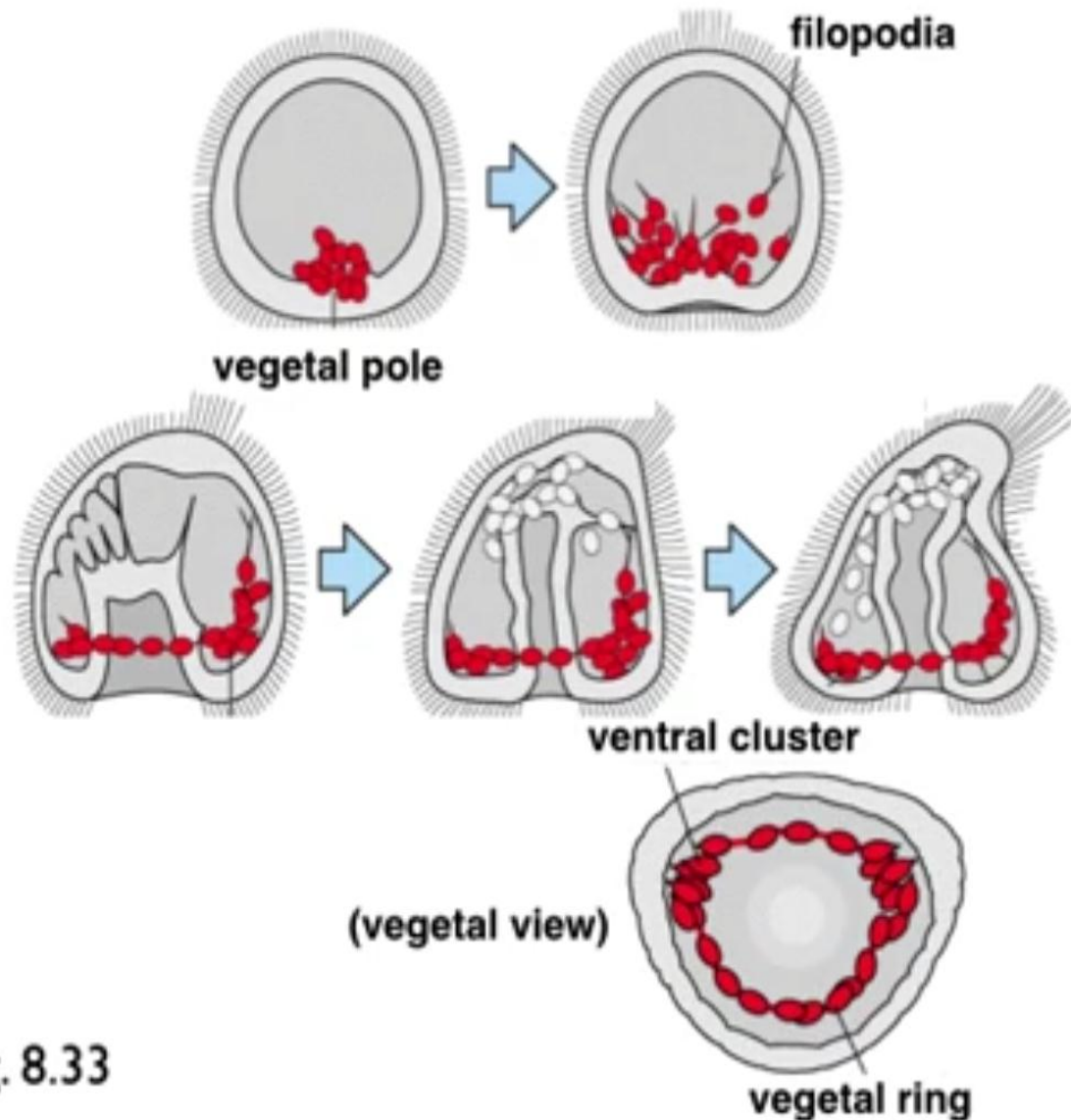


Gastrulation in Sea urchin

PMCs adopt a precise pattern

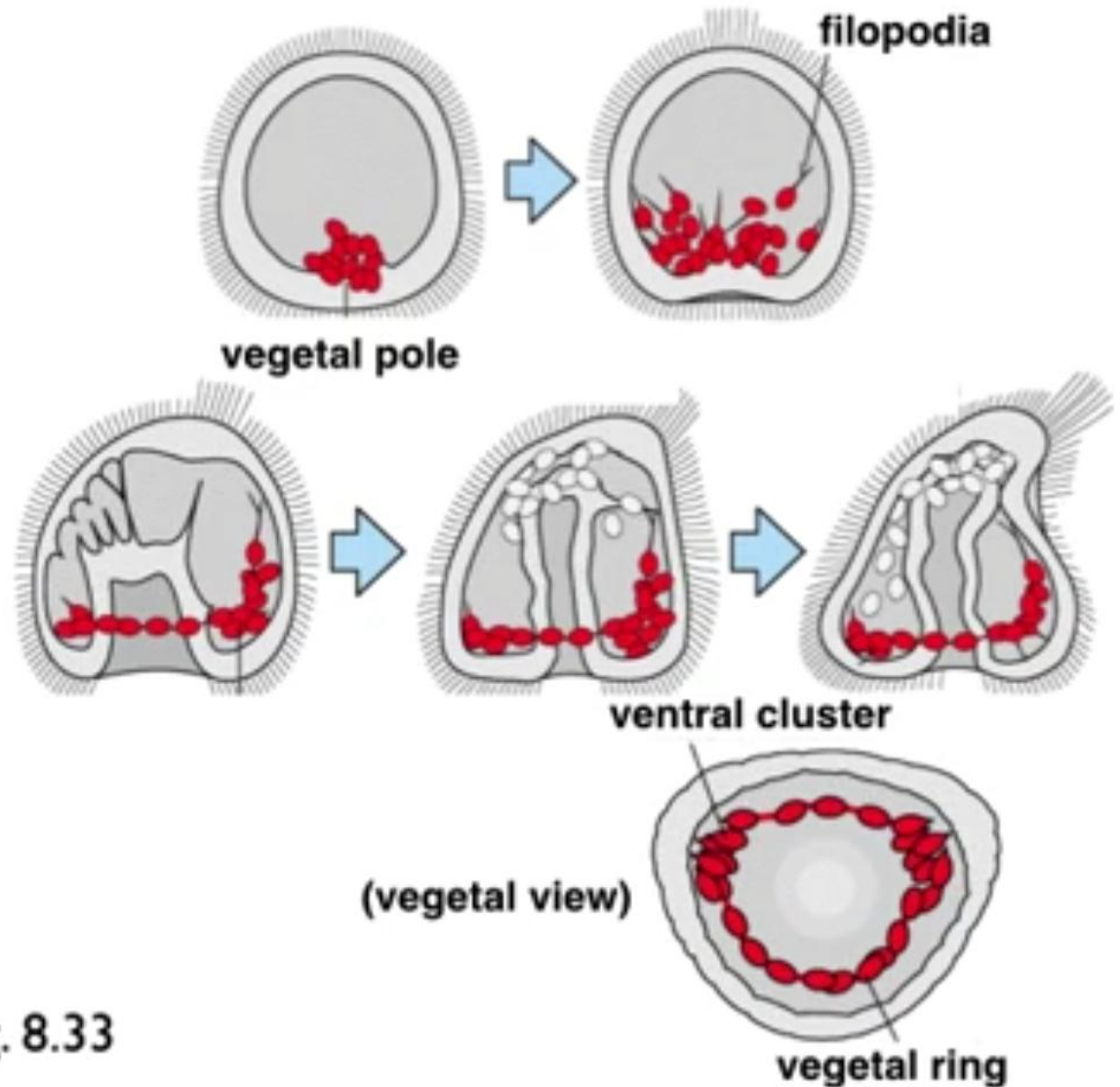
Skeletogenic (primary mesenchyme) adopt a precise pattern. Two **clusters** form on the ventral (oral) side of the embryo.



