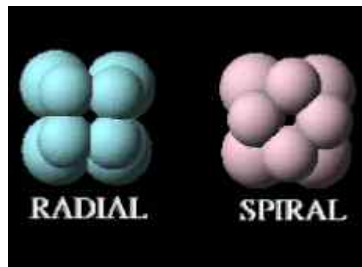
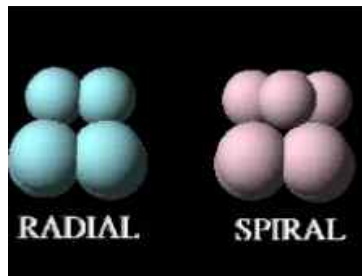


Padrões embriológicos do desenvolvimento:

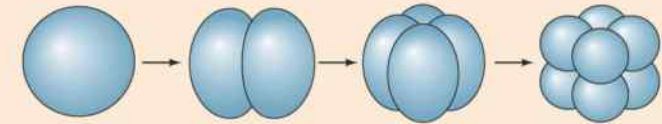


Isolecitos	
Mesolecitos	
Telolecitos	
Centrolecitos	

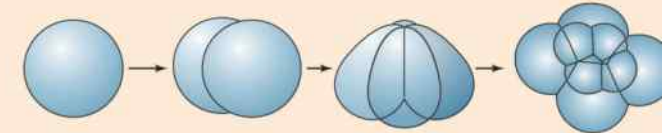
I. HOLOBLASTIC CLEAVAGE

A. Isolecithal

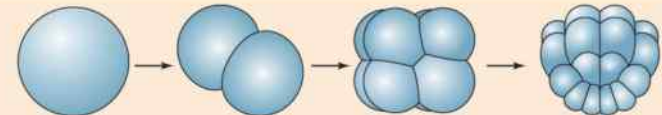
1. Radial cleavage
Echinoderms,
amphioxus



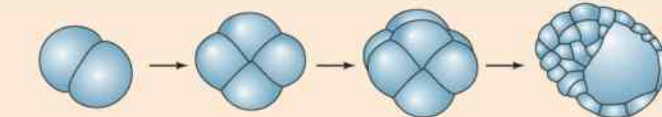
2. Spiral cleavage
Annelids, molluscs,
flatworms



