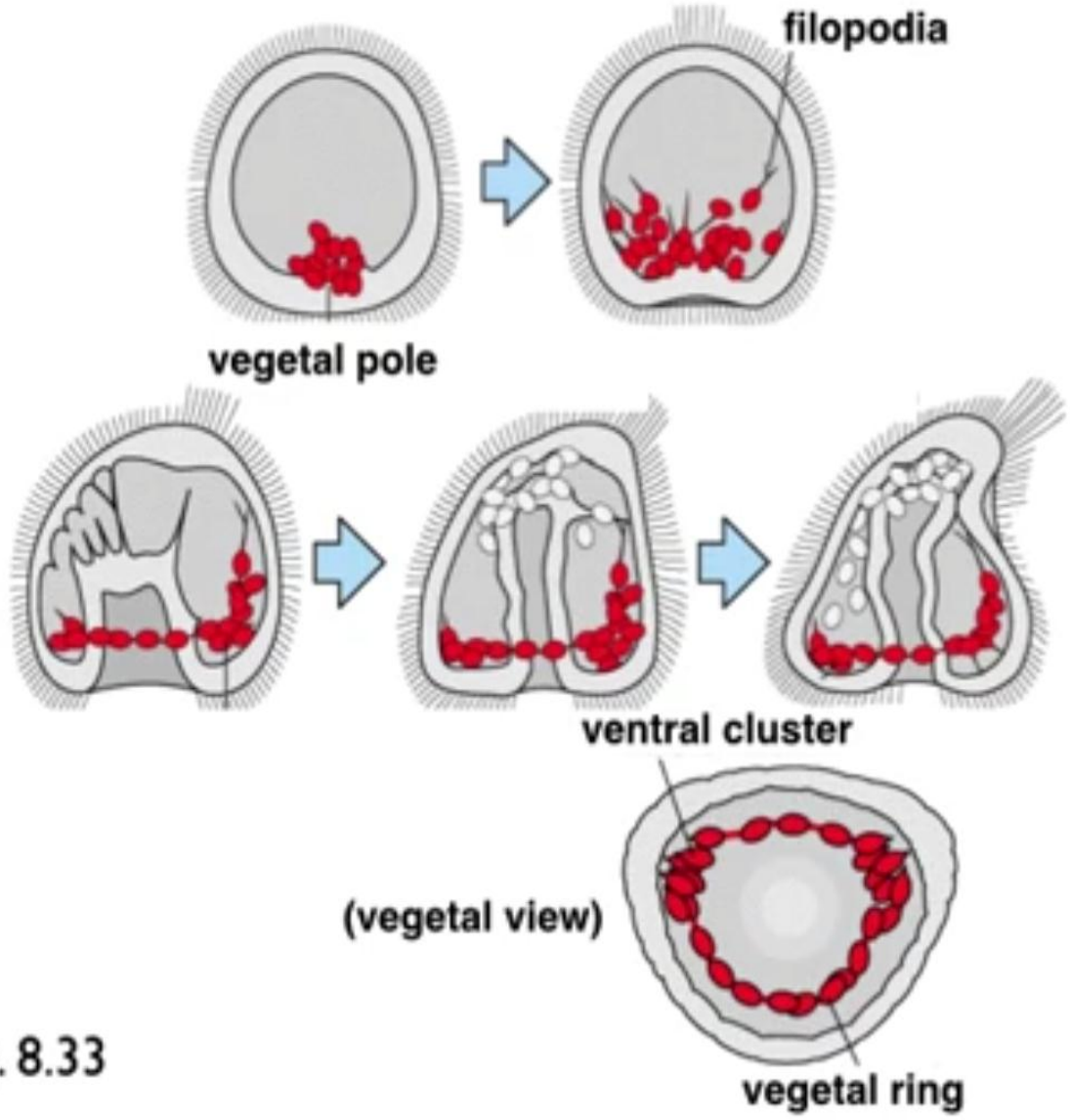
Gastrulation in Sea urchin

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

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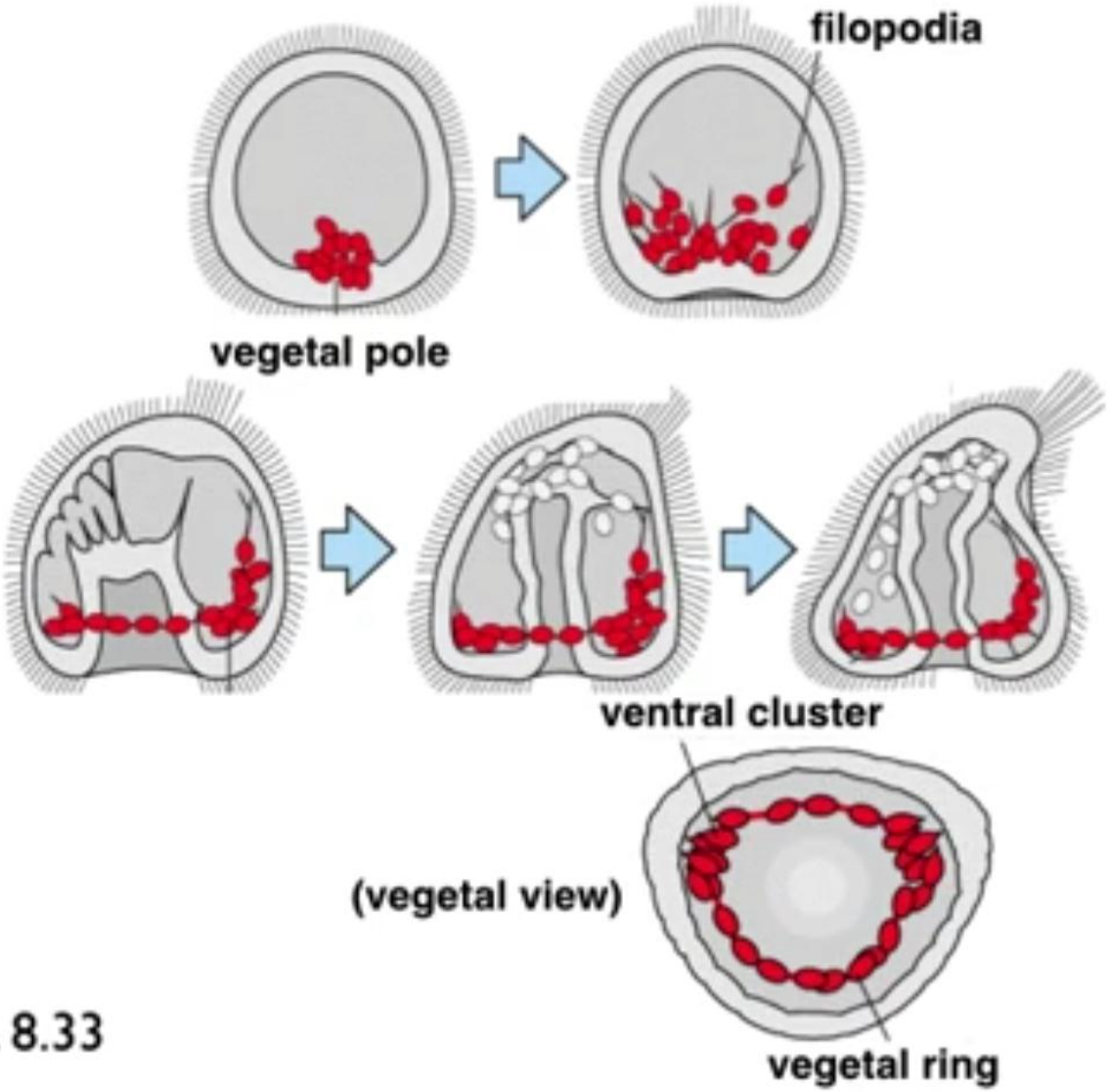
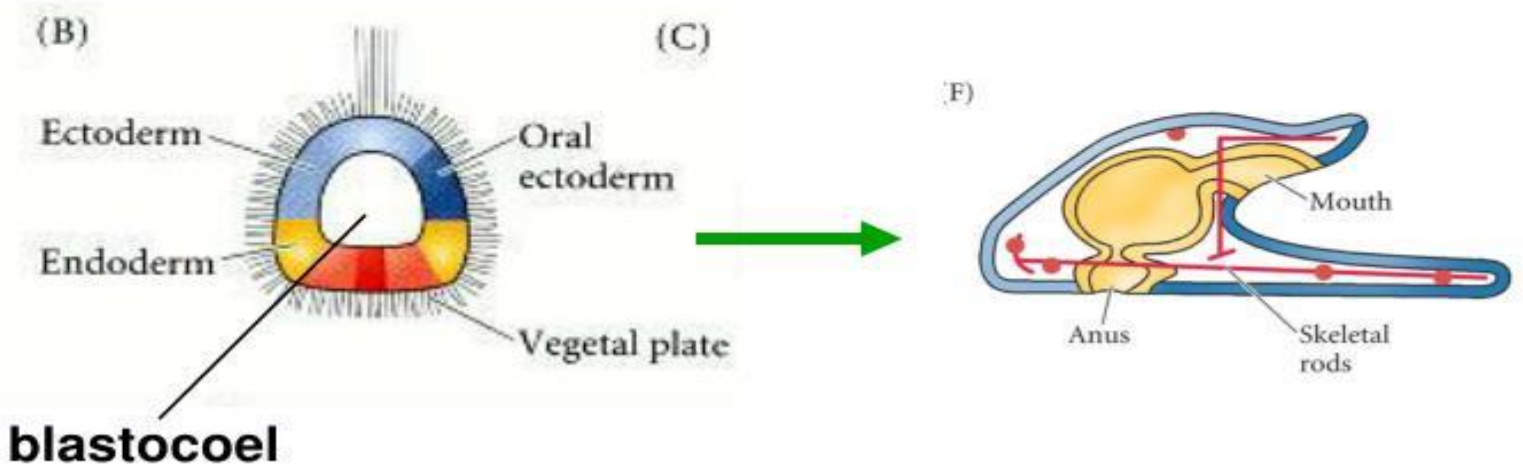