Wolpert et al, 2e, Fig. 8.33

PMCs adopt a precise pattern

Skeletogenic (primary mesenchyme) adopt a precise pattern. Two **clusters** form on the ventral (oral) side of the embryo.



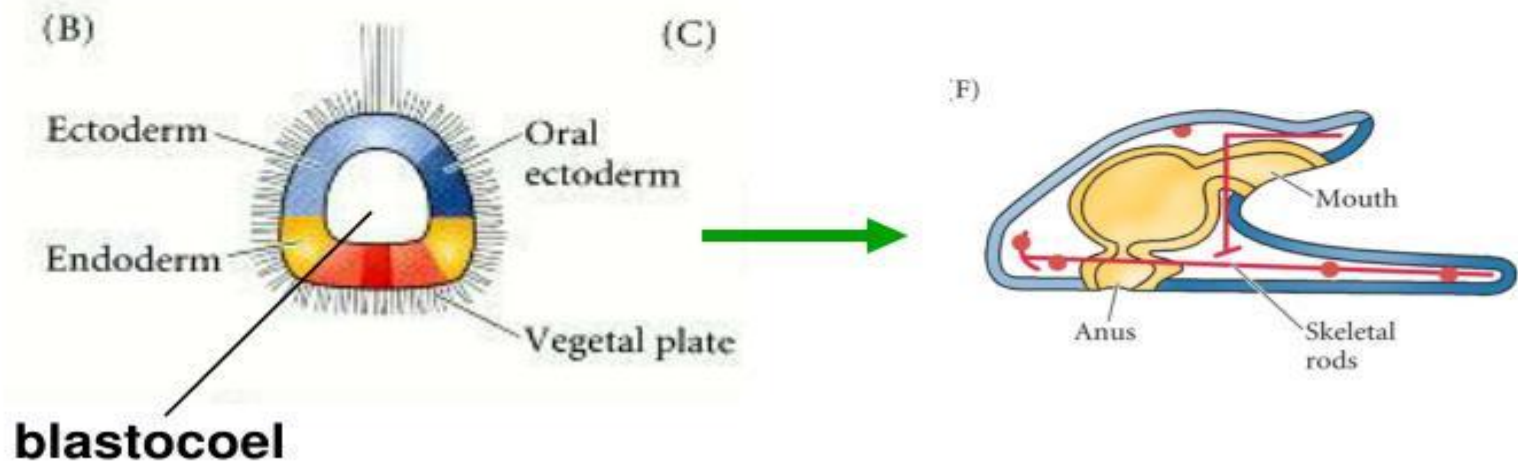
Wolpert et al, 2e, Fig. 8.33

