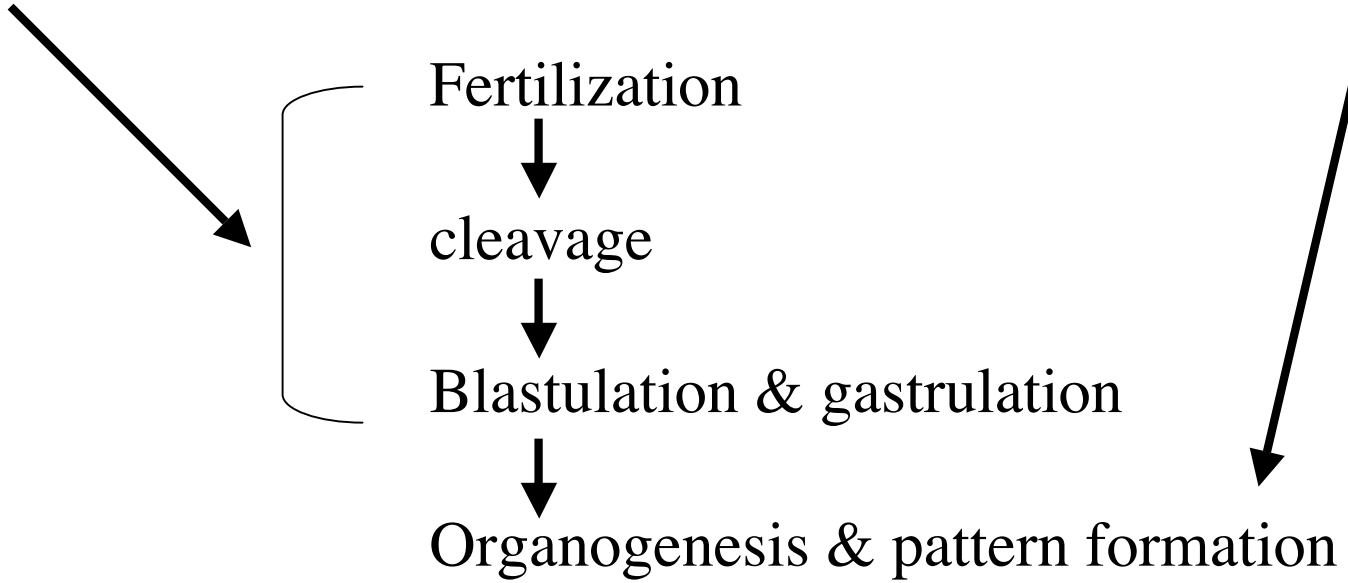
Development

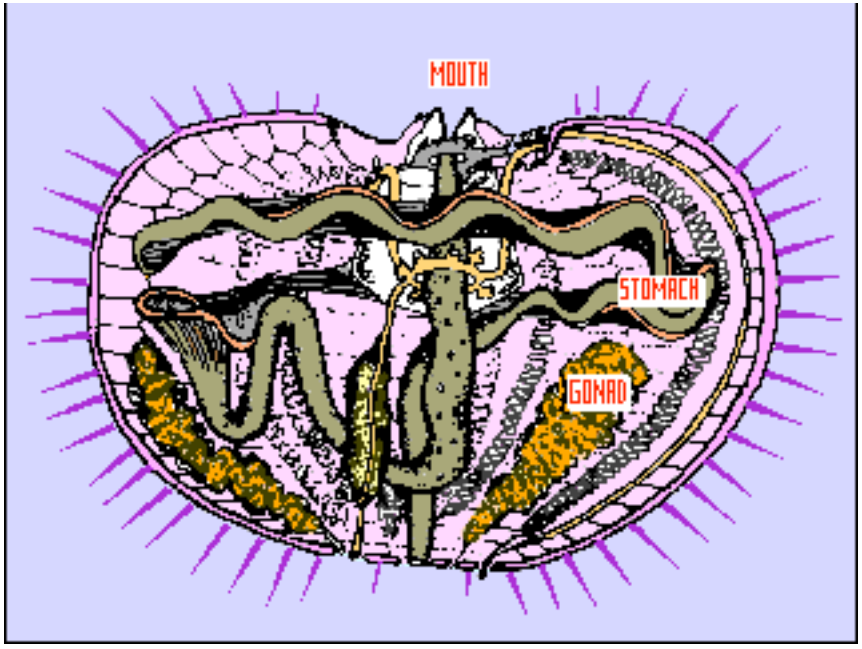
<u>Sea urchin</u>
Deuterostome
Isolecithal
Holoblastic cleavage

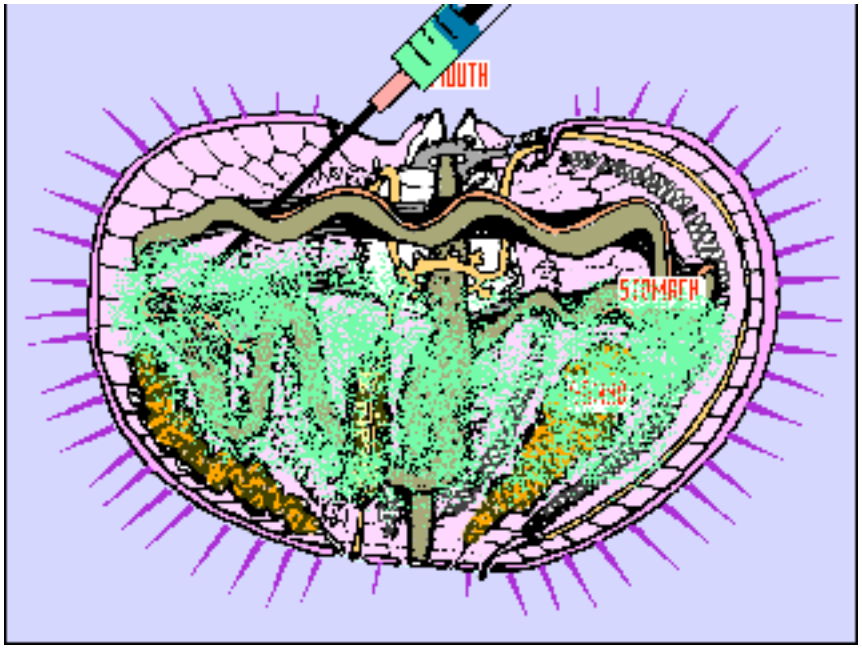
<u>Chick</u>
Deuterostome
Telolecithal
Meroblastic cleavage

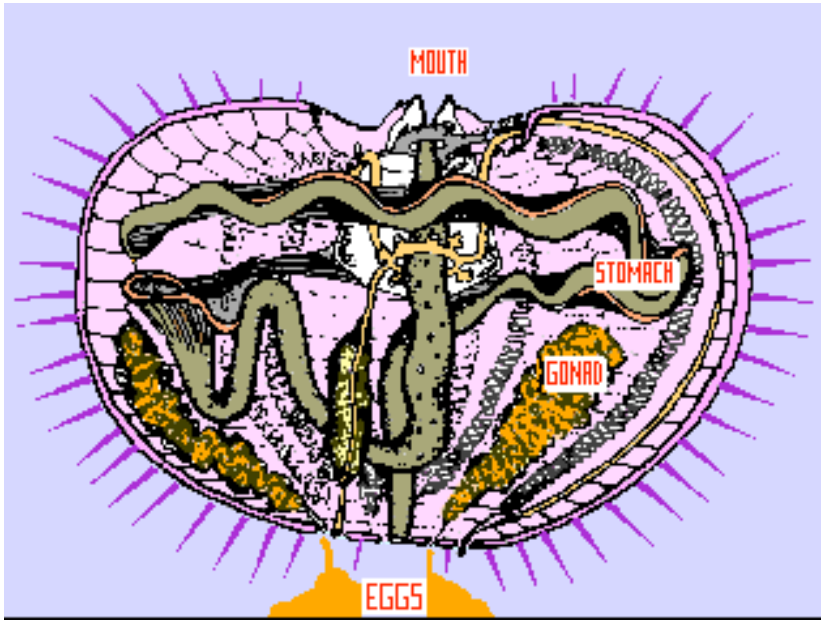


Why do cells move in specific ways at specific times?
How, why, and when do cells become specialized?