3. Bilateral cleavage
Tunicates

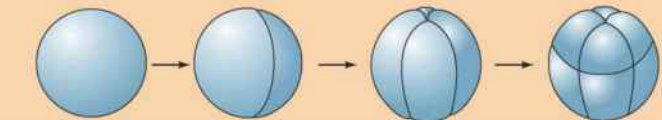


4. Rotational cleavage
Mammals, nematodes



B. Mesolecithal

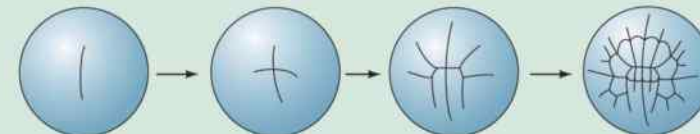
- Displaced radial cleavage
Amphibians



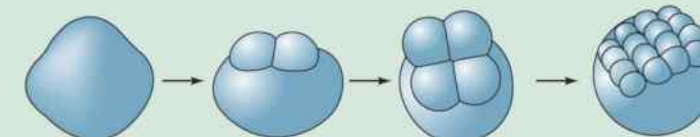
II. MEROBLASTIC CLEAVAGE

A. Telolecithal

1. Bilateral cleavage
Cephalopod
molluscs

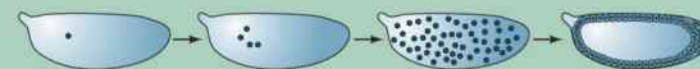