Sea urchin gastrulation

Our “simple” model

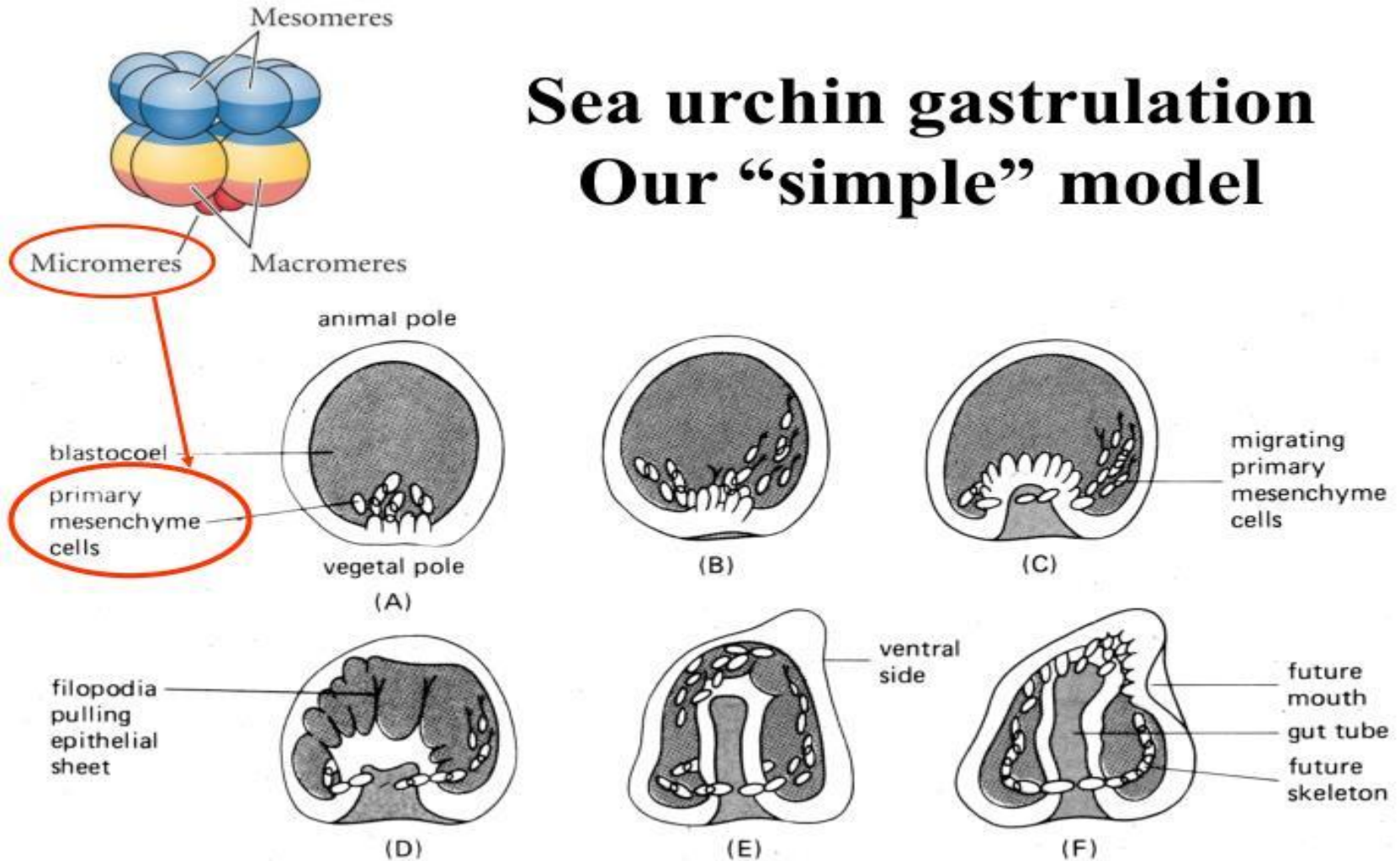


Fig. 5.14

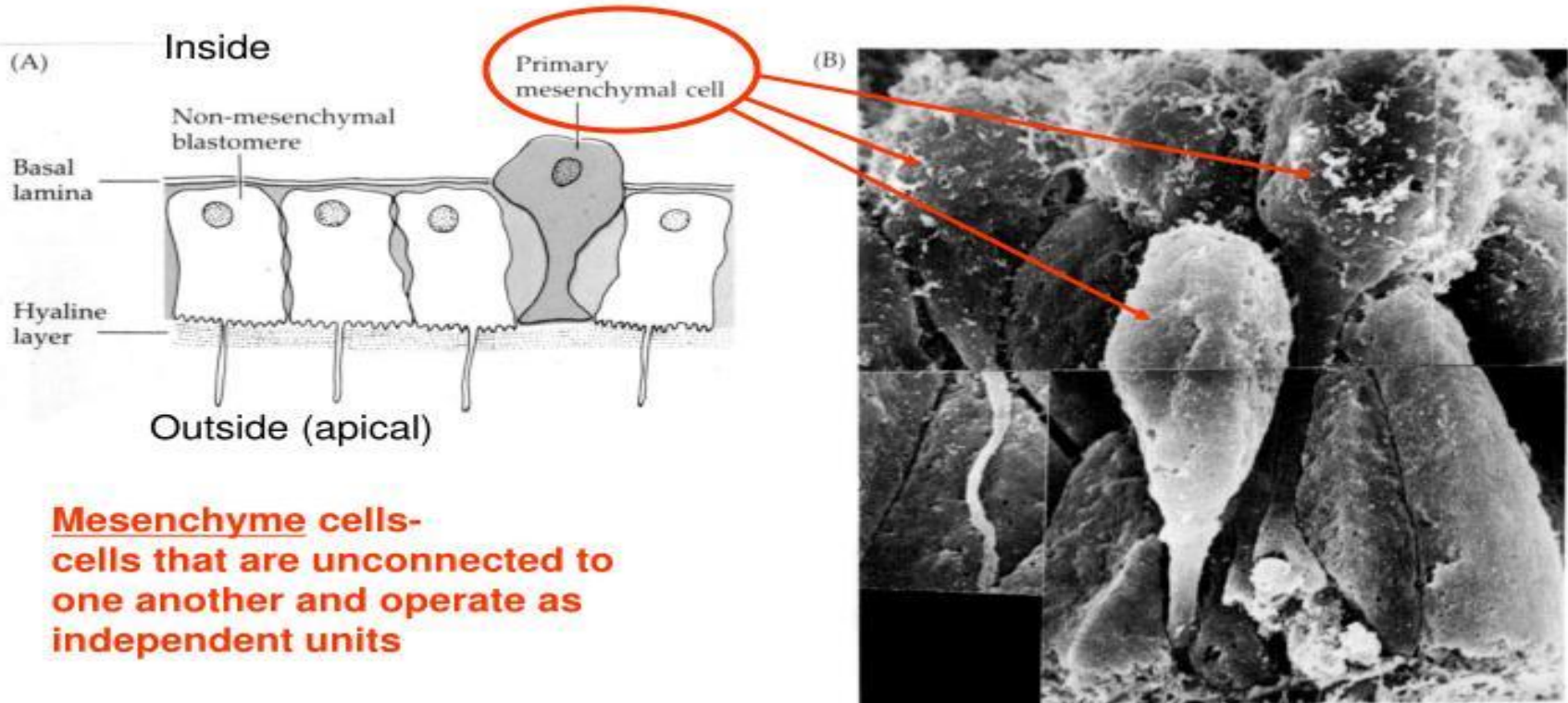


Sea urchin gastrulation

Our “simple” model

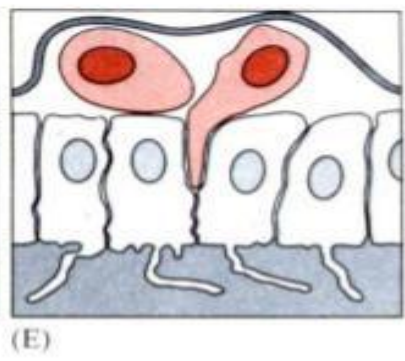
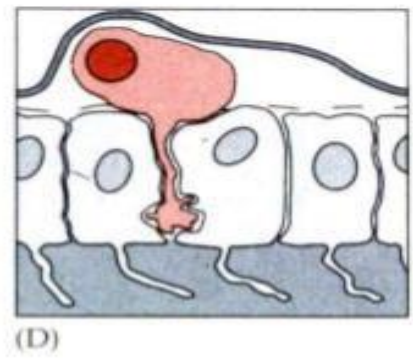