Wolpert et al, 2e, Fig. 8.33

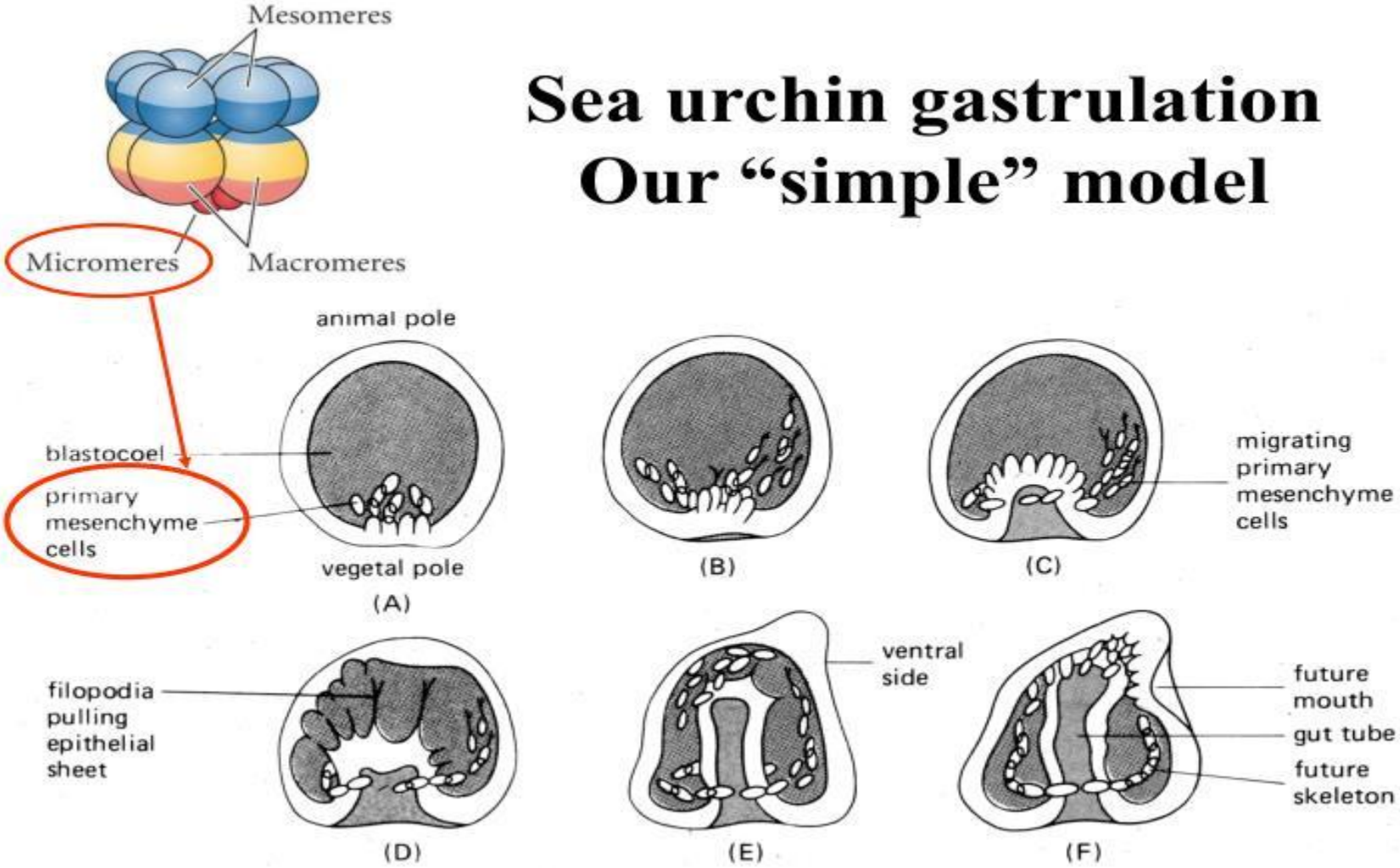
Sea urchin gastrulation

Our "simple" model

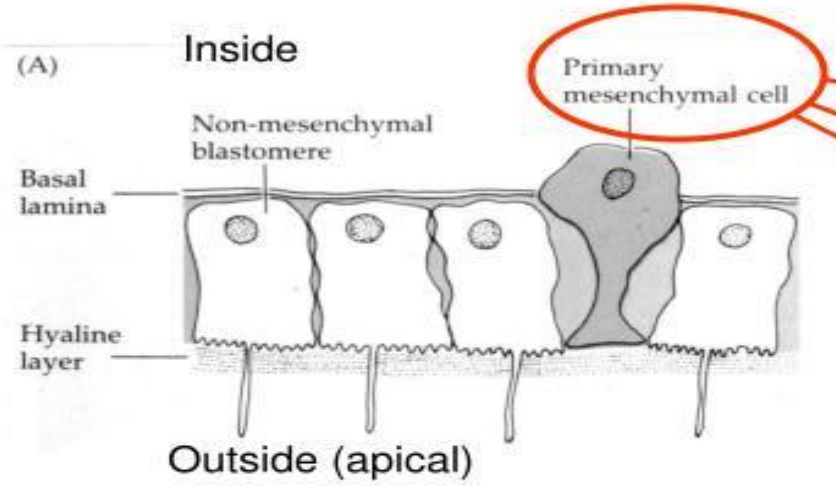
Fig. 5.14