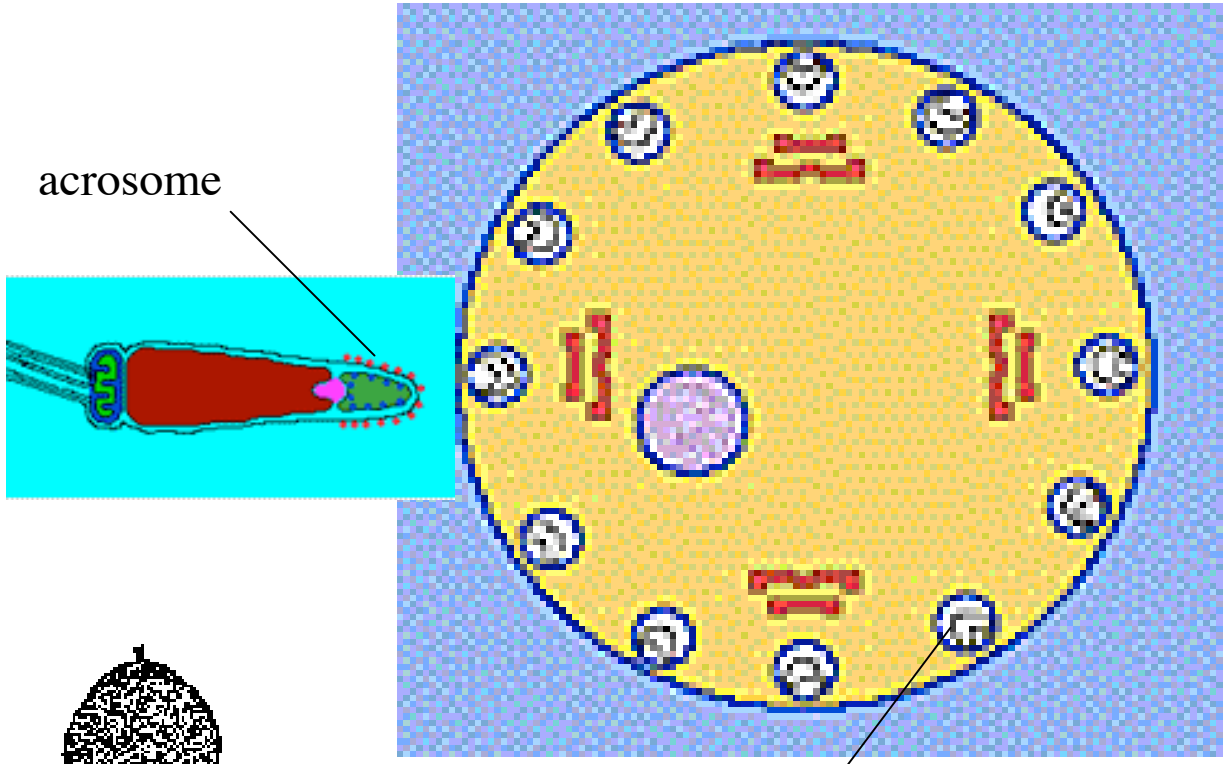
Sea urchin body plan

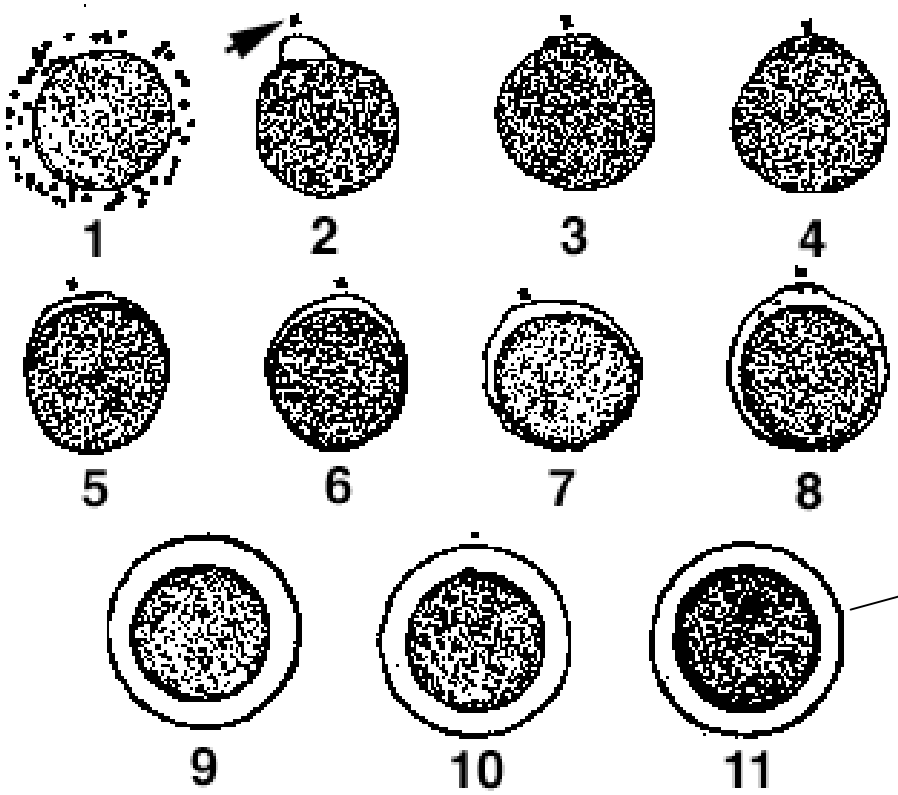


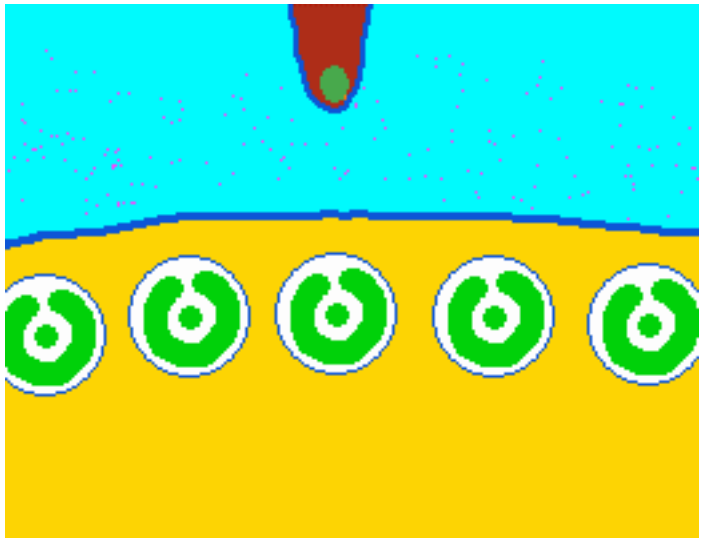


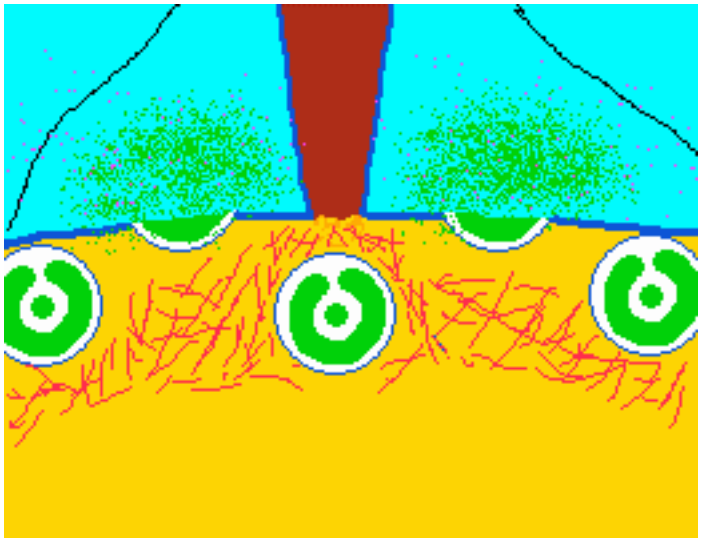


Sea urchin fertilization

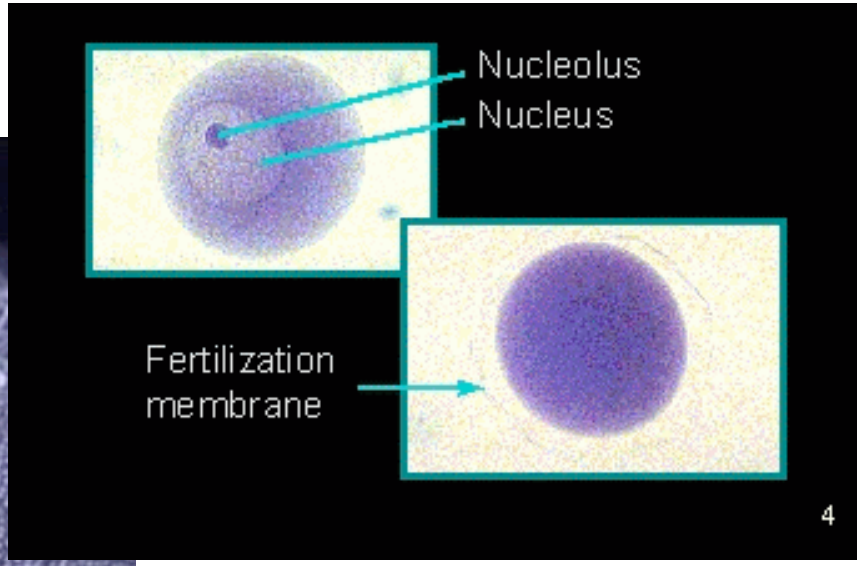


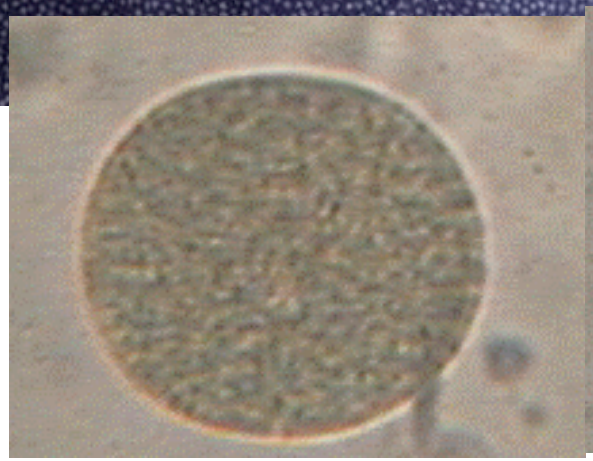




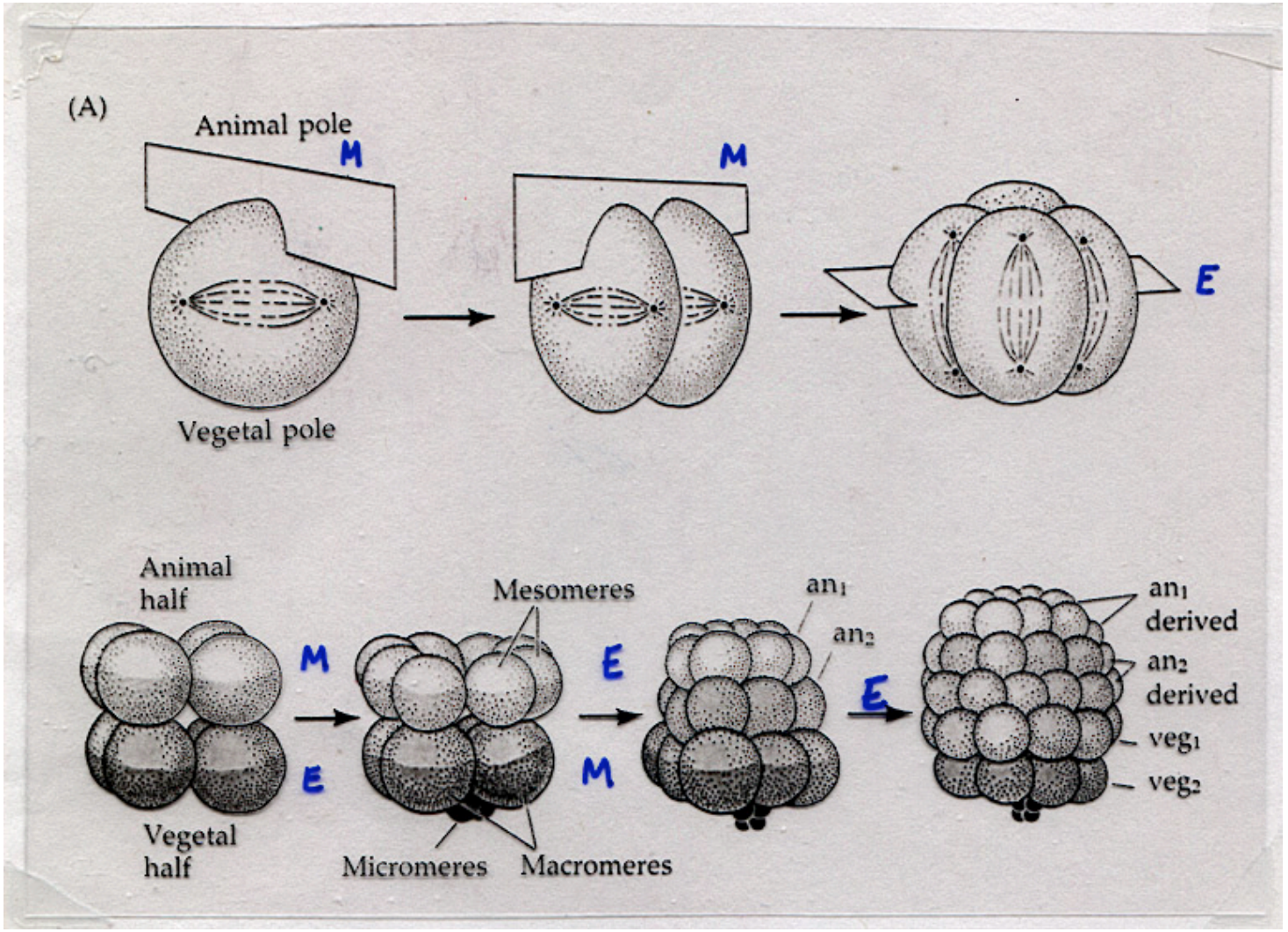


Fertilization





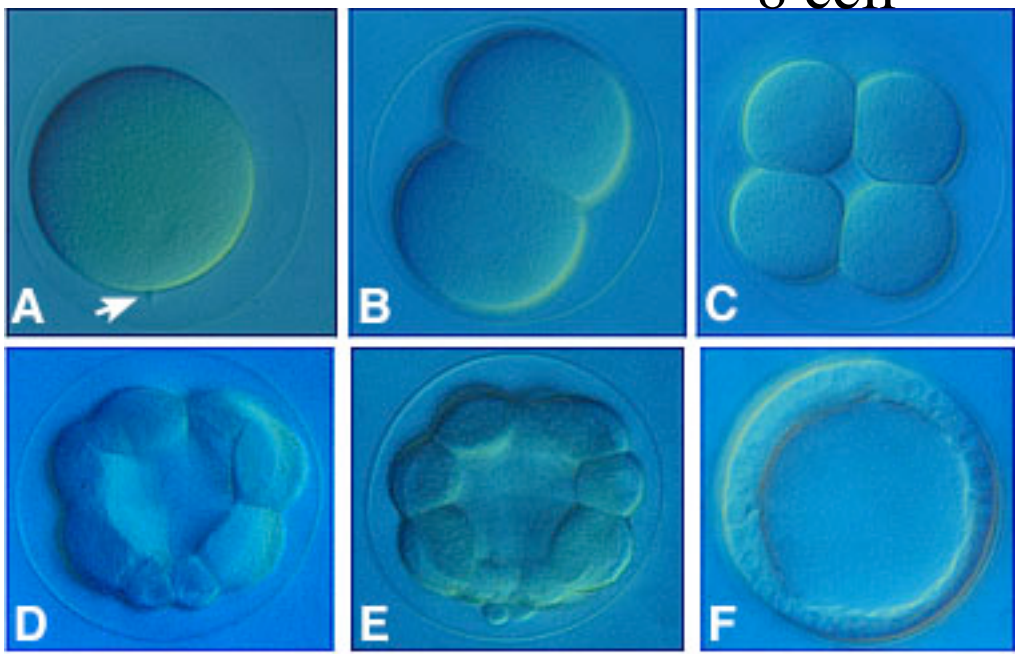
Holoblastic--cleaves completely through cell
Isolecithal--evenly dispursed yolk.

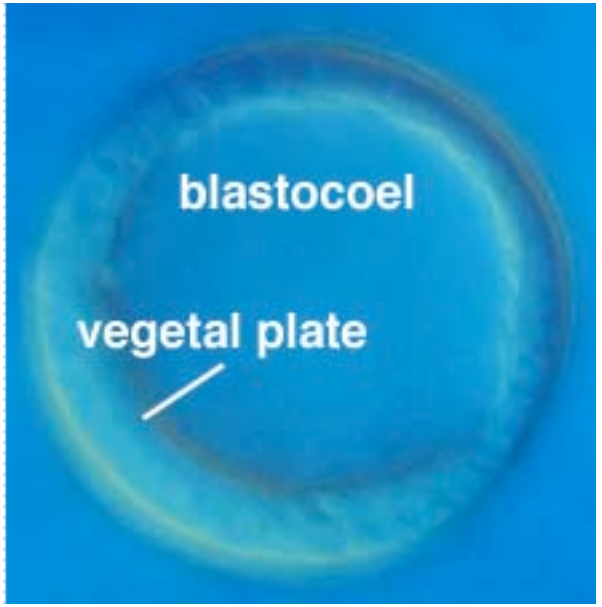


Sea Urchin Cleavage and blastulation

1st div.