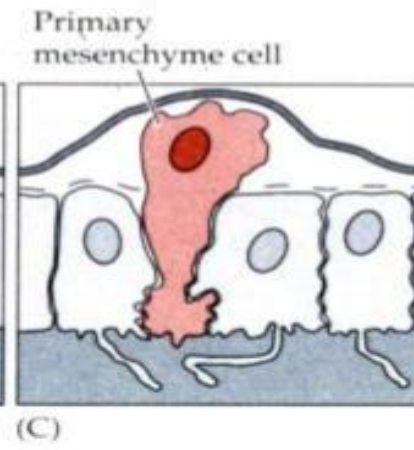
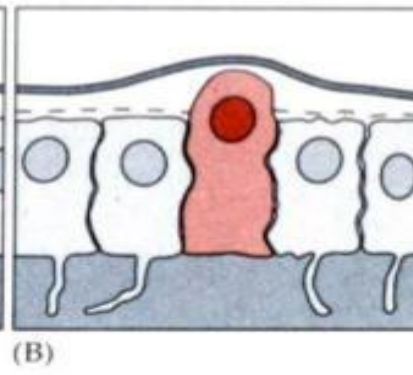
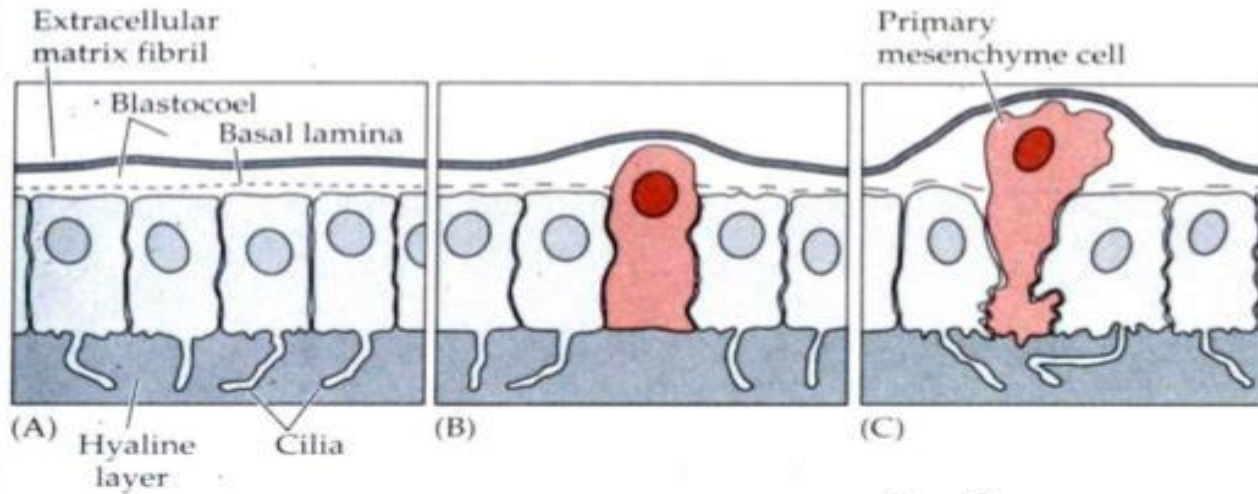


Step 1: Primary mesenchyme cells **ingress**



Mesenchyme cells-
cells that are unconnected to
one another and operate as
independent units