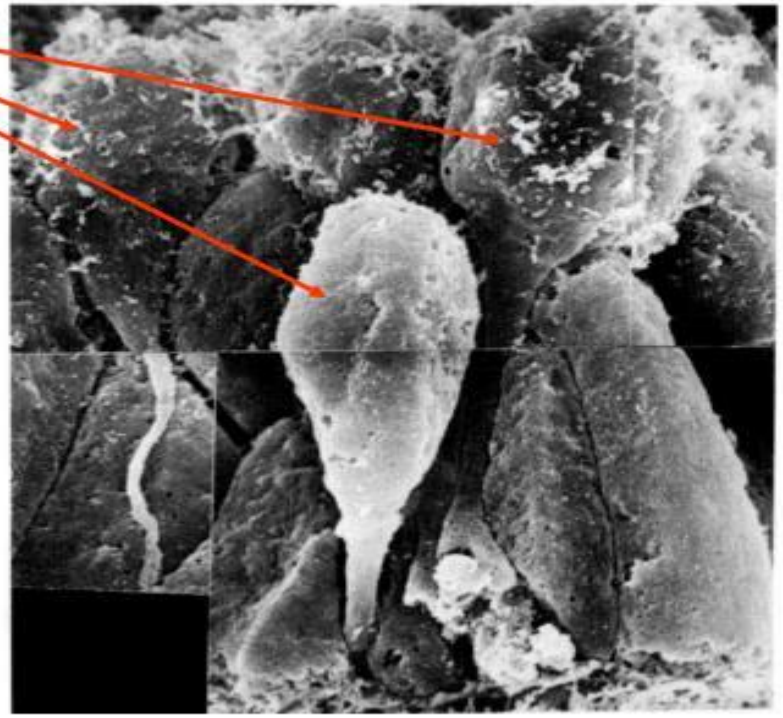


Sea urchin gastrulation
Our "simple" model



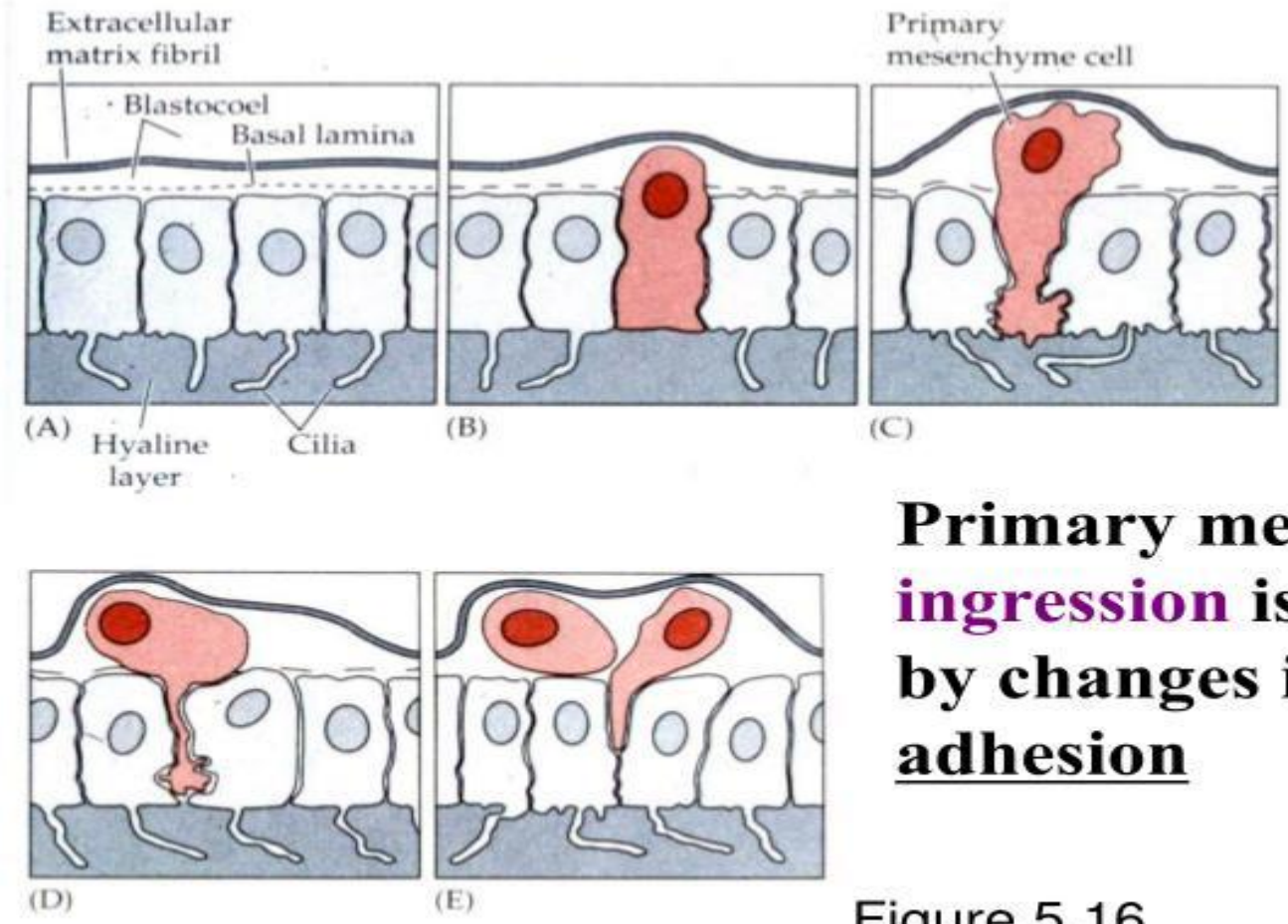
Step 1: Primary mesenchyme cells ingress