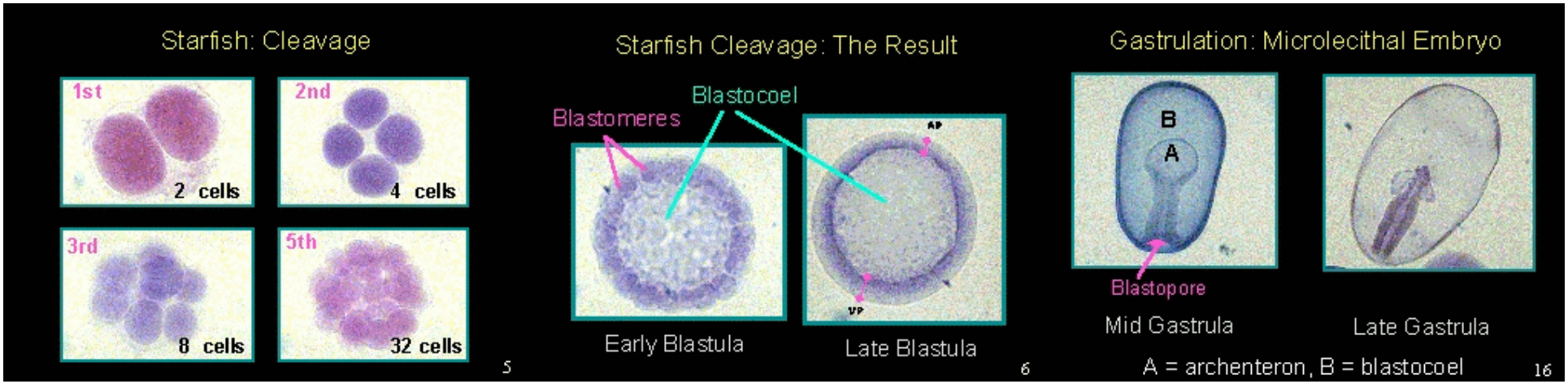
3 div.
8 cell





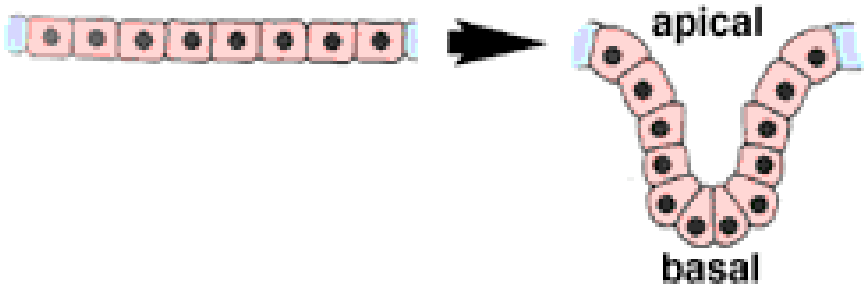
blastula

Hatched
blastula

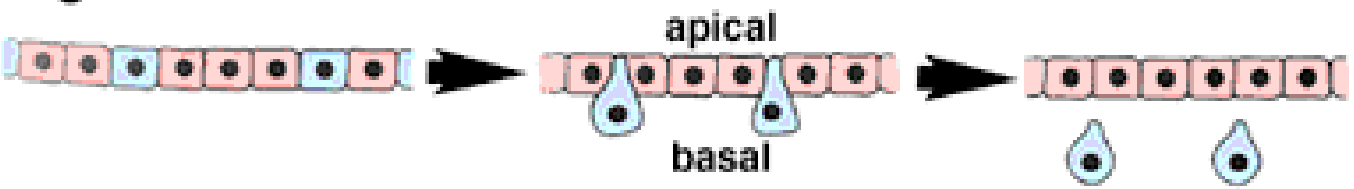


Three types of morphogenetic movements during gastrulation.

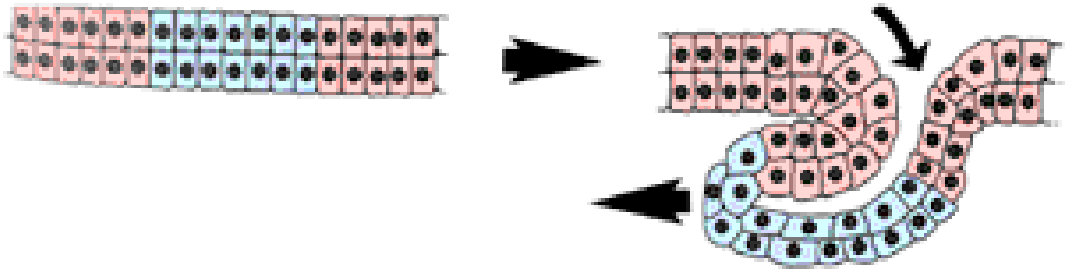
- Invagination

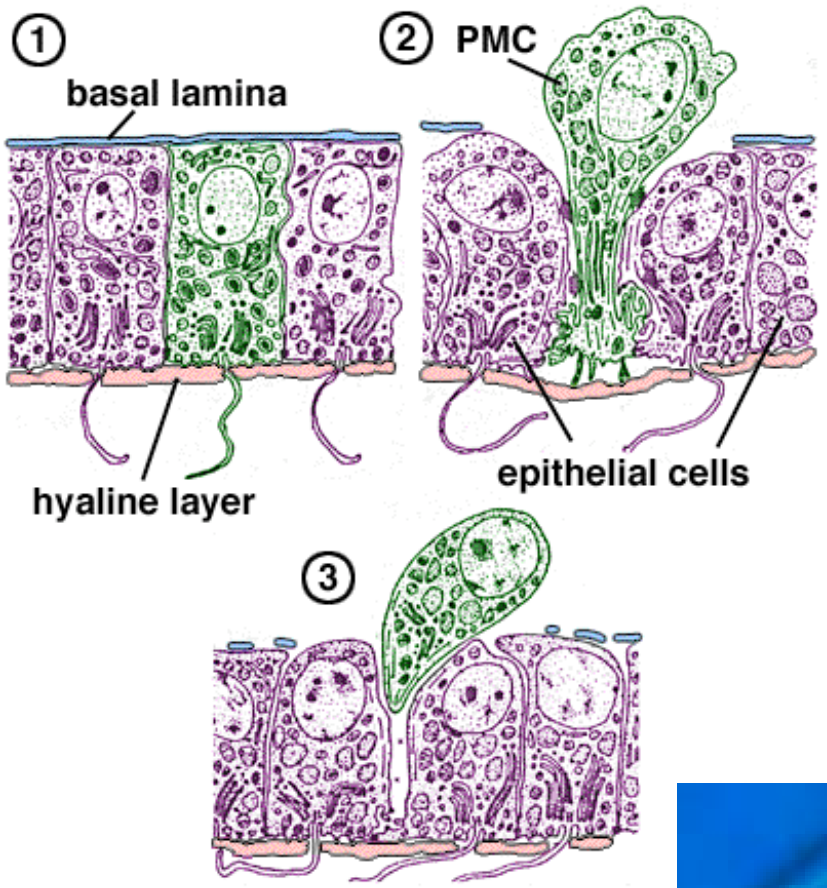


- Ingression



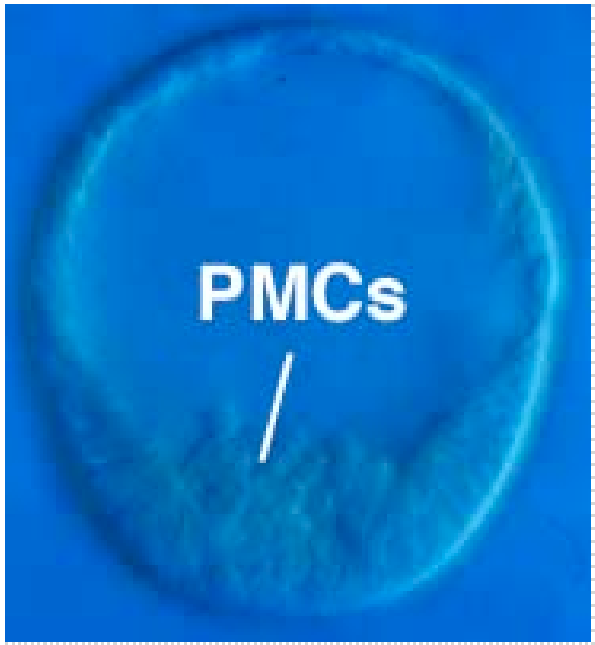
Involution

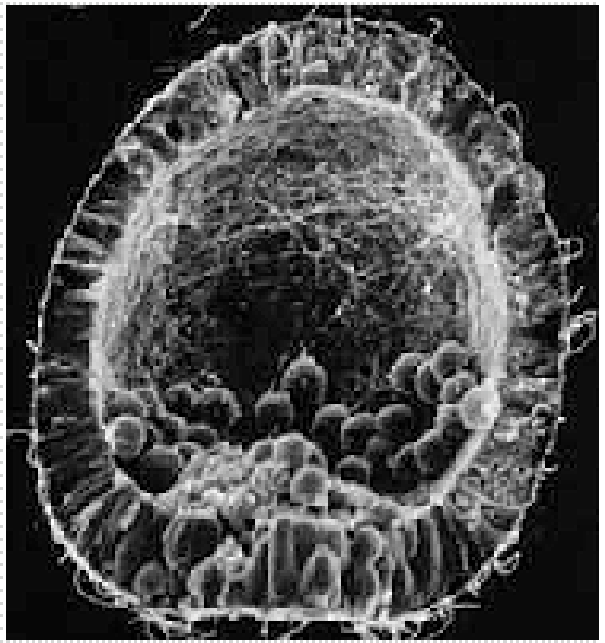


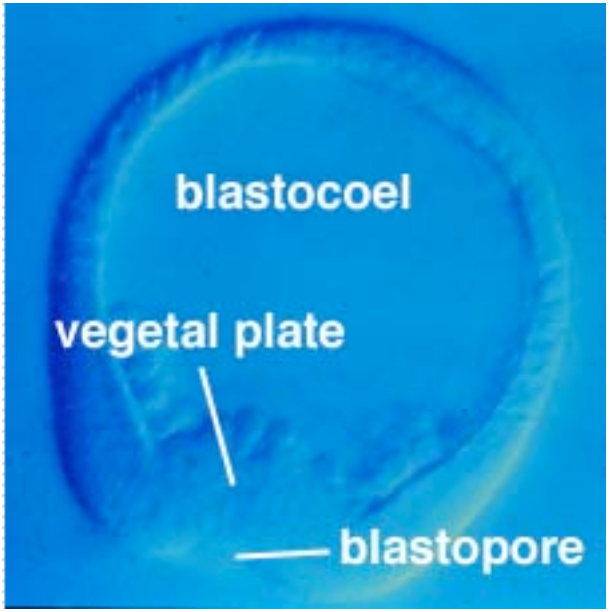


Gastrulation -2 types of morphogenetic movements.

1. Ingression of ~40 cells to form Primary mesenchyme cells (PMC) Formation of <u>mesoderm.</u>





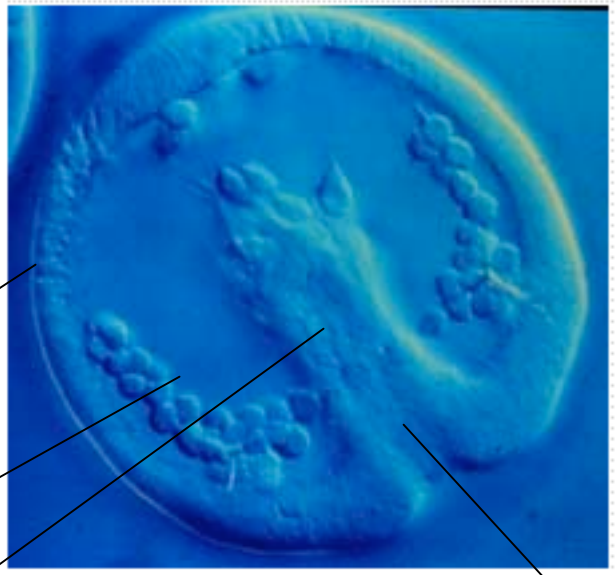


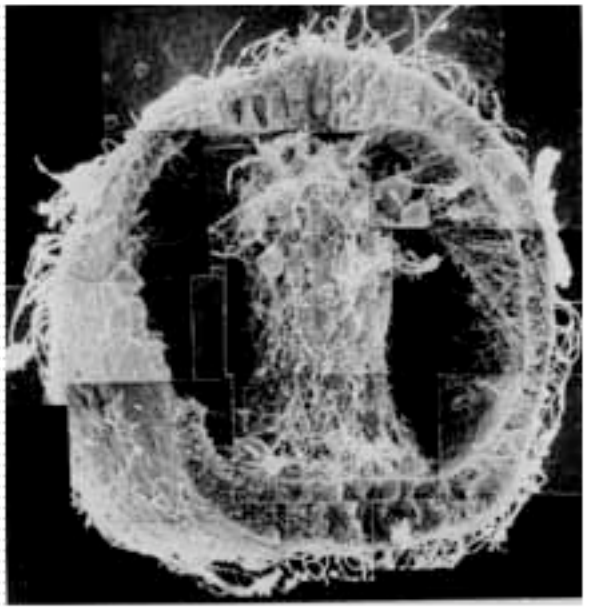
Gastrulation

2. Invagination of cells at vegetal pole

Forms blastopore and

archenteron-primitive gut





3 germ layers

ectoderm-

skin and nervous system.