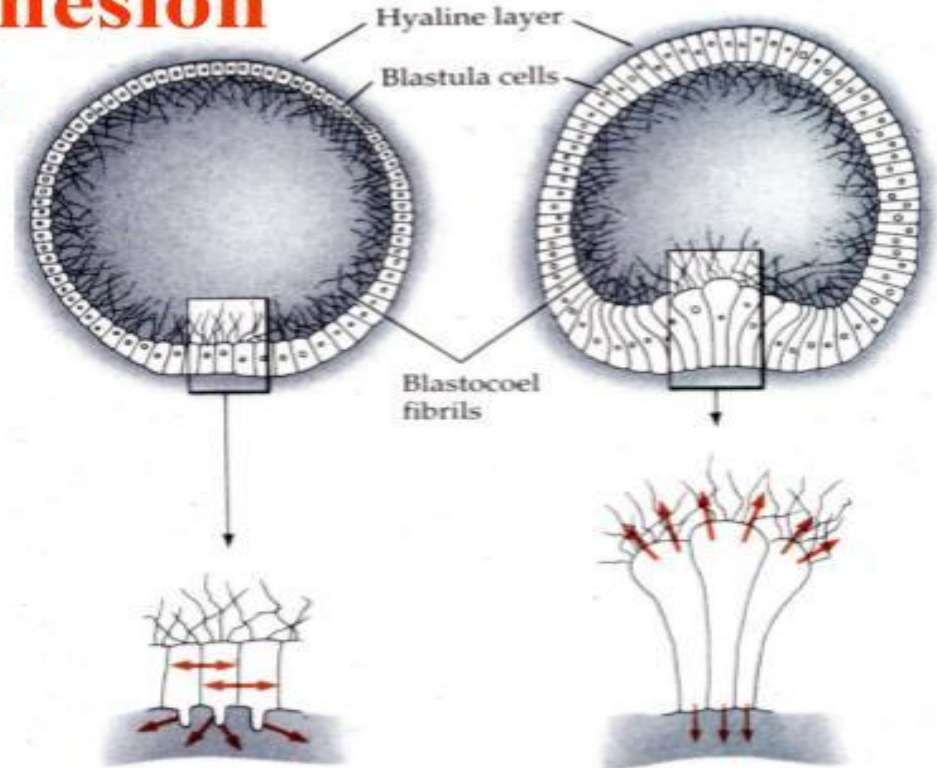
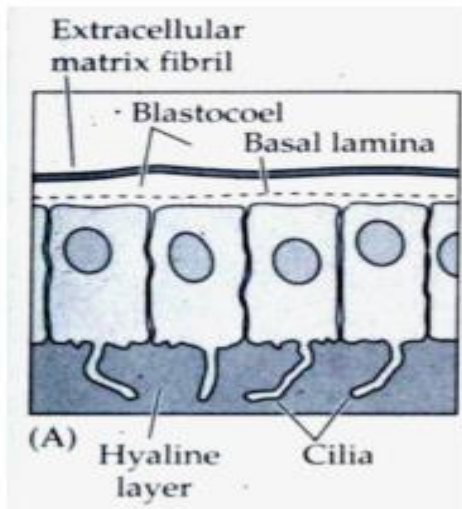
See also Figure 5.16



**Primary mesenchyme
ingression is driven
by changes in cell
adhesion**

Figure 5.16

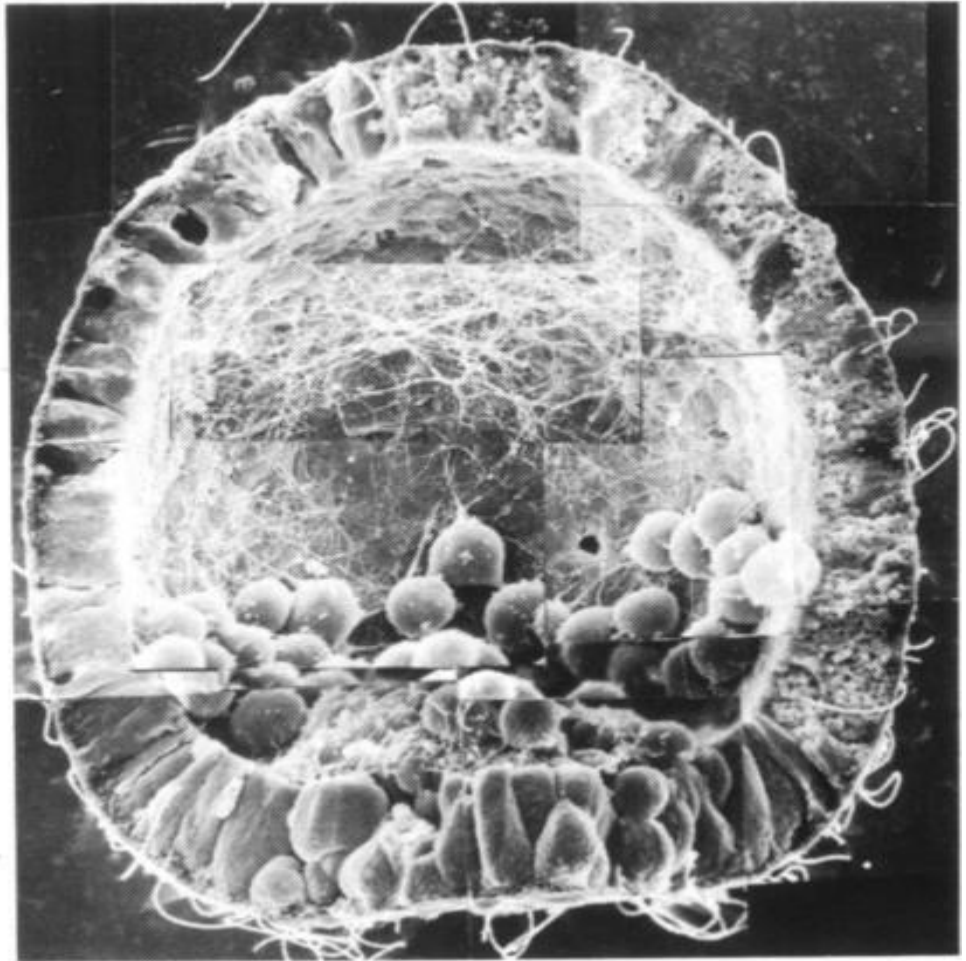
Changes in cell adhesion drive the first step of gastrulation



High affinity for neighboring cells and hyaline layer

Decreasing affinity for neighboring cells and hyaline layer
Increased affinity for basal lamina and extracellular matrix

**Invaginating primary
mesenchyme cells
beginning to
migrate on the
extracellular matrix
lining the blastocoel**



Primary mesenchyme cells eventually fuse and form the spicules (skeletal rods)