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

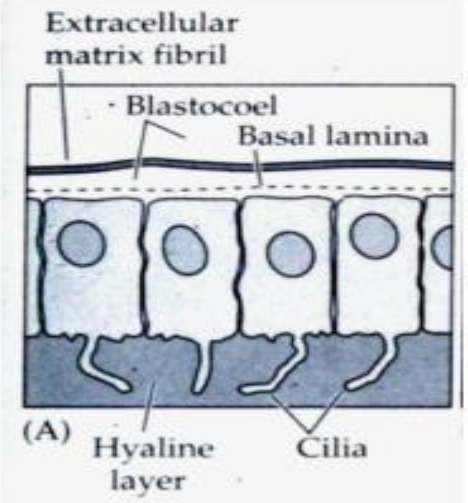
See also Figure 5.16

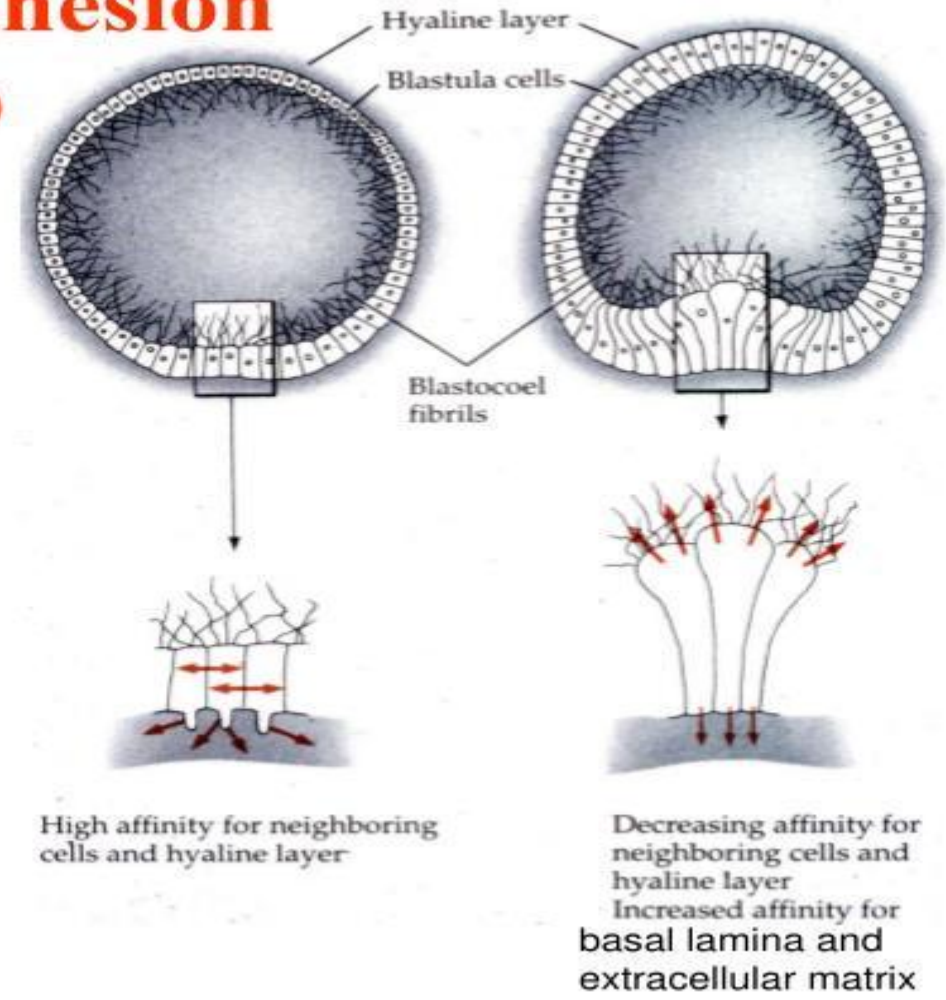


Primary mesenchyme ingression is driven by changes in cell adhesion

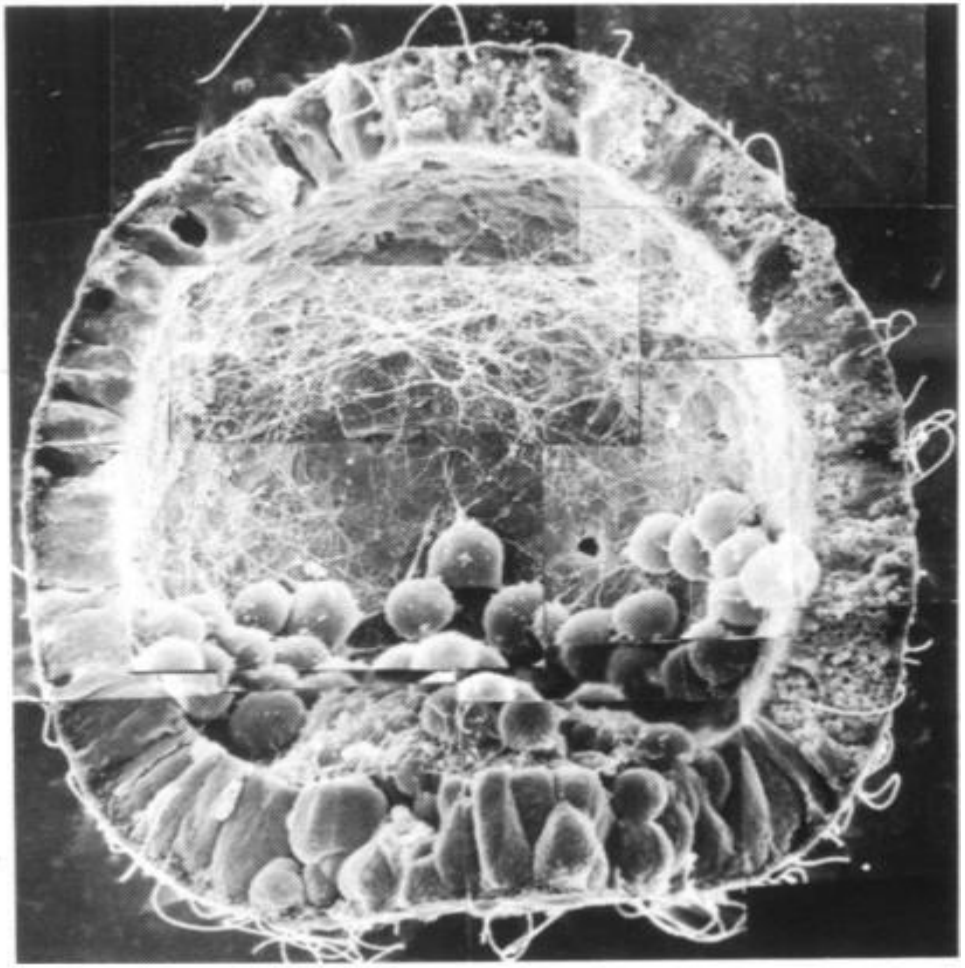
Figure 5.16

Changes in cell adhesion drive the first step of gastrulation