2. Discoidal cleavage
Fish, reptiles, birds

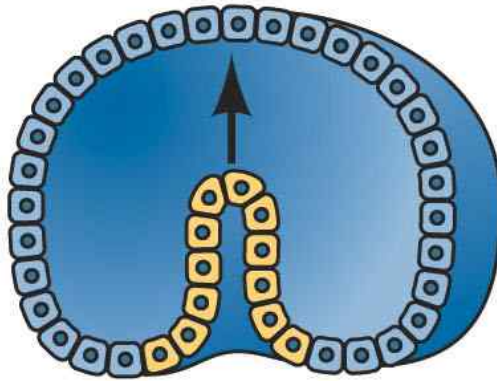


B. Centrolecithal

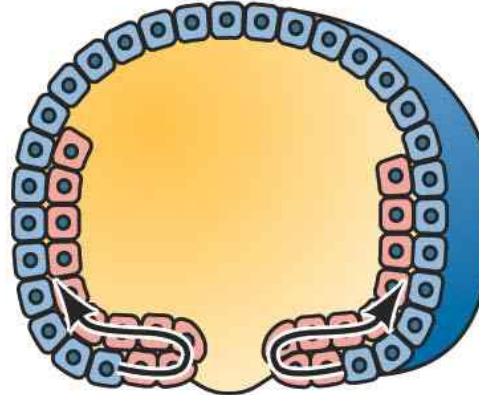
- Superficial cleavage
Most insects



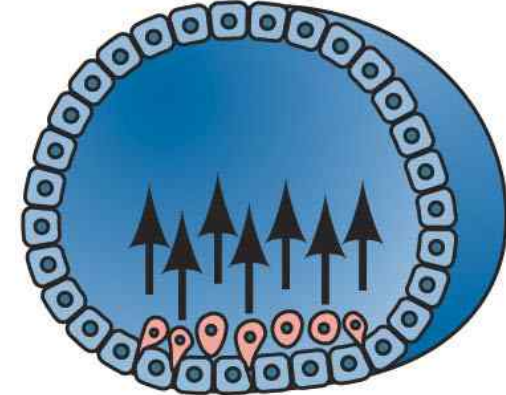
Invagination



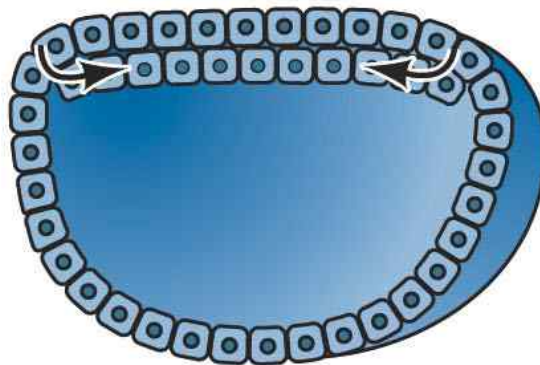
Involution



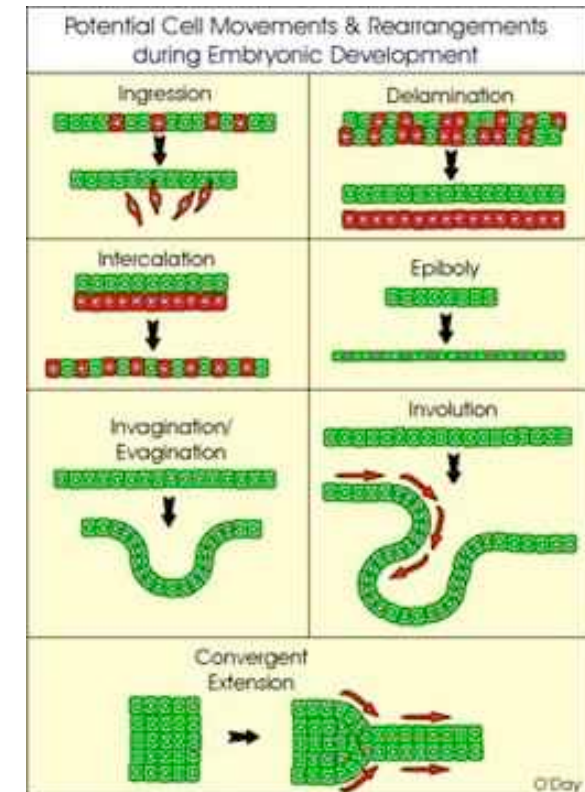
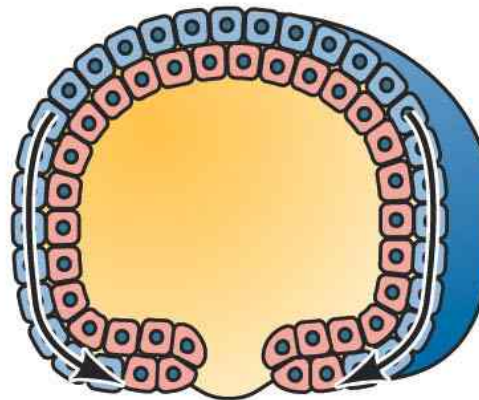
Ingression