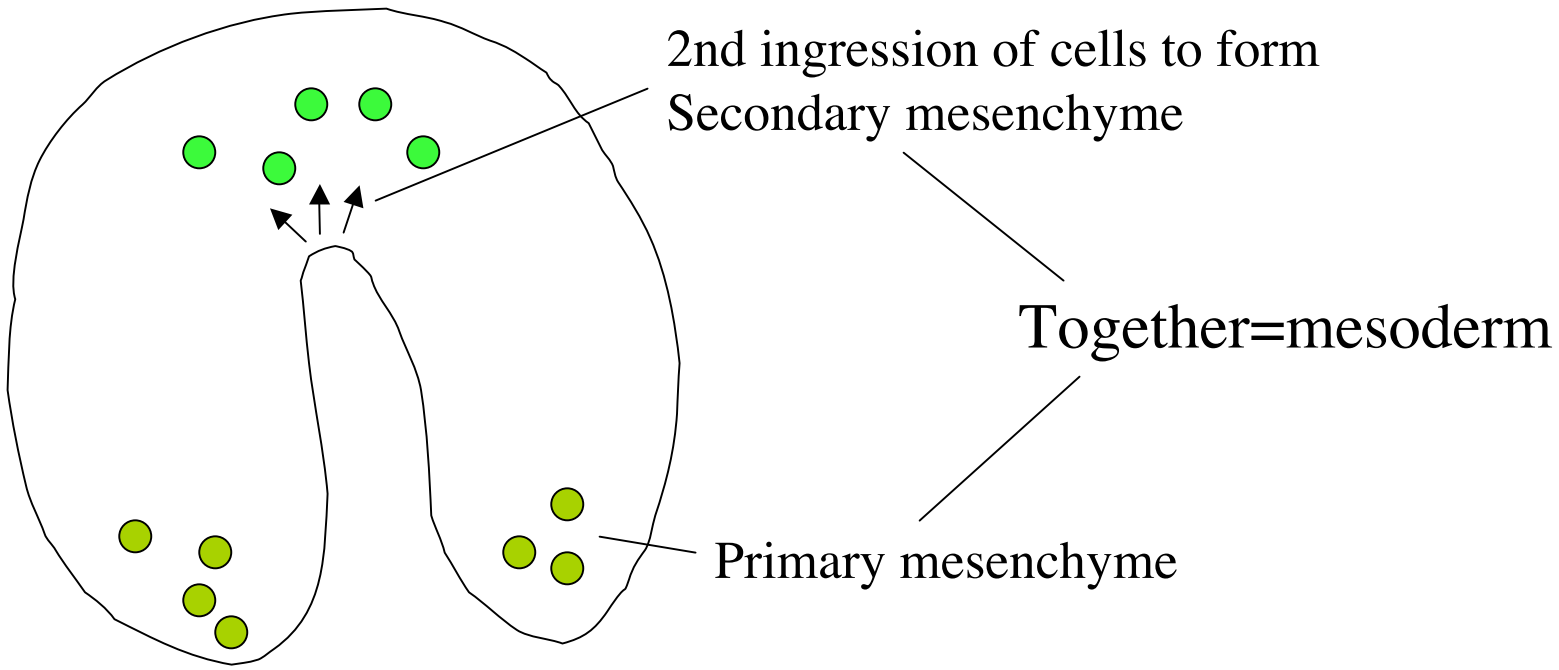
mesoderm-

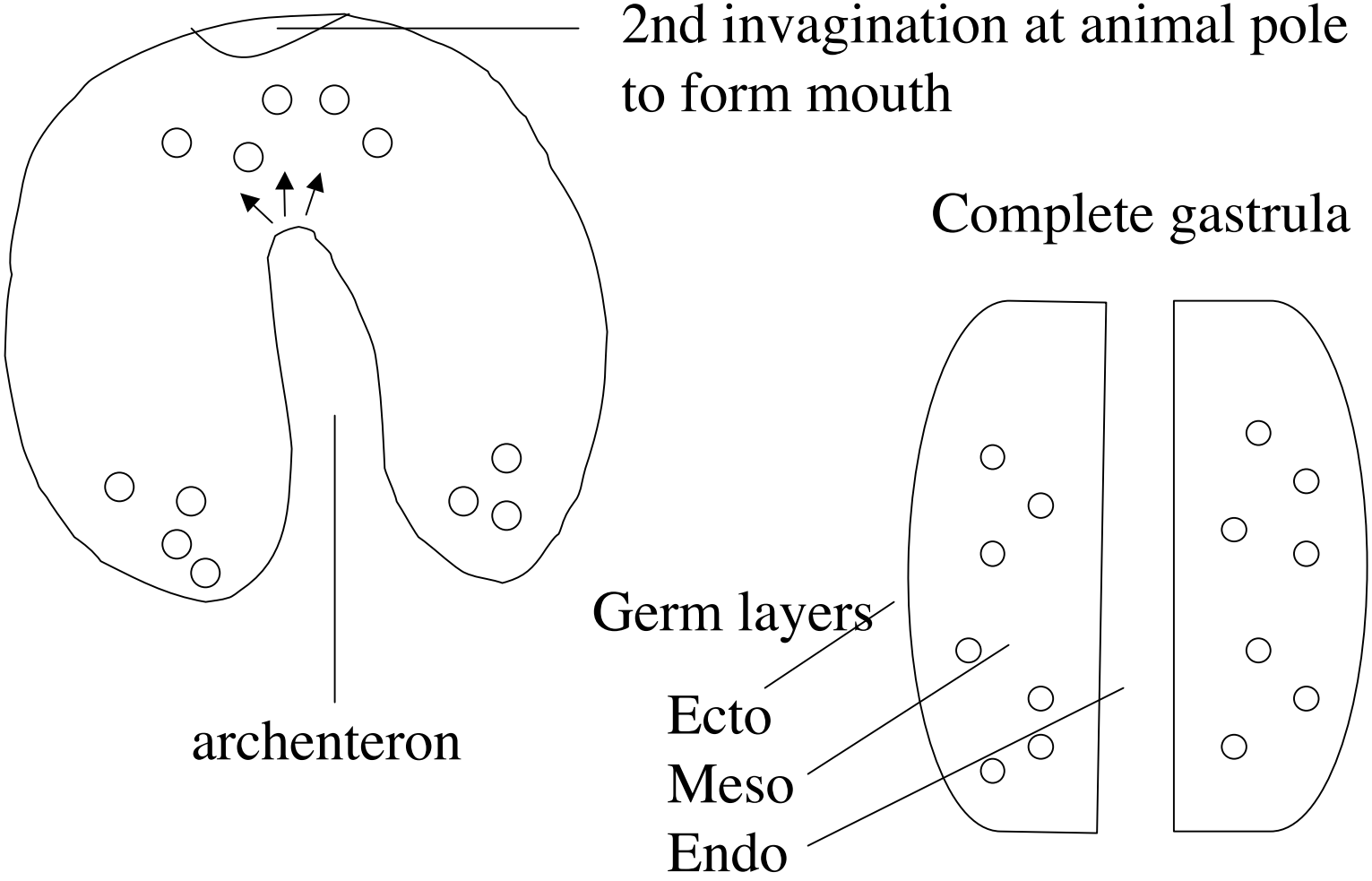
bone, muscle, circ. system, internal organs.

endoderm-

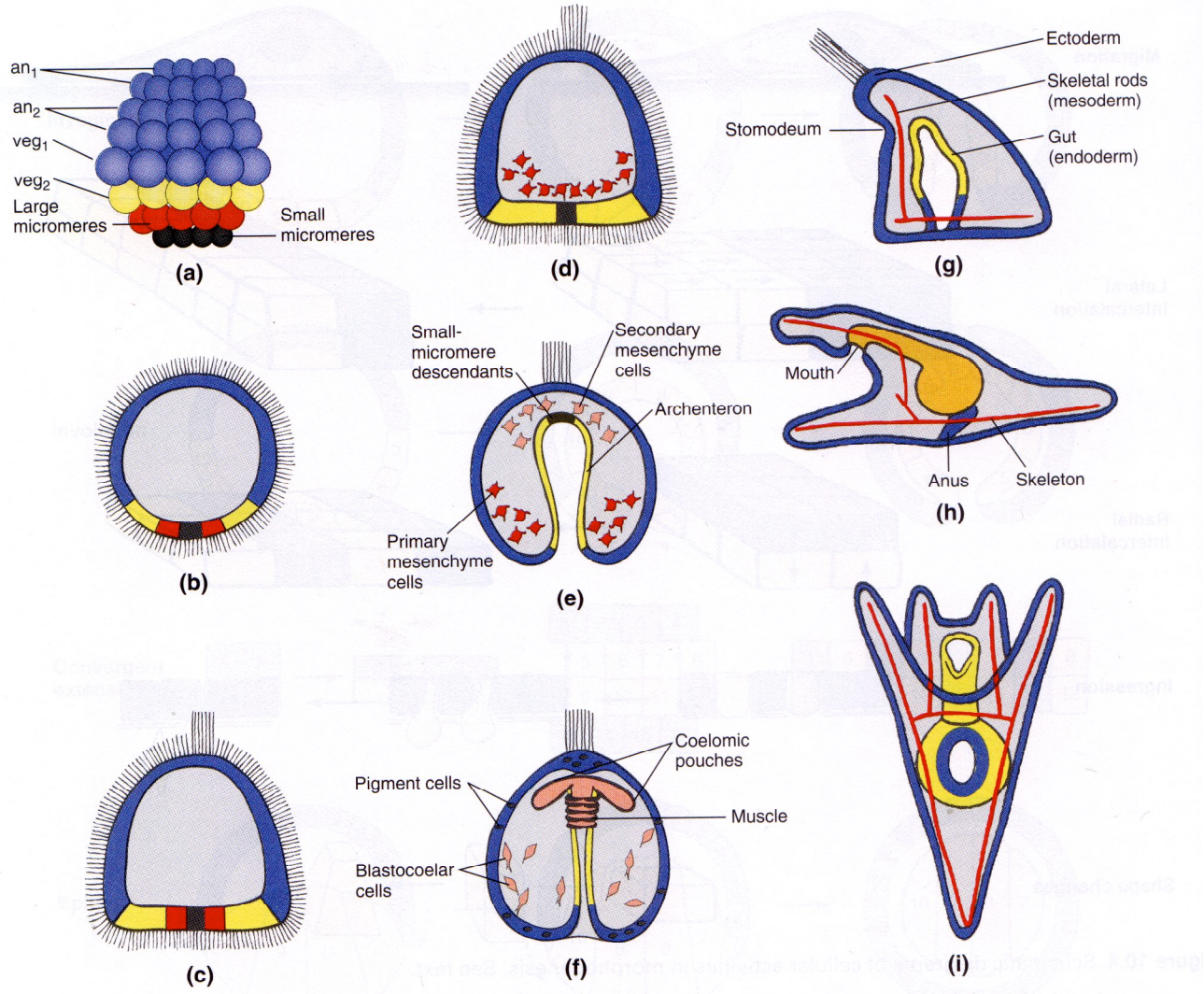
stomach and guts.