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)

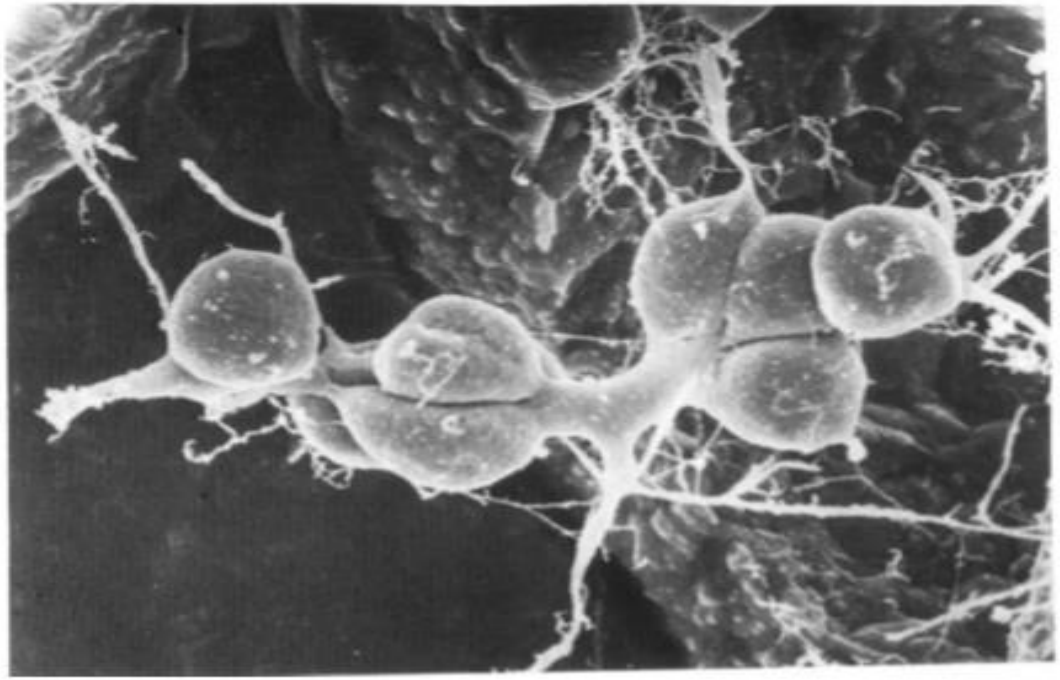


Figure 5.17

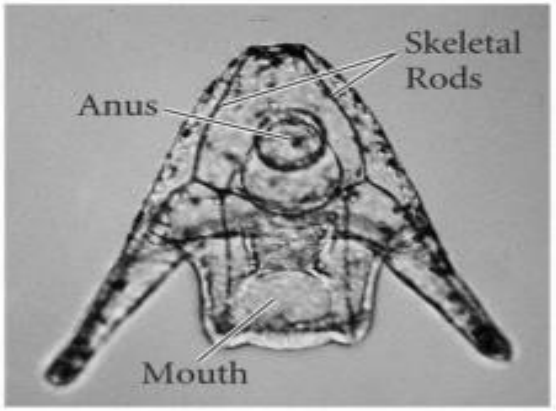


Figure 5.15

Step 2:
Apical constriction and changes in the extracellular matrix create a dome-shaped invagination = archenteron (primitive gut)