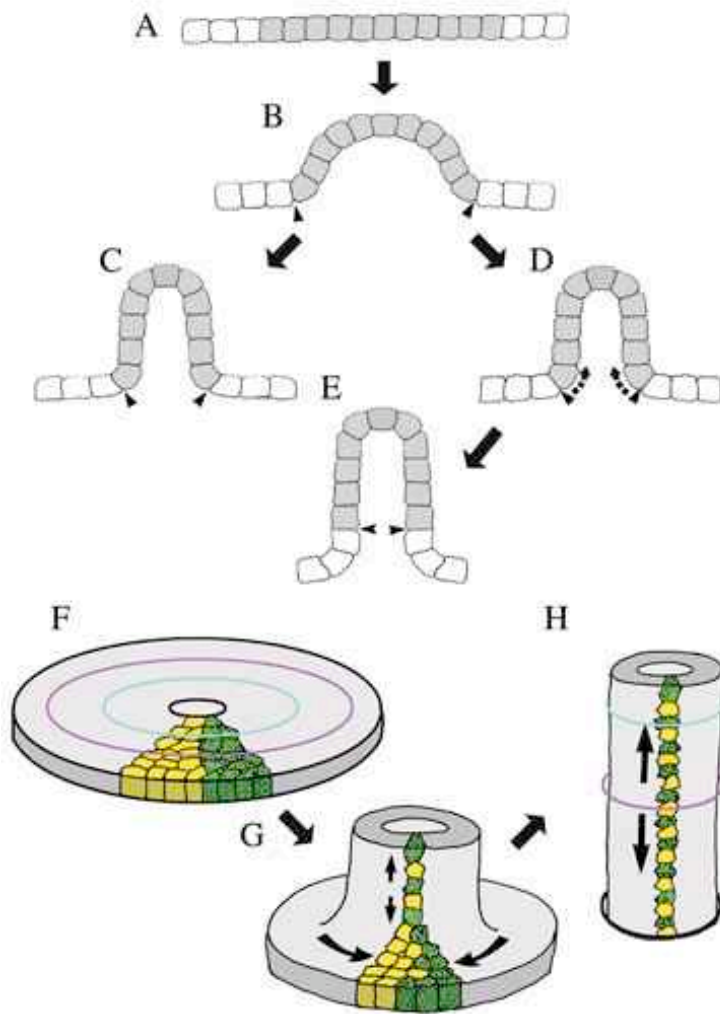
Delamination



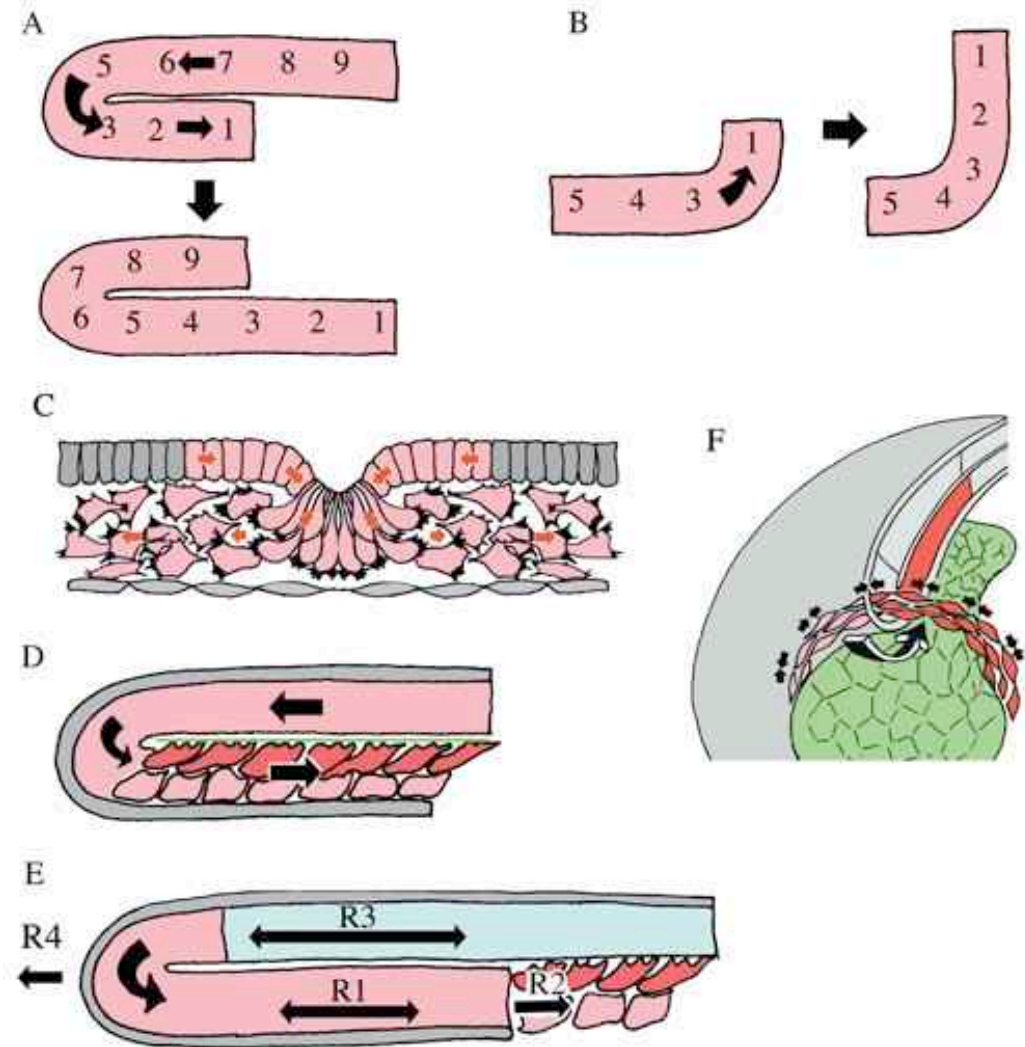
Epiboly



Movimentos da gastrulação

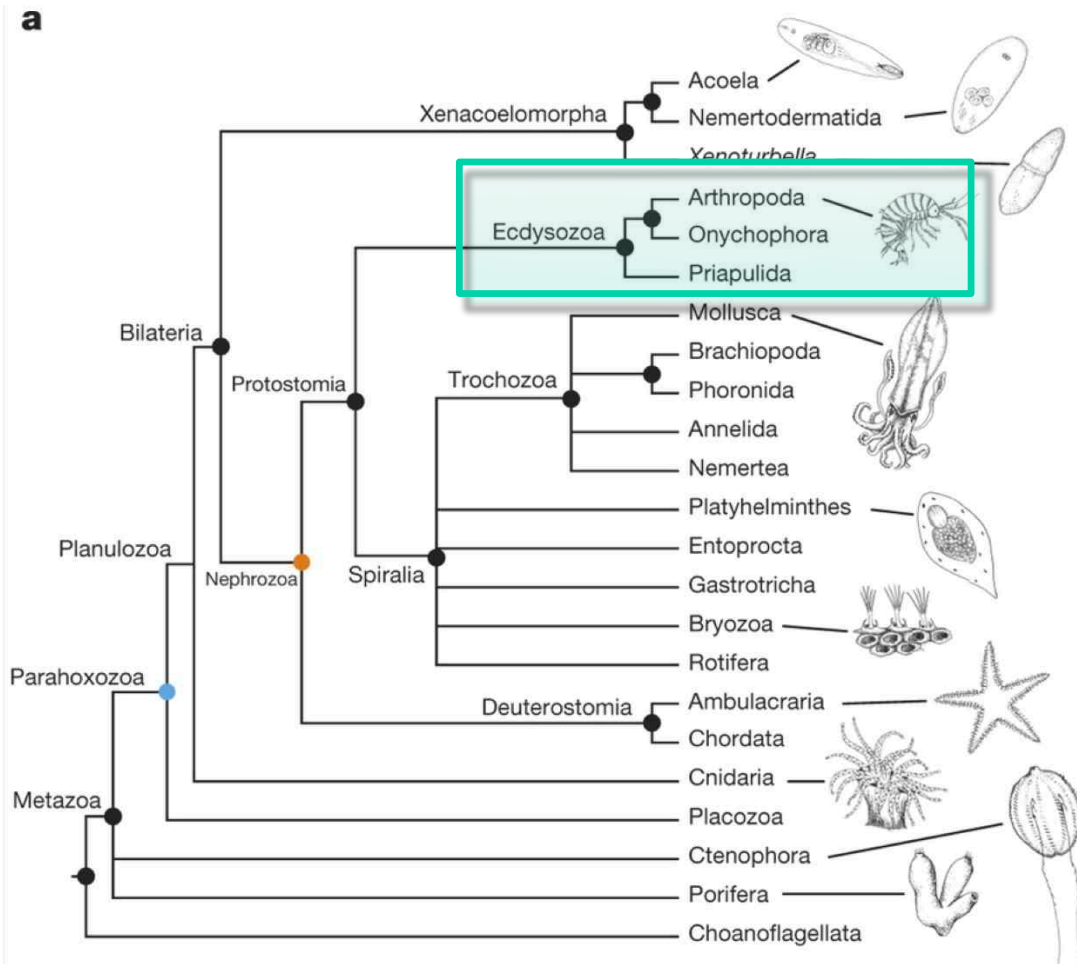


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Chapter 19, Figure 1



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From *Gastrulation: From Cells to Embryo*
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Chapter 19, Figure 4

Pattern of development in the Metazoans:



Cannon et al. 2016

Isolecitos
Mesolecitos
Telolecitos
Centrolecitos

Ecdysozoa:

Superficial cleavage
Most insects

4. Rotational cleavage
Mammals, nematodes

Spiralia:

A. Telolecithal

1. Bilateral cleavage
Cephalopod molluscs

2. Spiral cleavage
Annelids, molluscs, flatworms

Deuterostomia:

4. Rotational cleavage
Mammals, nematodes

2. Discoidal cleavage
Fish, reptiles, birds

B. Mesolecithal

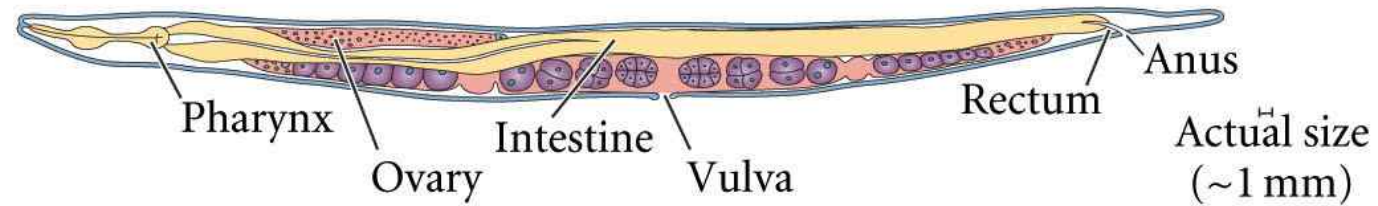
Displaced radial cleavage
Amphibians

3. Bilateral cleavage
Tunicates

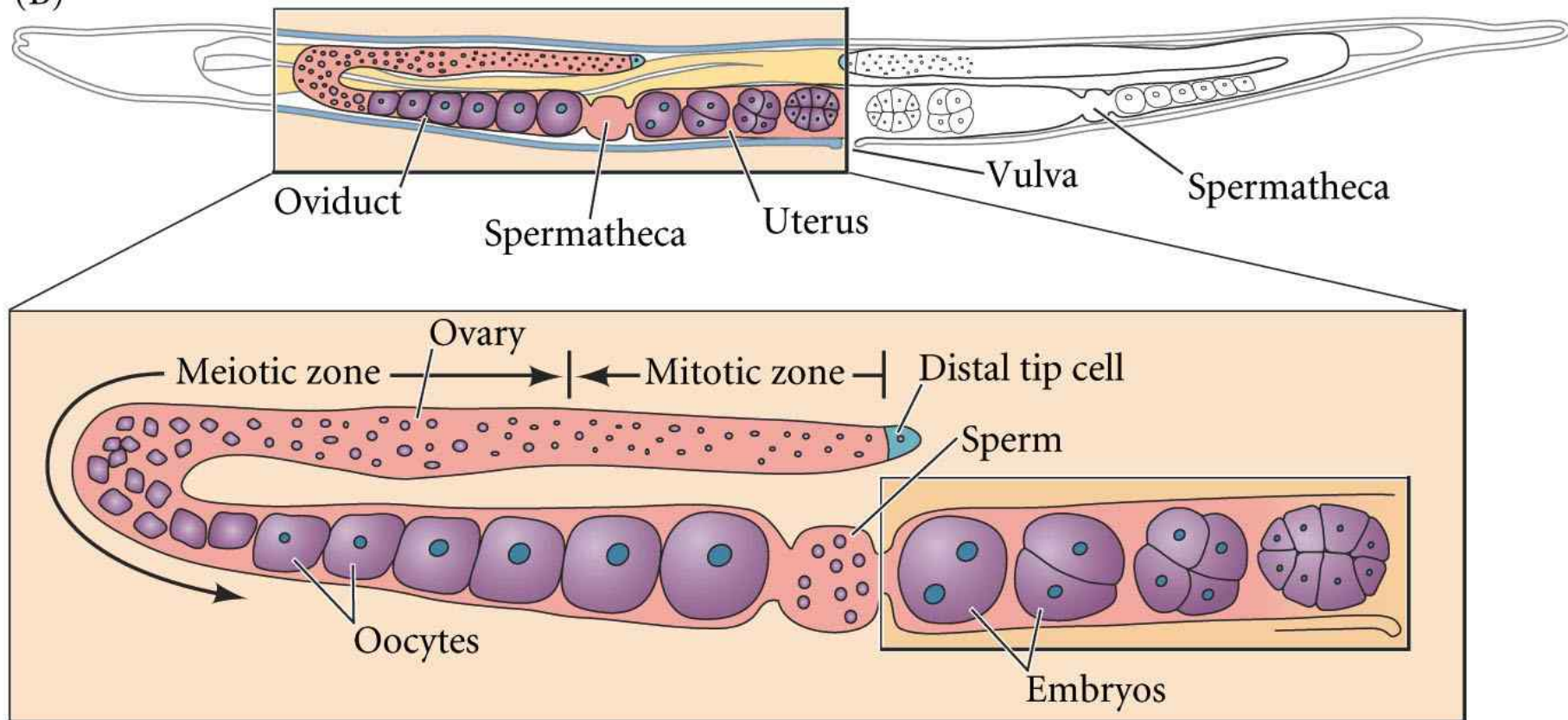
A. Isolecithal

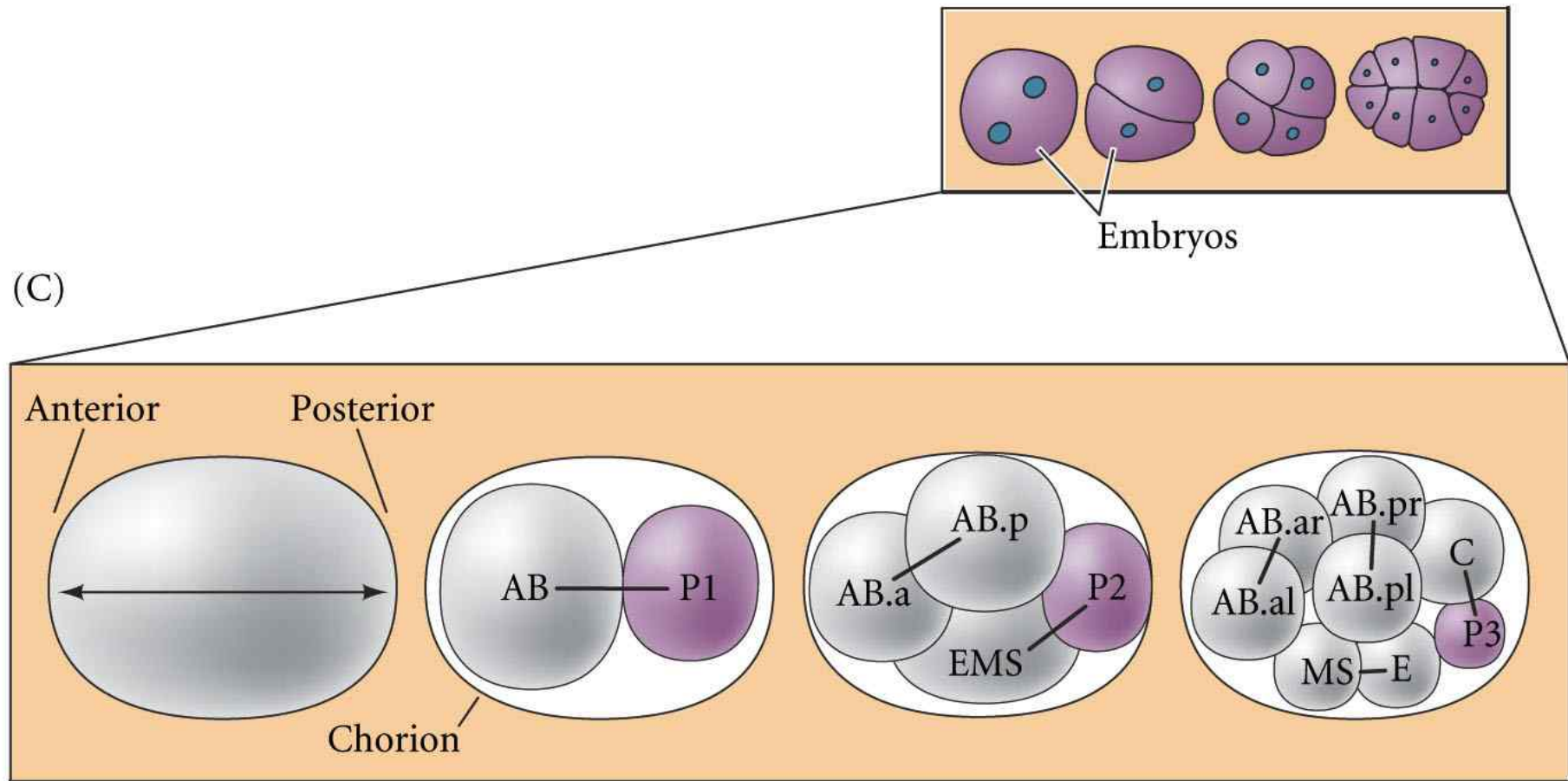
1. Radial cleavage
Echinoderms, amphioxus