archenteron

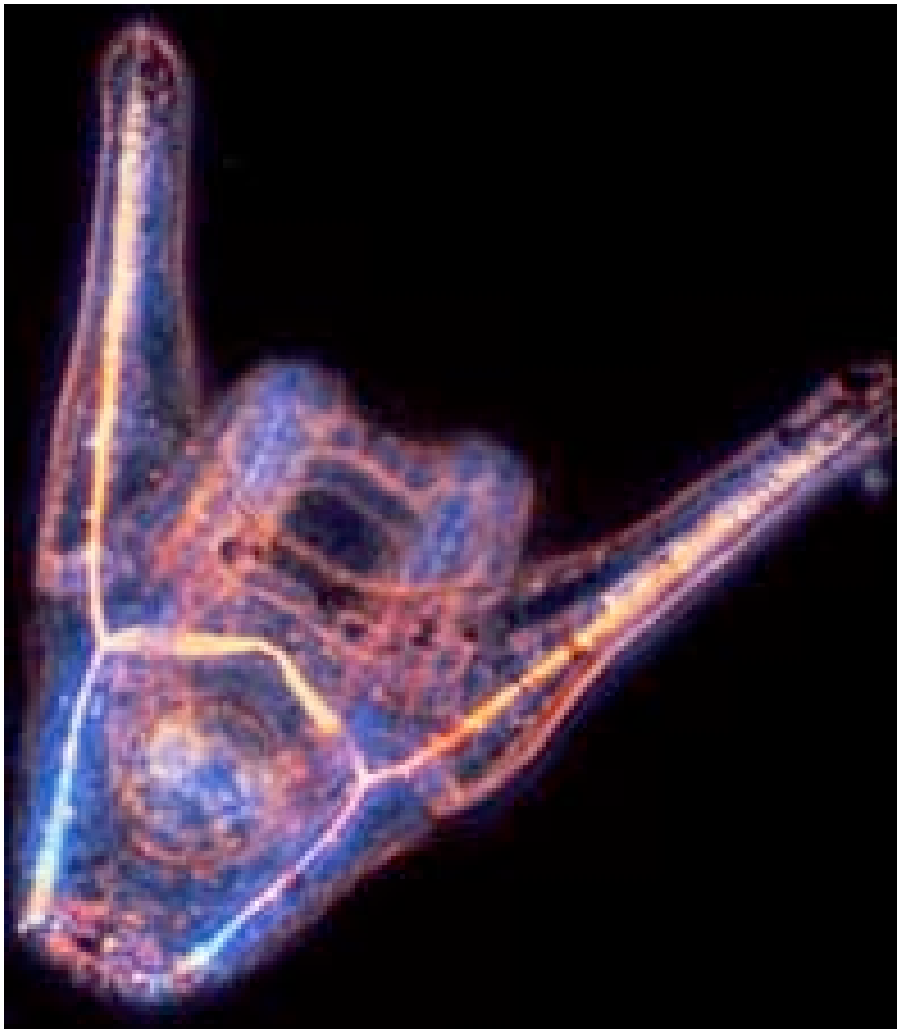

2nd ingression of cells to form
Secondary mesenchyme
Together=mesoderm
Primary mesenchyme


2nd invagination at animal pole
to form mouth
Complete gastrula
Germ layers
Ecto
Meso
Endo
archenteron

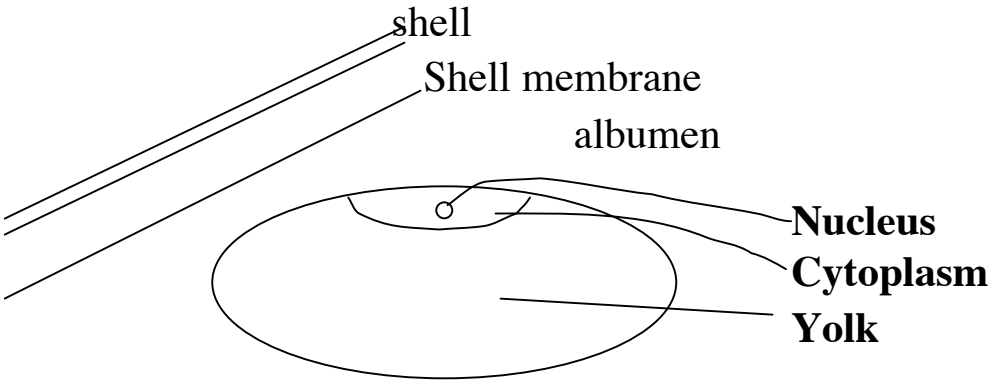
Sea urchin larval development.



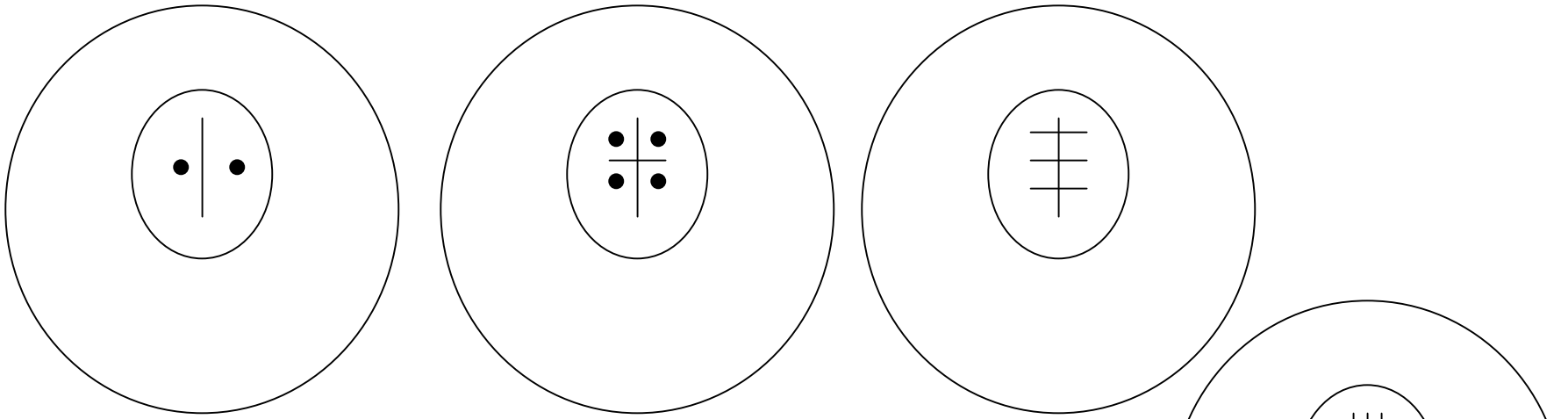
Sea urchin larva



Chick

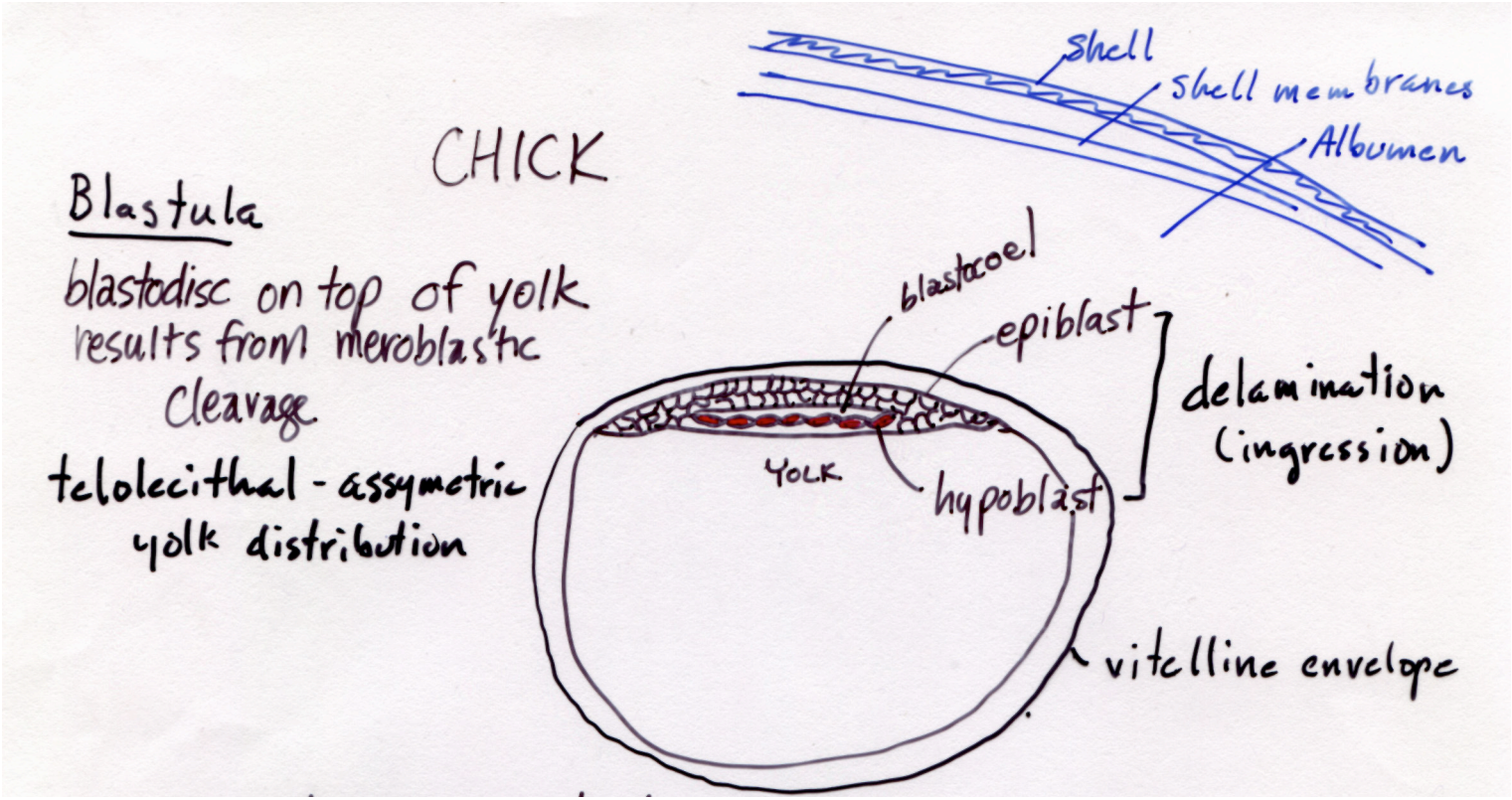


Telolecithal-asymmetric



1st div. 2nd 3rd 4th

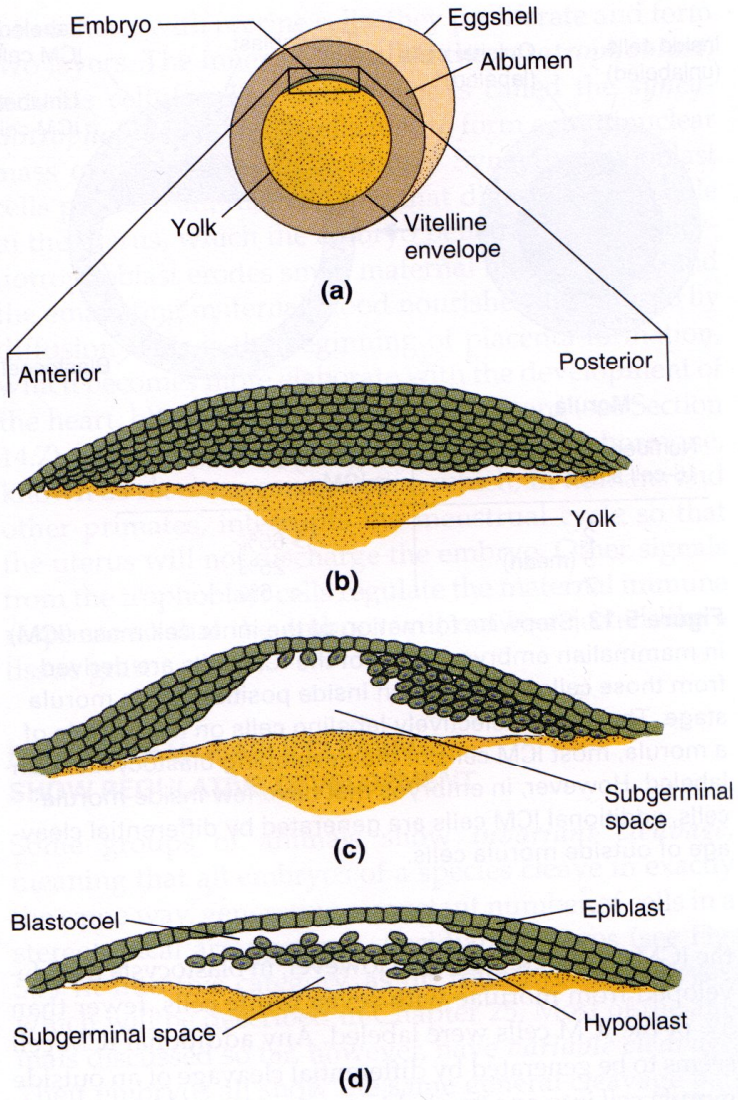
Meroblastic cleavage-part cleavage



~100,000 cells when egg laid.