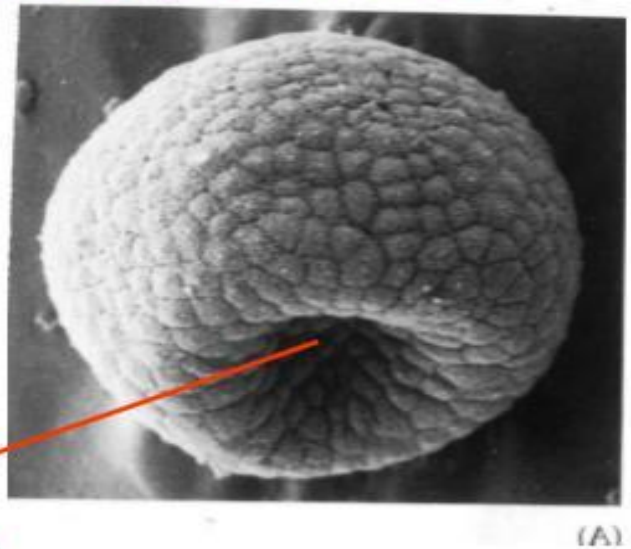
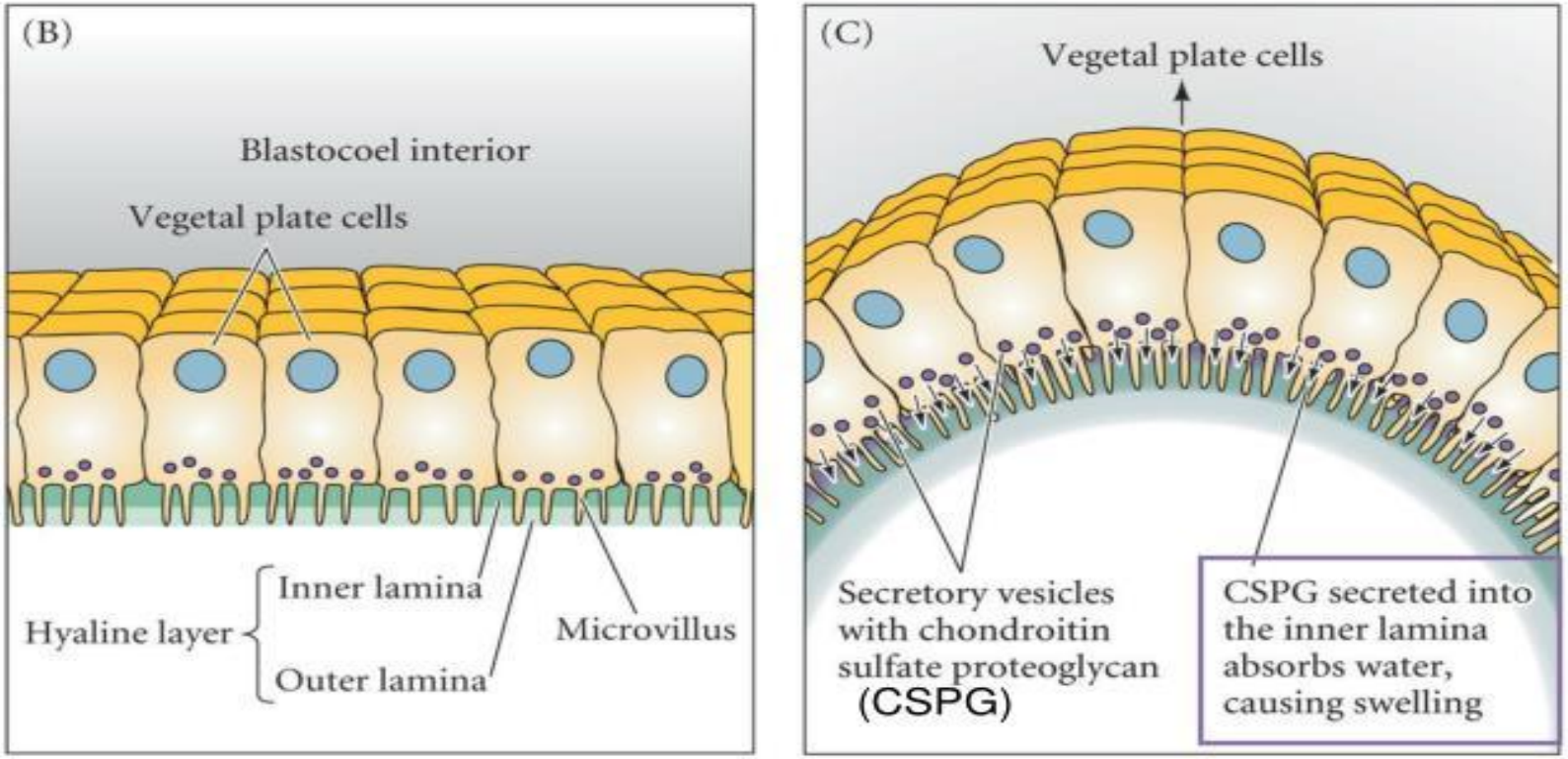
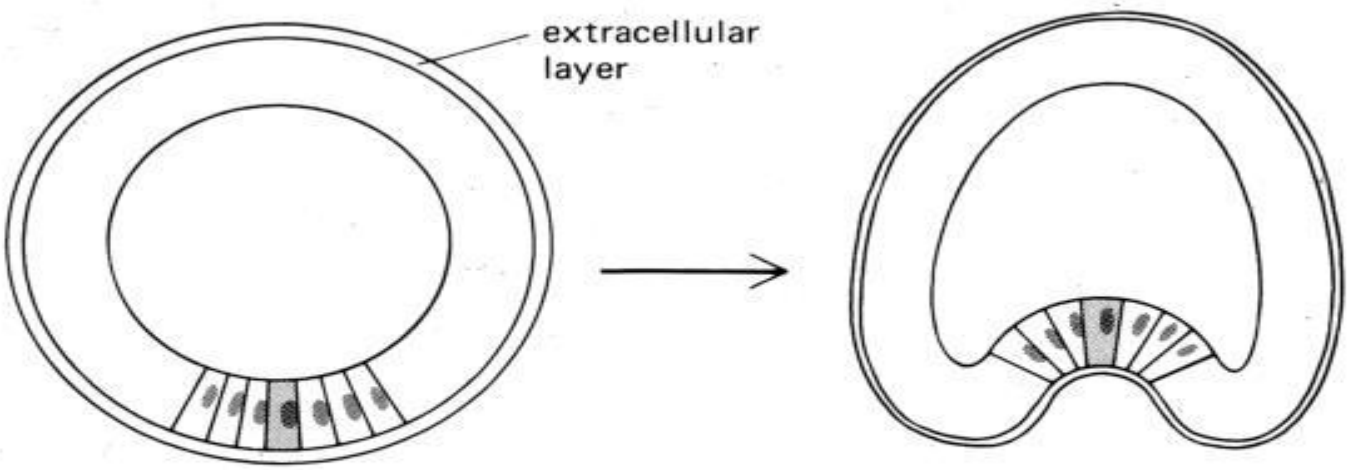


