gamete production and fertilization

Cleavage divisions: setting aside embryonic vs. extraembryonic cells initial stages of implantation and formation of extraembryonic spaces.

Gastrulation: from whence you migrate determines your fate. Formation of 3 germ layers.