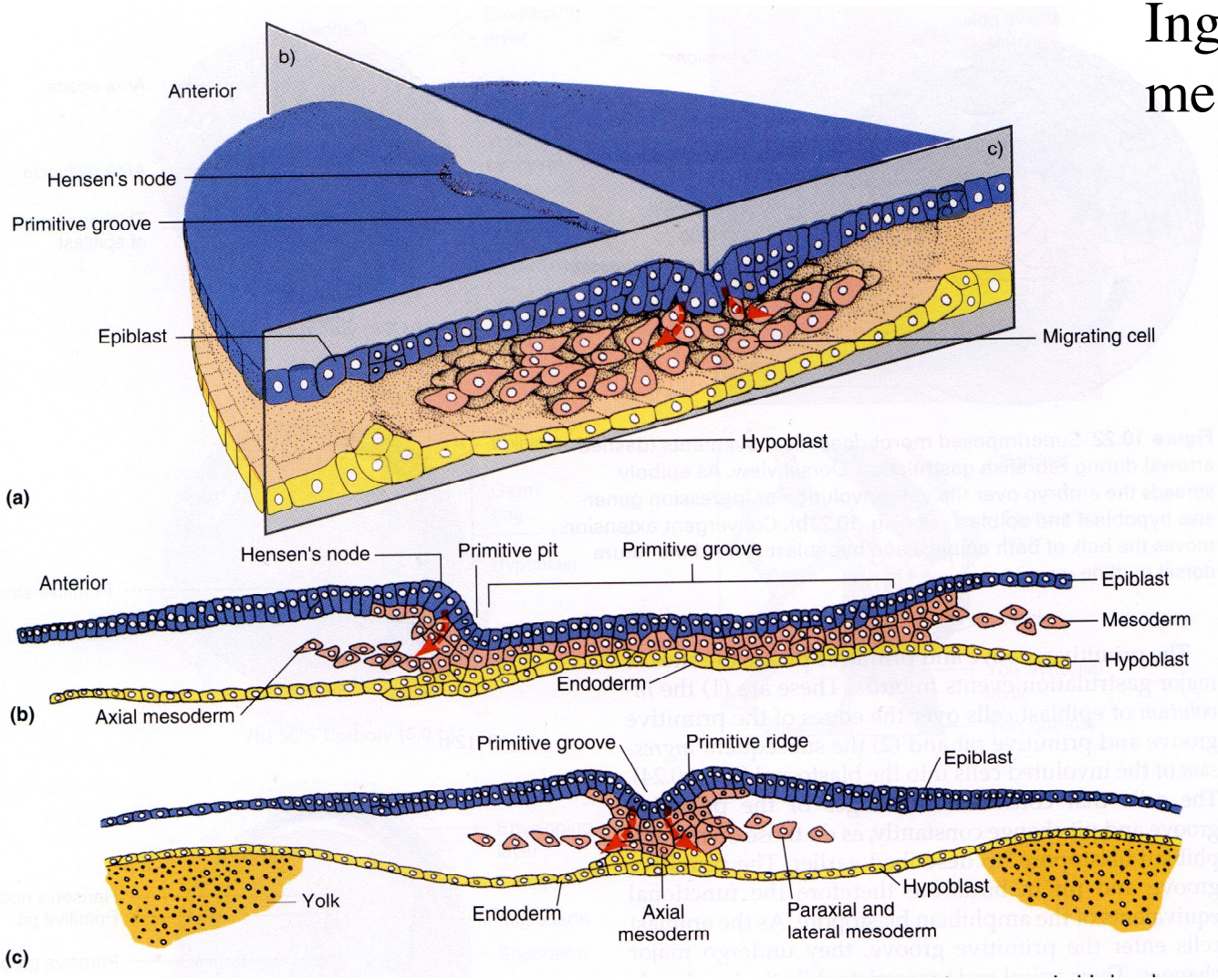
Epiblast - 3 germ layers

- ectoderm
- mesoderm
- endoderm

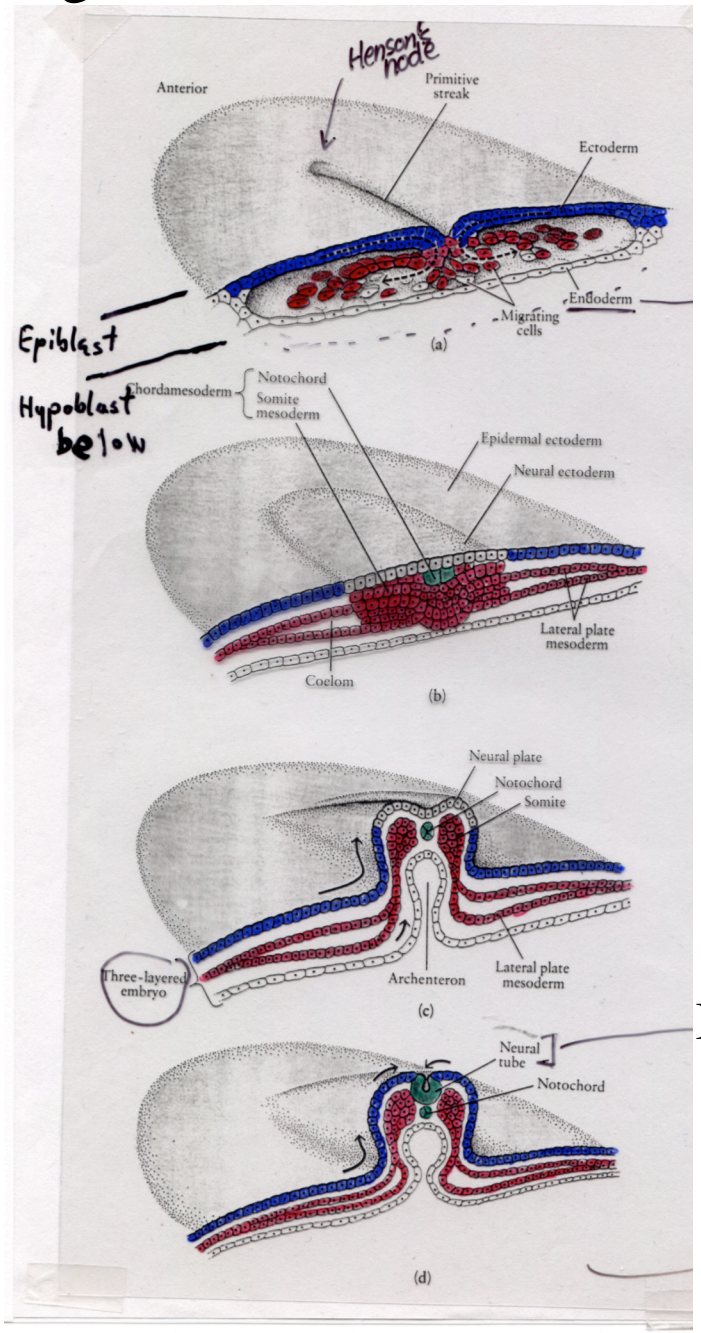


Delamination

Ingression-mesoderm



Chick gastrulation.



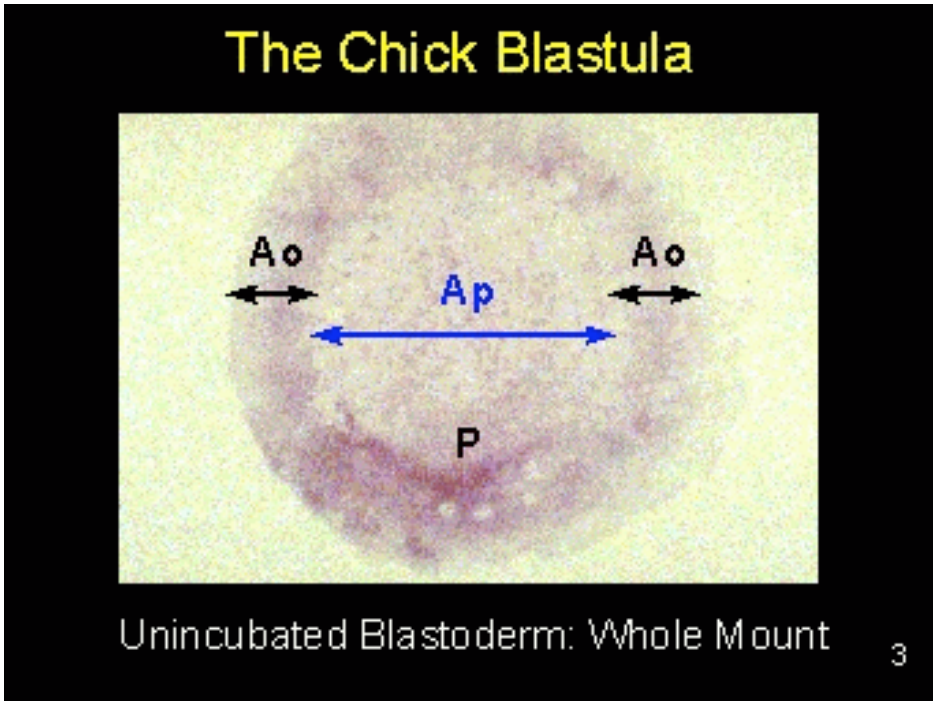
Primitive streak
-cells ingress
-induced by hypoblast
~blastopore

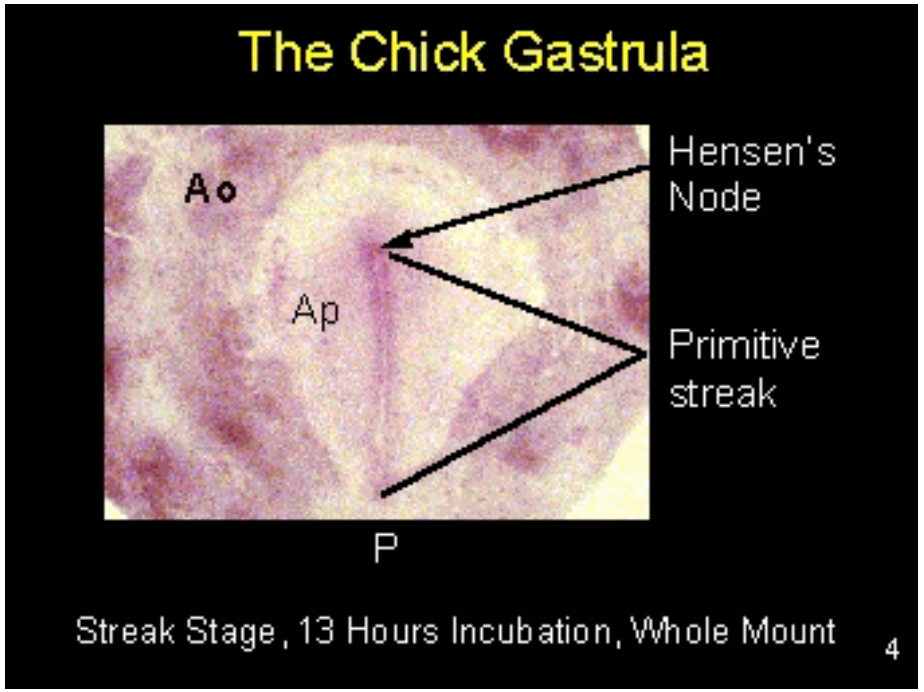
Notochord
-induced by Hansen's node
Somites
-muscle, bone