Figure 5.19

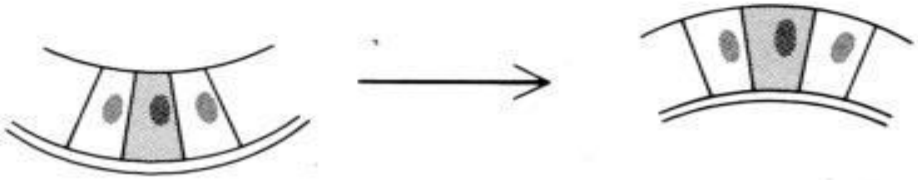
Invagination of the Vegetal Plate involves changes in the extracellular matrix



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

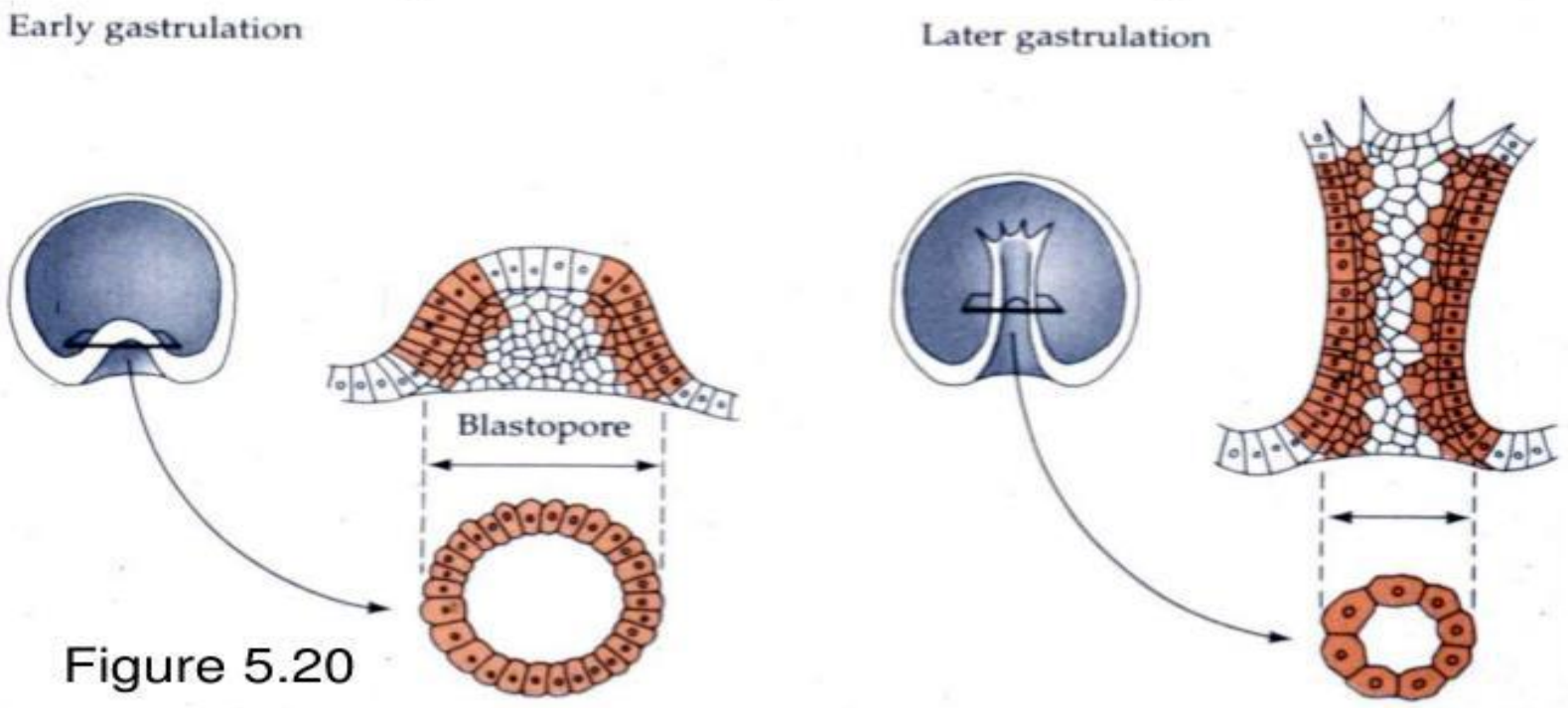


Figure 5.20

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