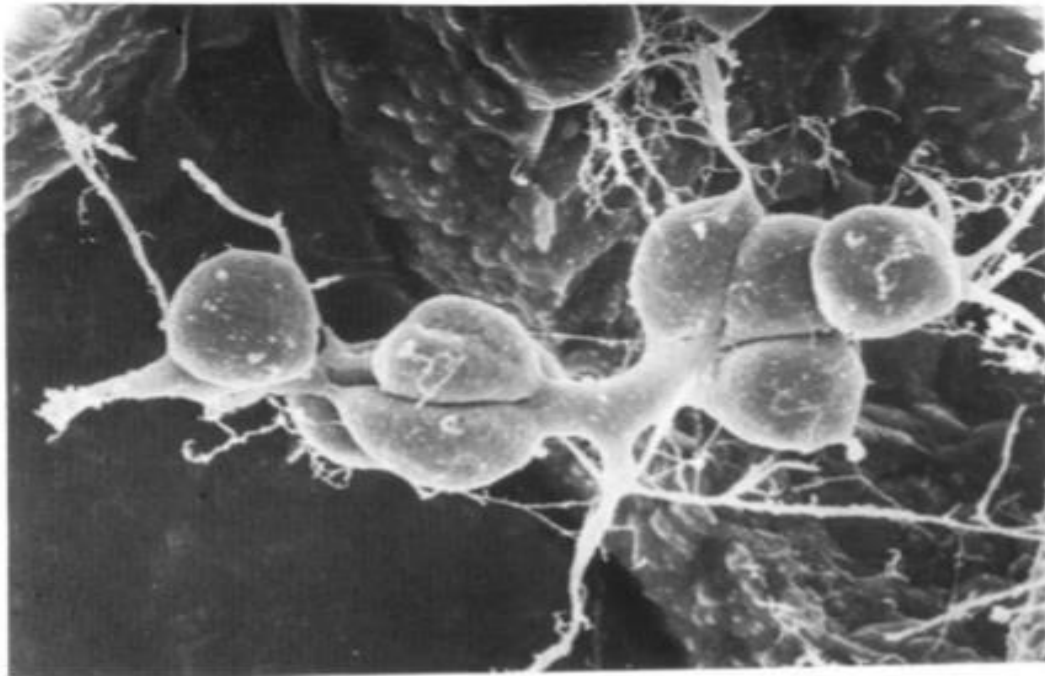


Figure 5.17

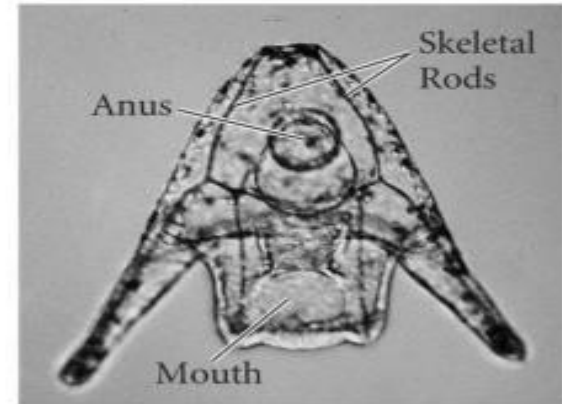
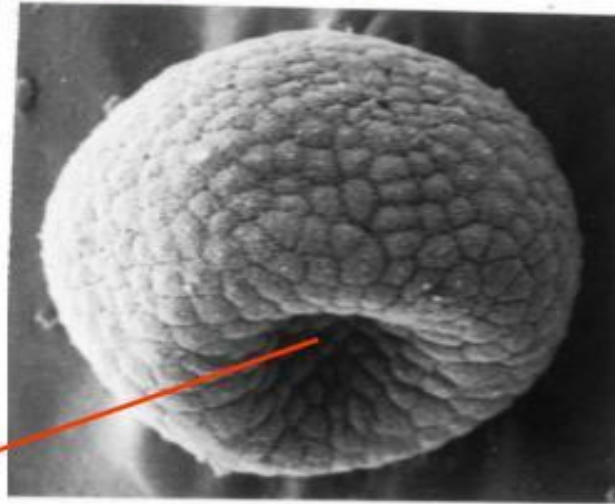


Figure 5.15

Step 2:

Apical constriction and changes in the extracellular matrix create a dome-shaped **invagination** = **archenteron** (primitive gut)

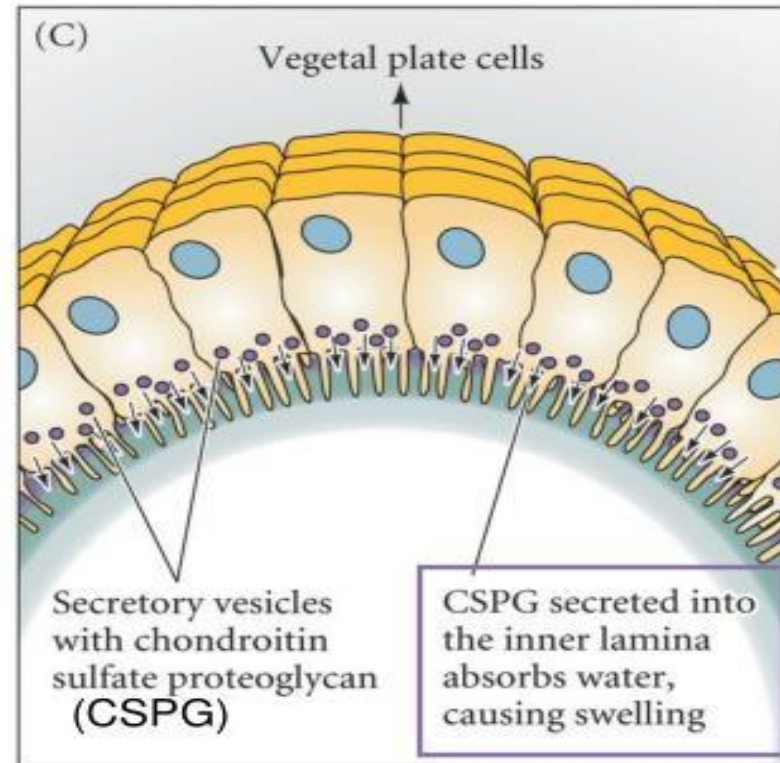
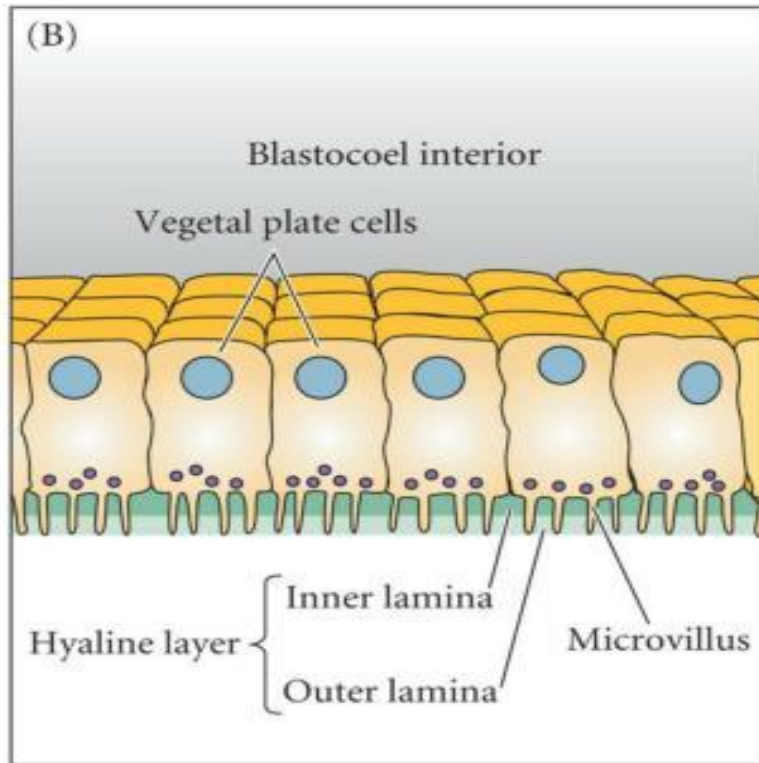