Embryo lifts off surface-
3 layers-
ectoderm
mesoderm
endoderm

Becomes brain

Sacs form around embryo

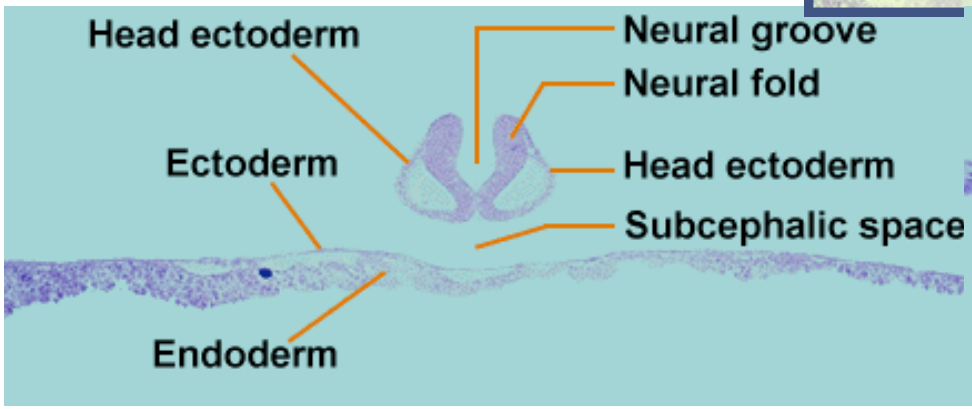


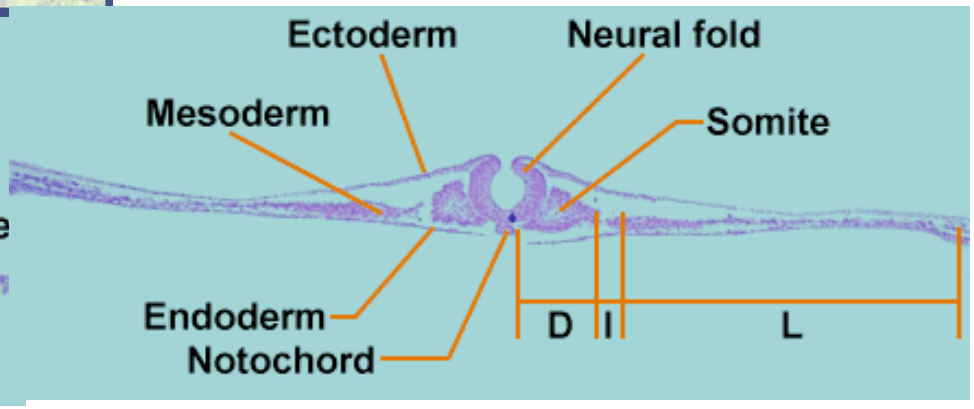


Fresh laid egg-blastodisc

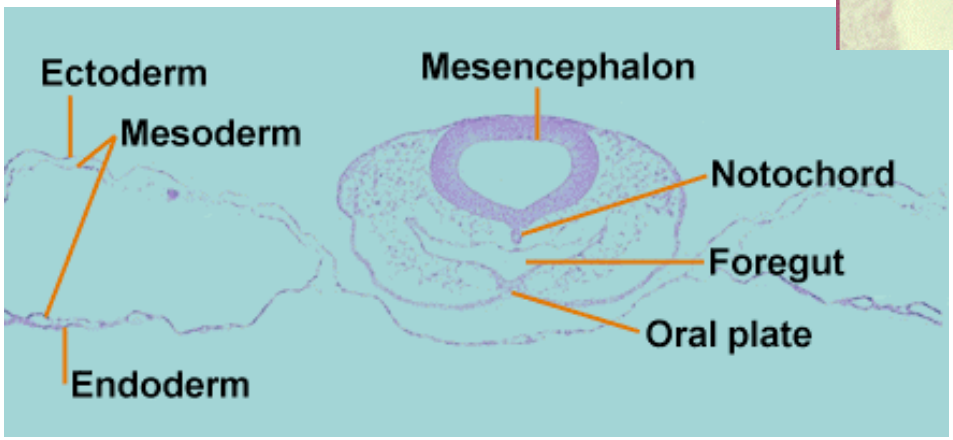
13 hour egg

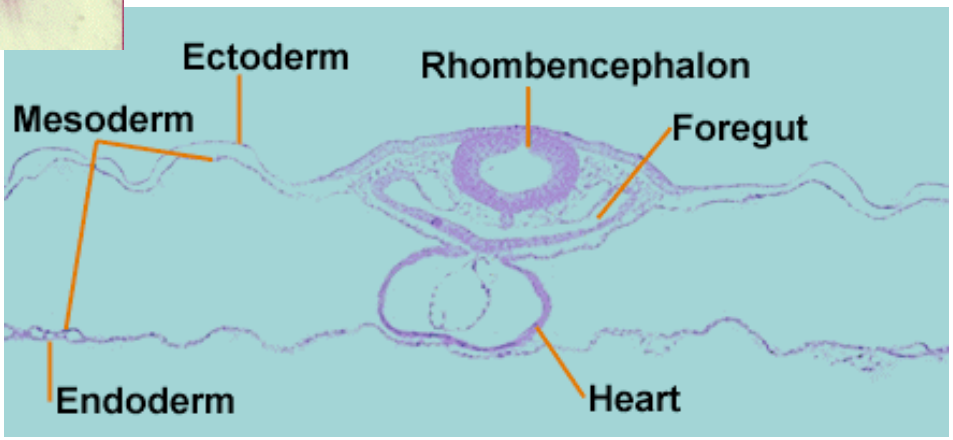
24 hour chick sections



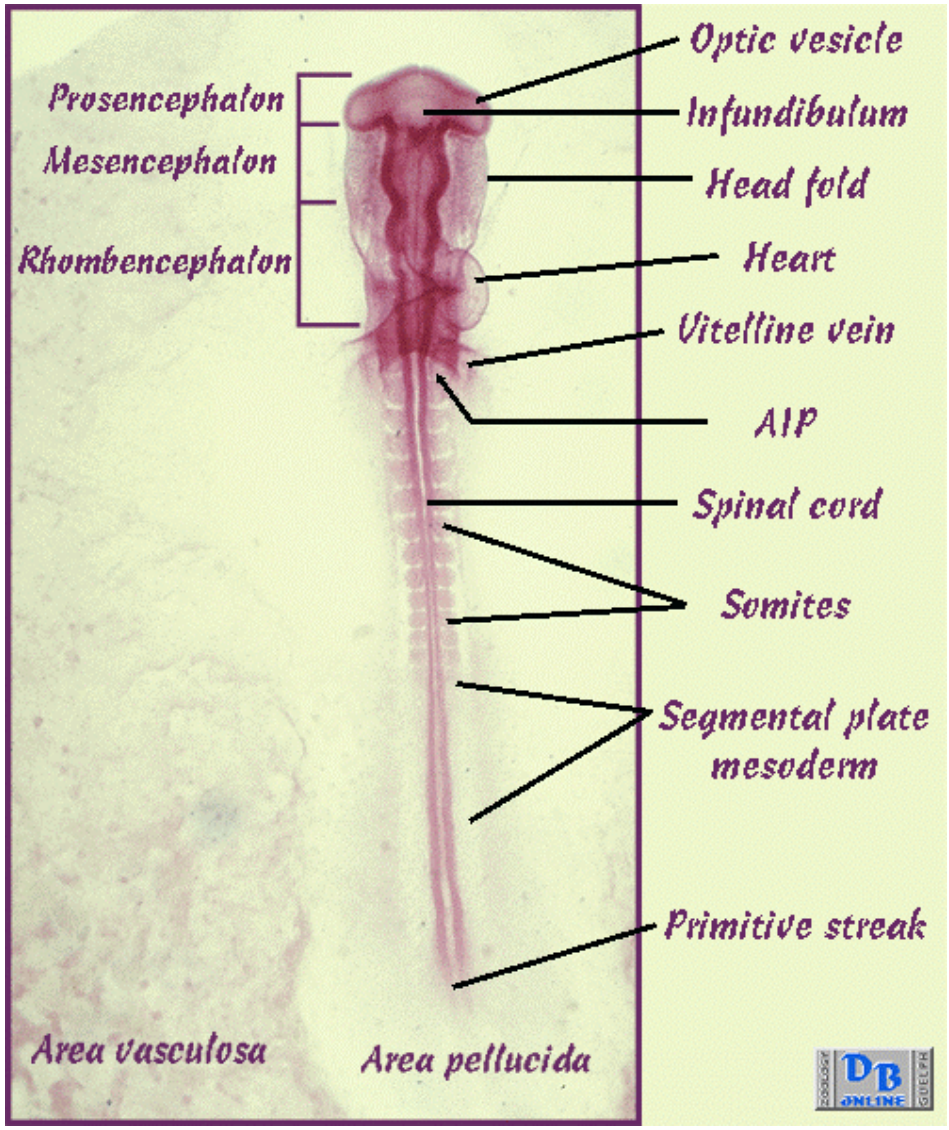


33 hour chick sections

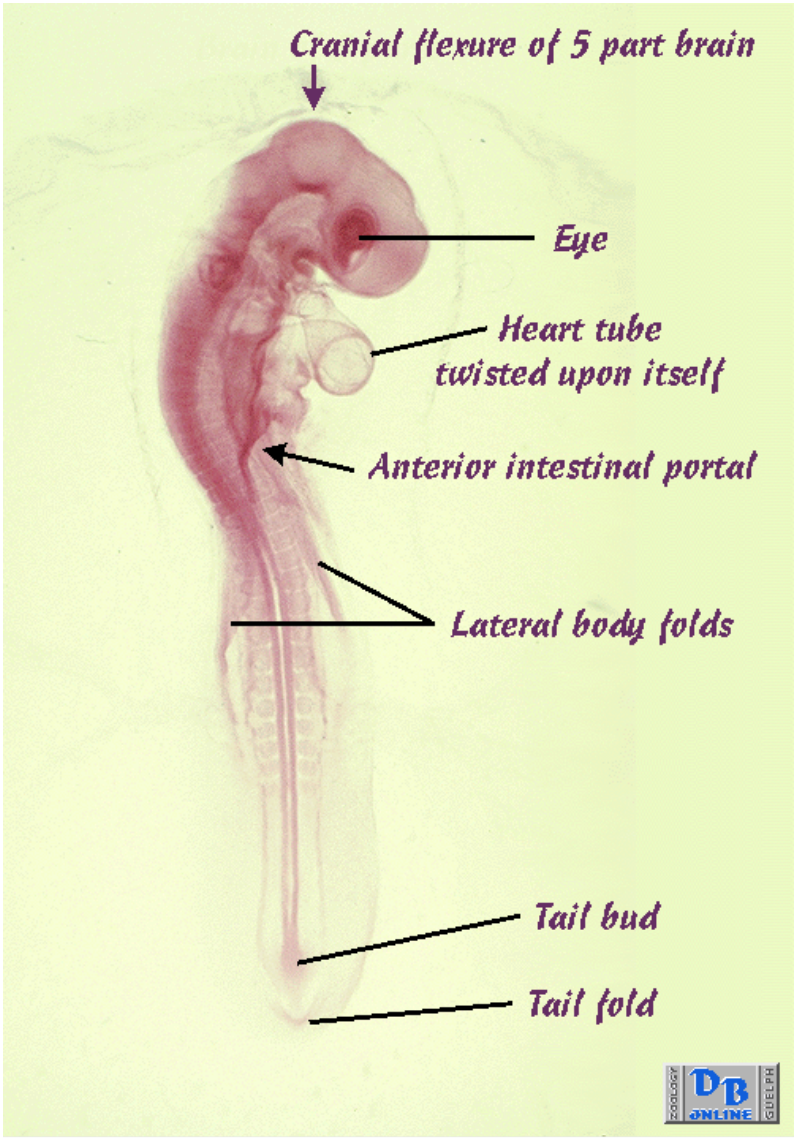




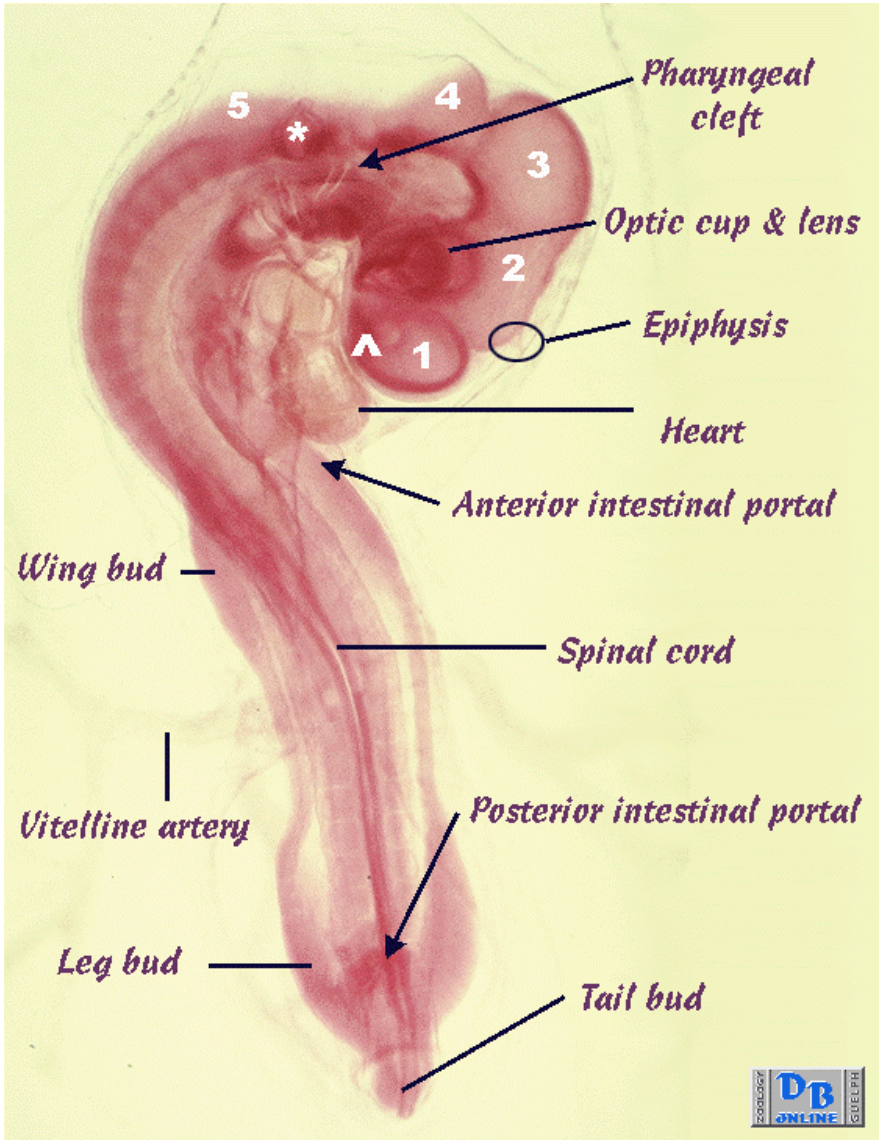
33 hour whole mount



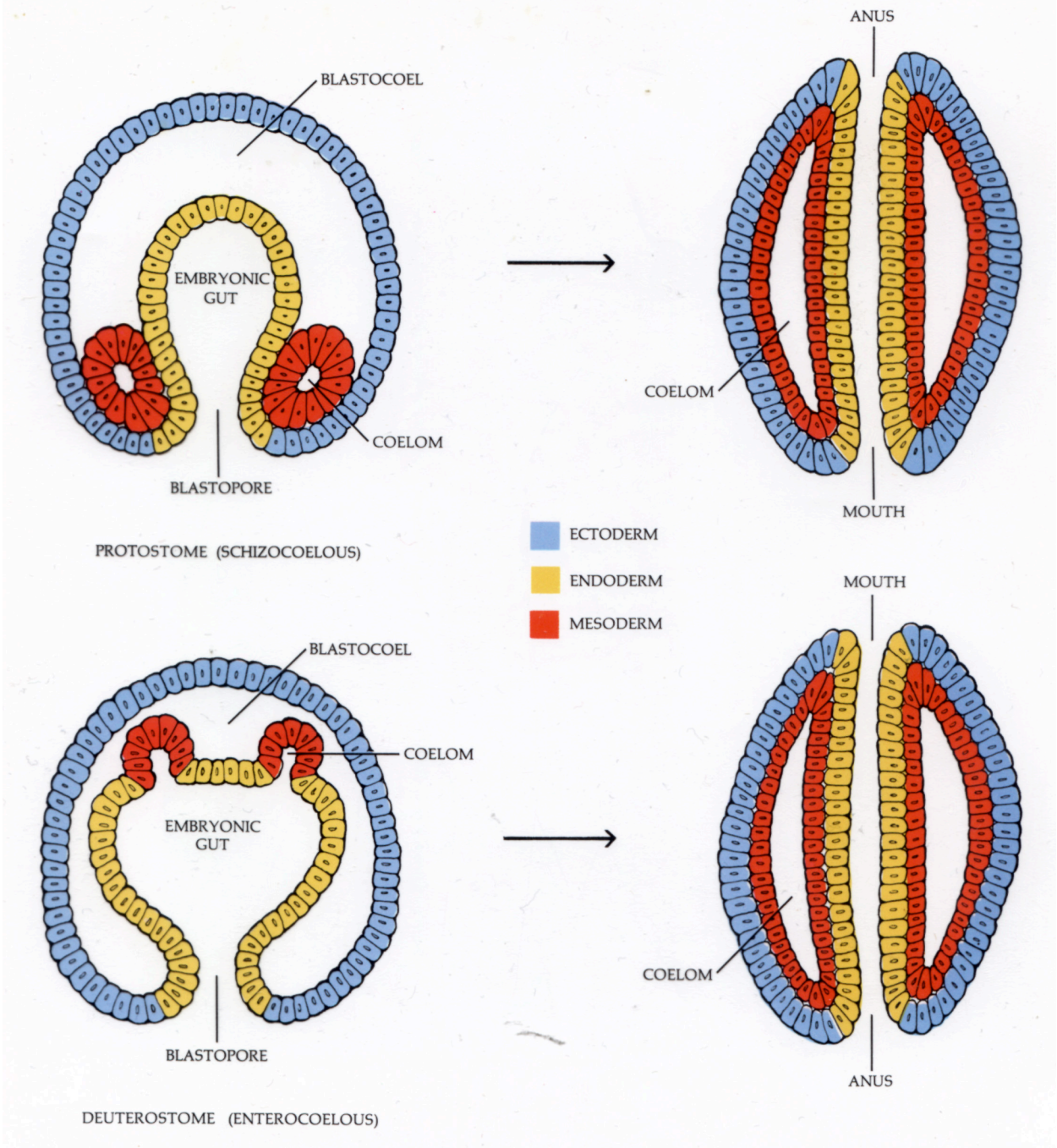
48 hour



72 hour



Protostome/deuterostome



Mosaic vs. Regulative Development

Mosaic - after each cleavage, cells have specific fates.