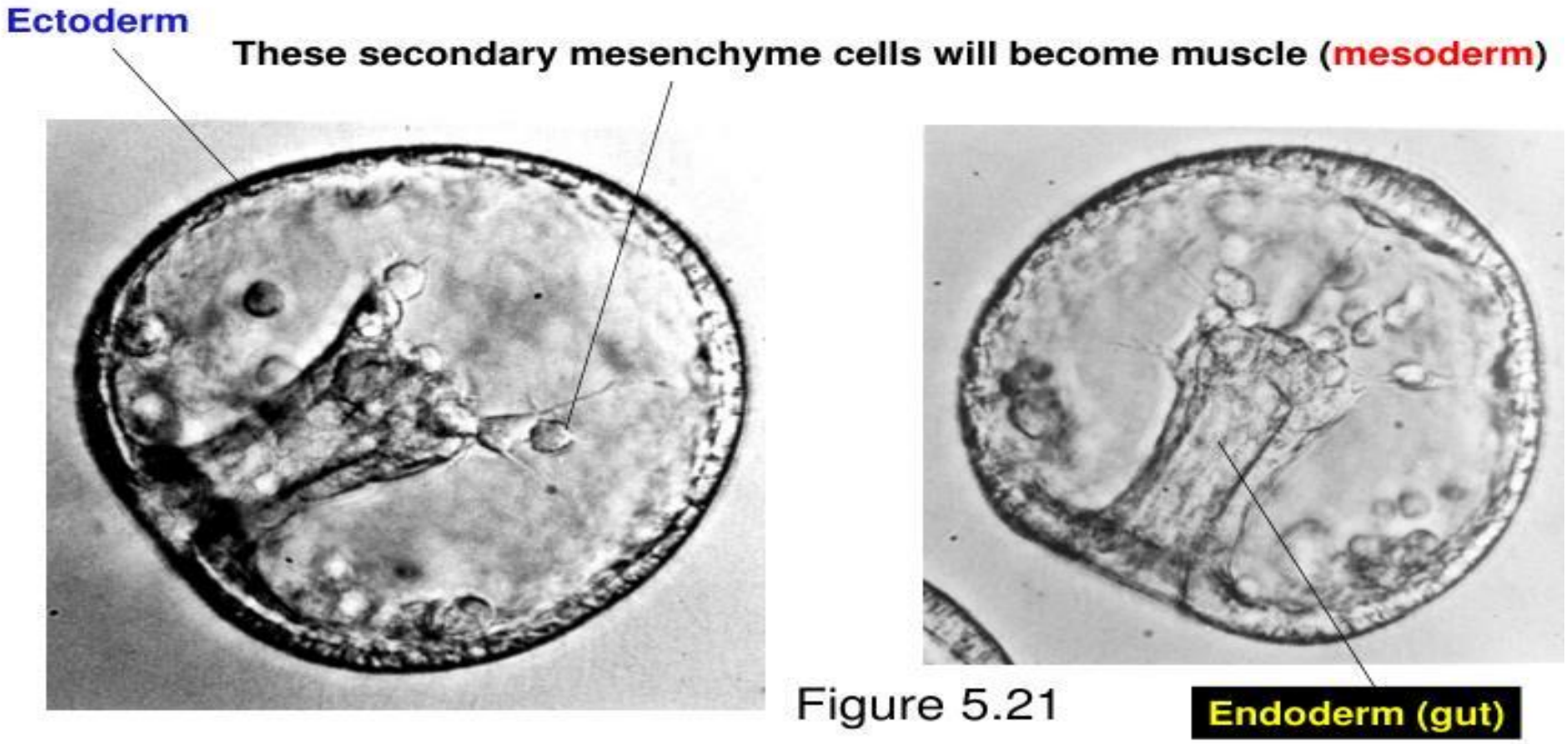
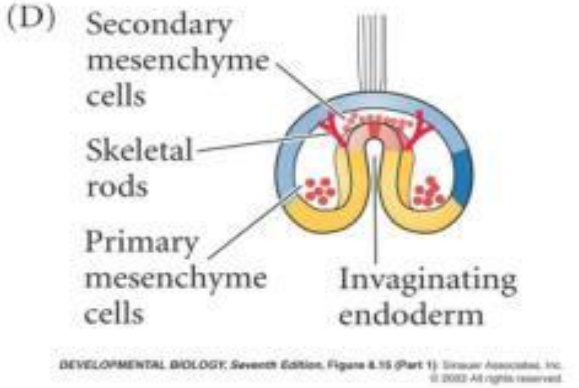
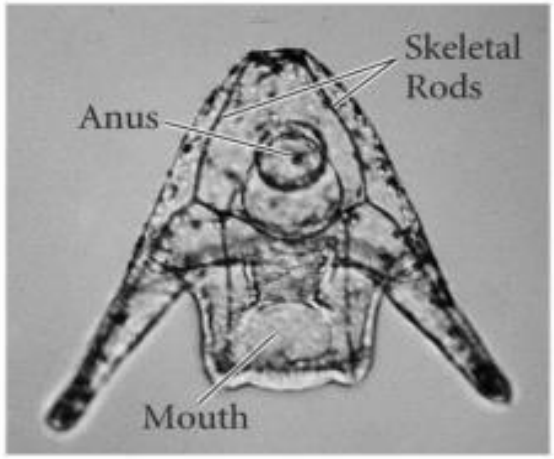
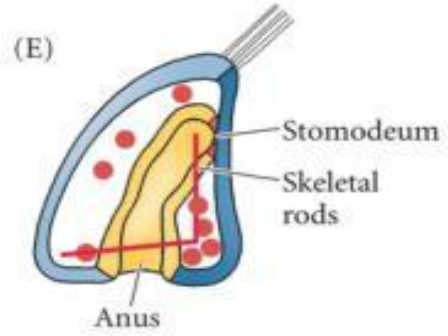


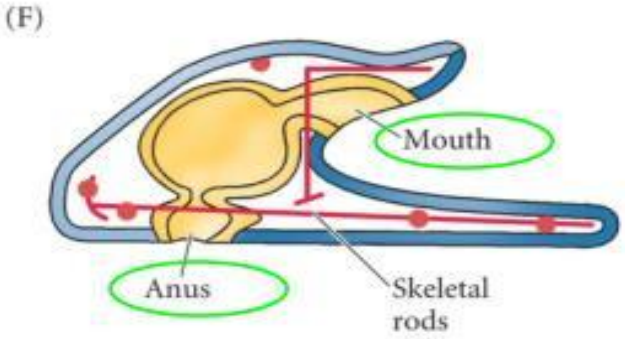
Figure 5.21





Pluteus larva





Pluteus larva

References

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