(A)

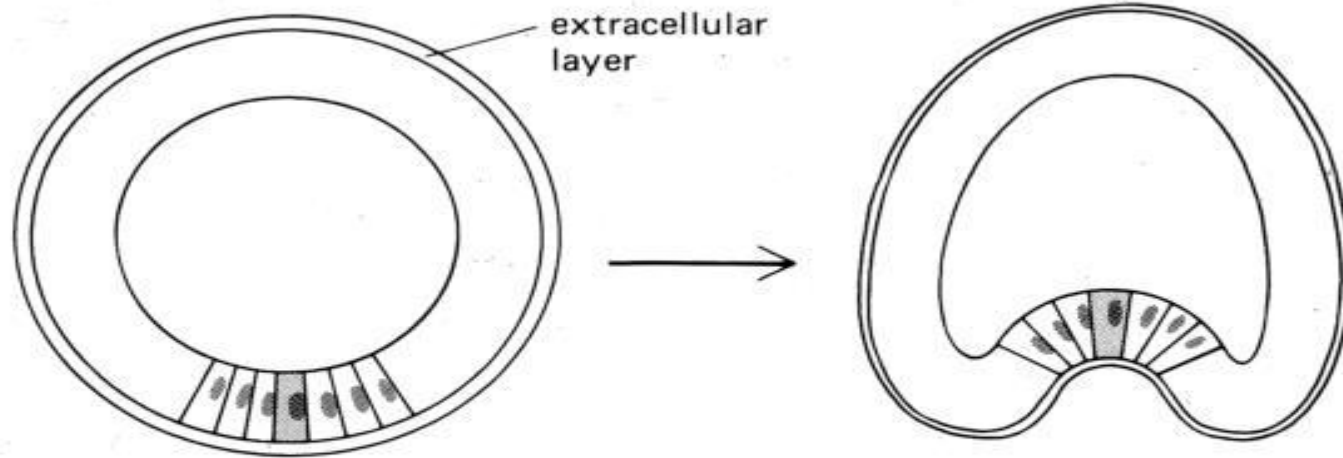
blastopore = opening

Figure 5.19

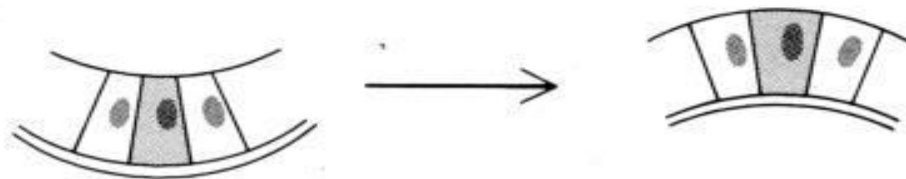
Invagination of the Vegetal Plate involves changes in the extracellular matrix



Apical constriction drives invagination



change in the curvature of the epithelial sheet
may be forced by change in the shape of the cells



Step 3:
Cell intercalation (convergent extension**) converts the dome (archenteron) into an elongated tube**

Early gastrulation

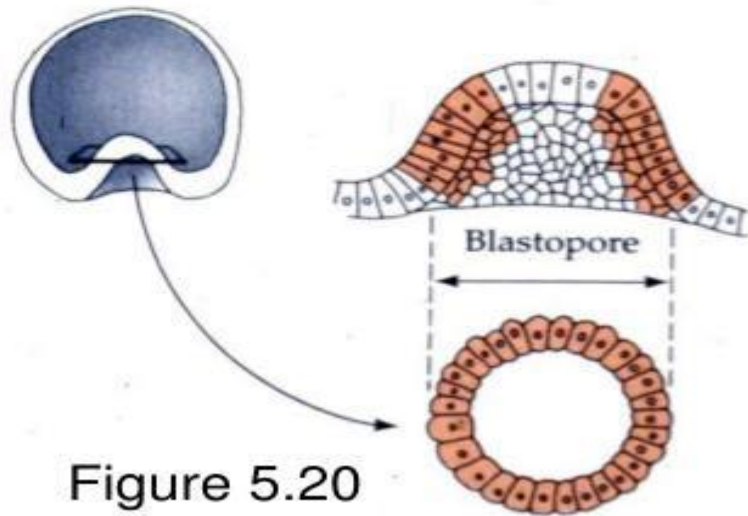
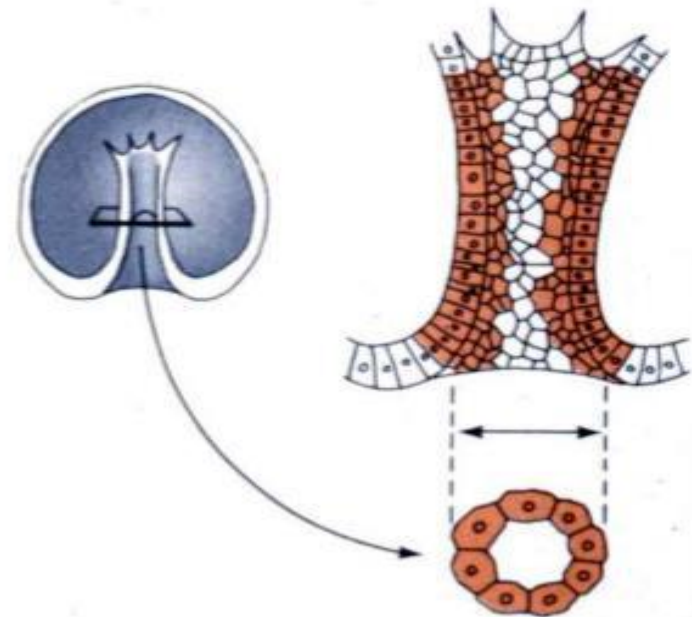