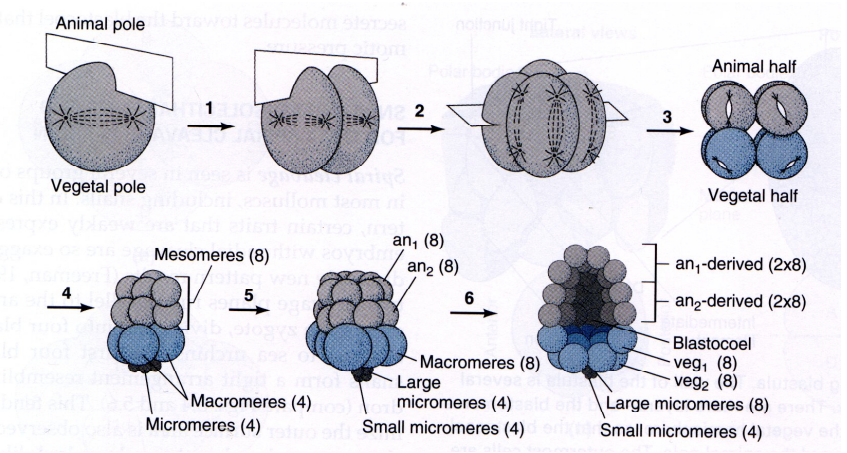
Regulative - cell communicate and can change their fate.

Induction

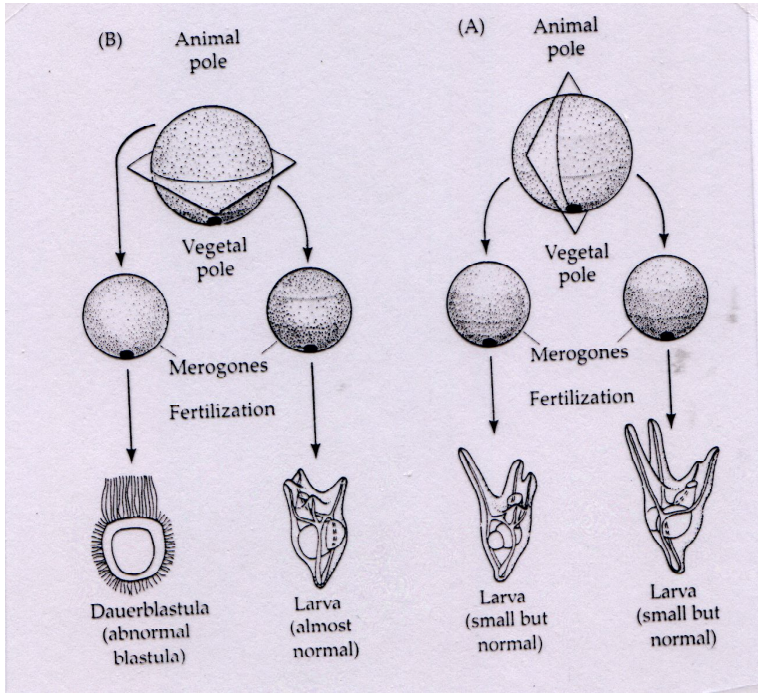
Studies can lead to discovery of hormones, regulatory genes. Defects in the normal processes are the basis of many cancers and developmental birth defects.

Horstadius experiments-

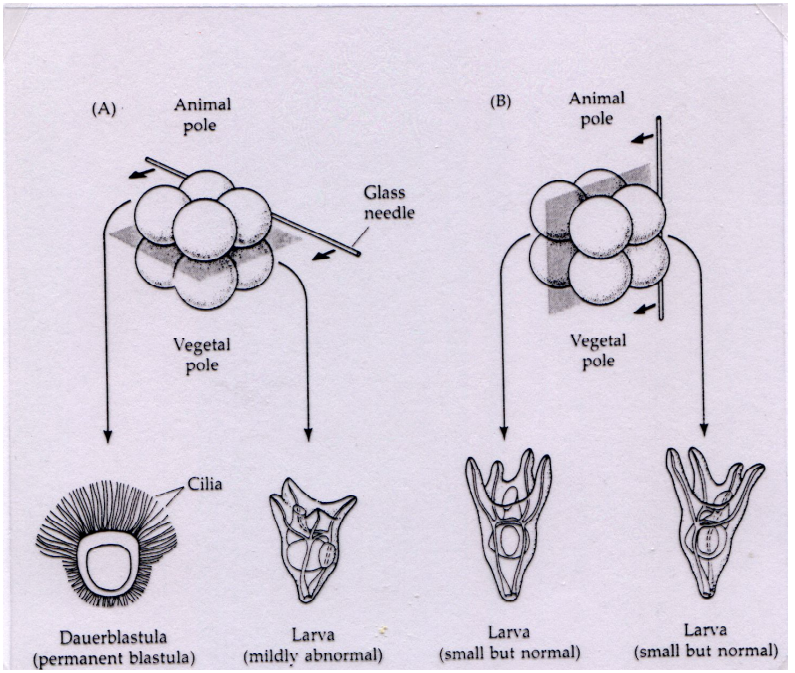
Show that there are mosaic and regulative Aspects to sea urchin development.



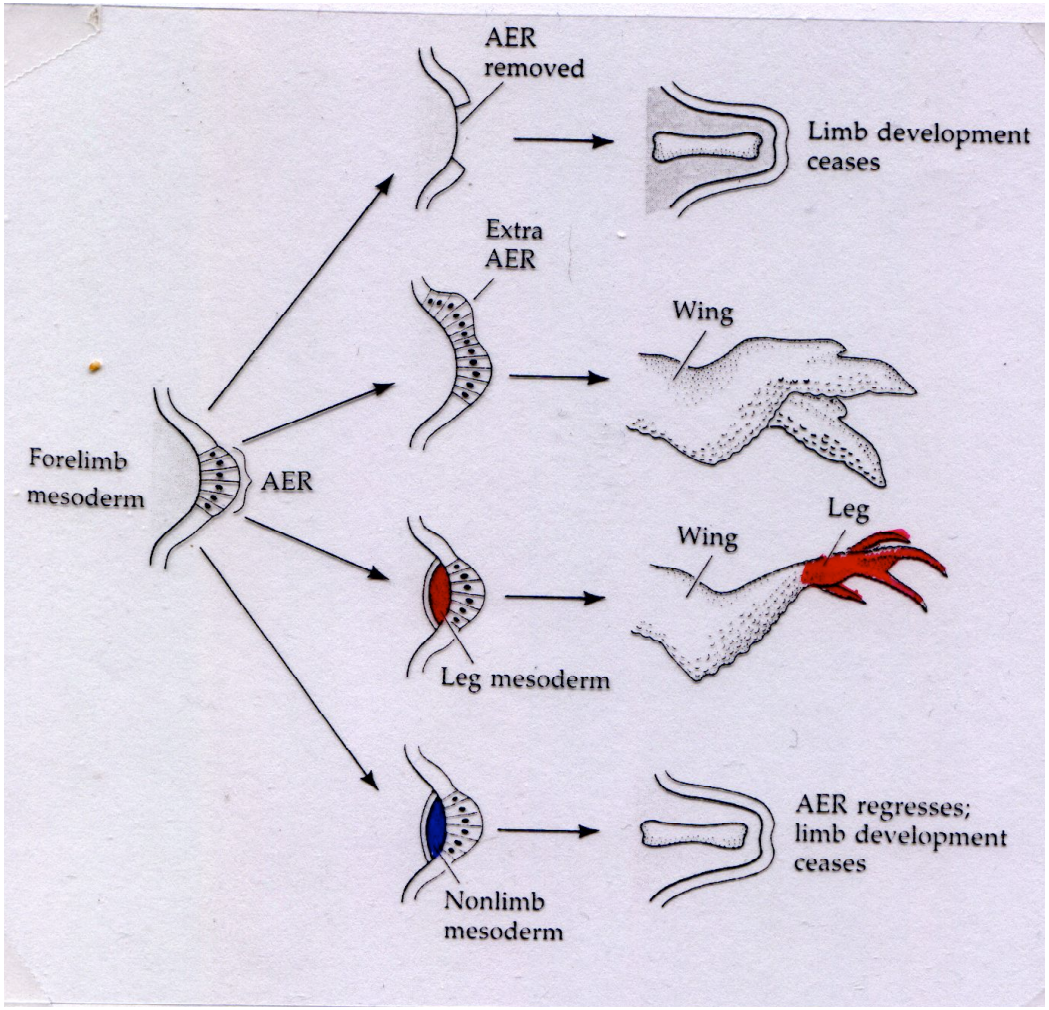
Split egg



Separate 8 cells
In half



Pattern formation - mesoderm induces ectoderm to make either a leg or wing
But ectoderm determines which.



AER = apical ectodermal ridge.