Figure 5.20

Later gastrulation



Step 4: Secondary mesenchyme cells at the leading edge of the gut tube use filopodia to look for cues at the animal pole and pull themselves to that site

Ectoderm

These secondary mesenchyme cells will become muscle (**mesoderm**)

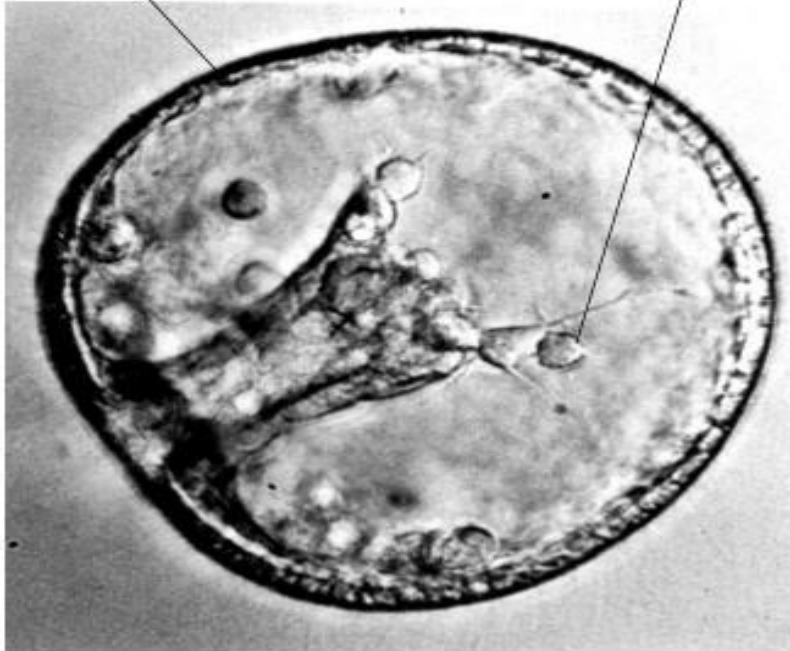
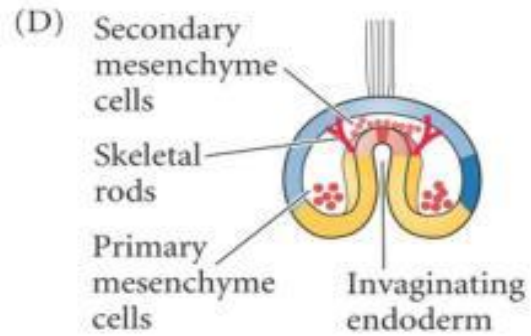
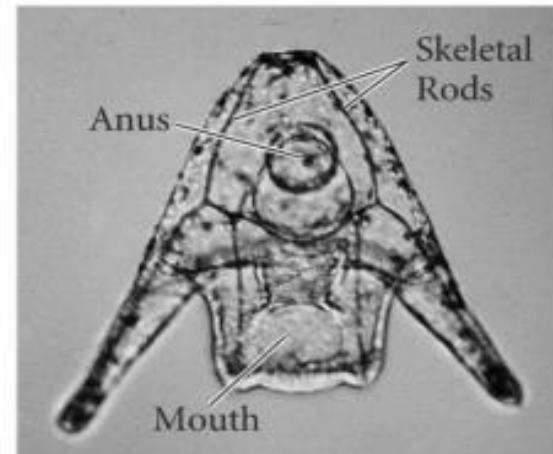


Figure 5.21

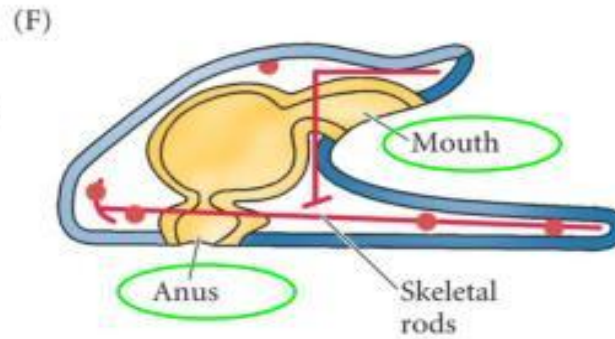
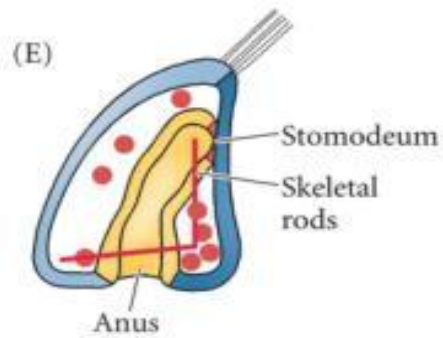
Endoderm (gut)



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Pluteus larva



Pluteus larva

References

Gilbert, S.F., Developmental Biology (8th. Edition) 2006. Sinauer Associates Inc. Sunderland, Massachusetts. USA. Page 348 - 354