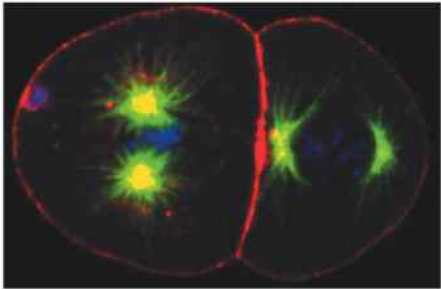
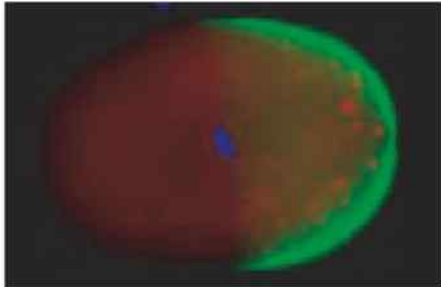
O nematódeo *Caenorhabditis elegans*



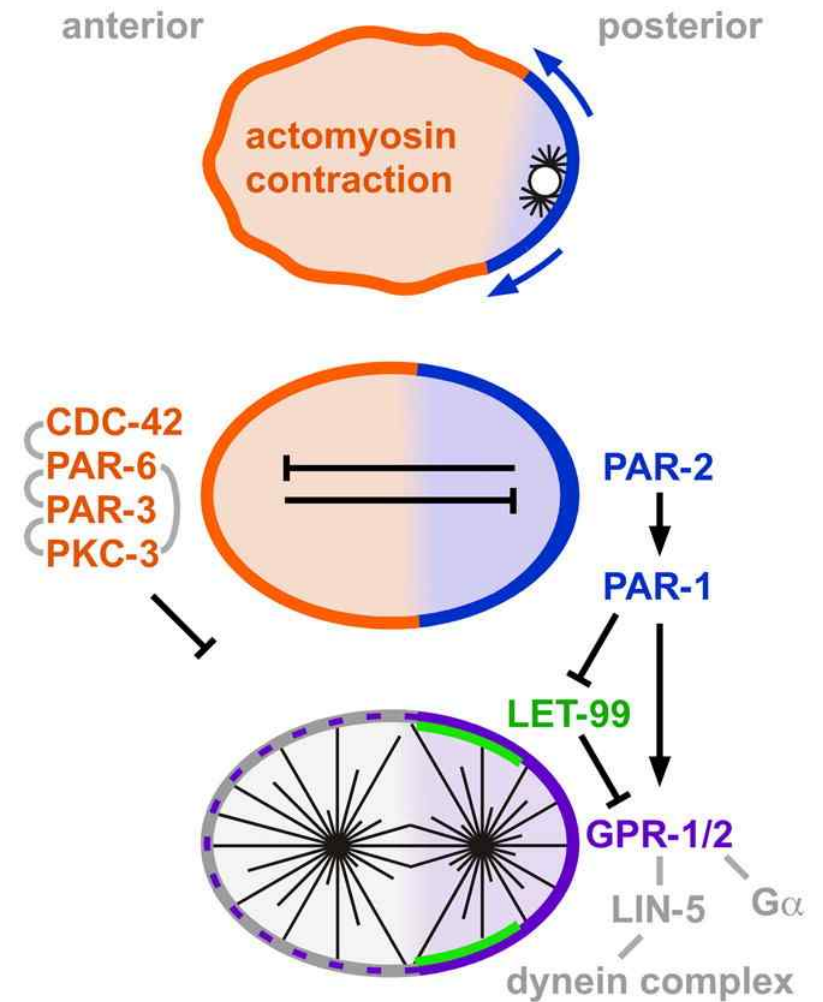
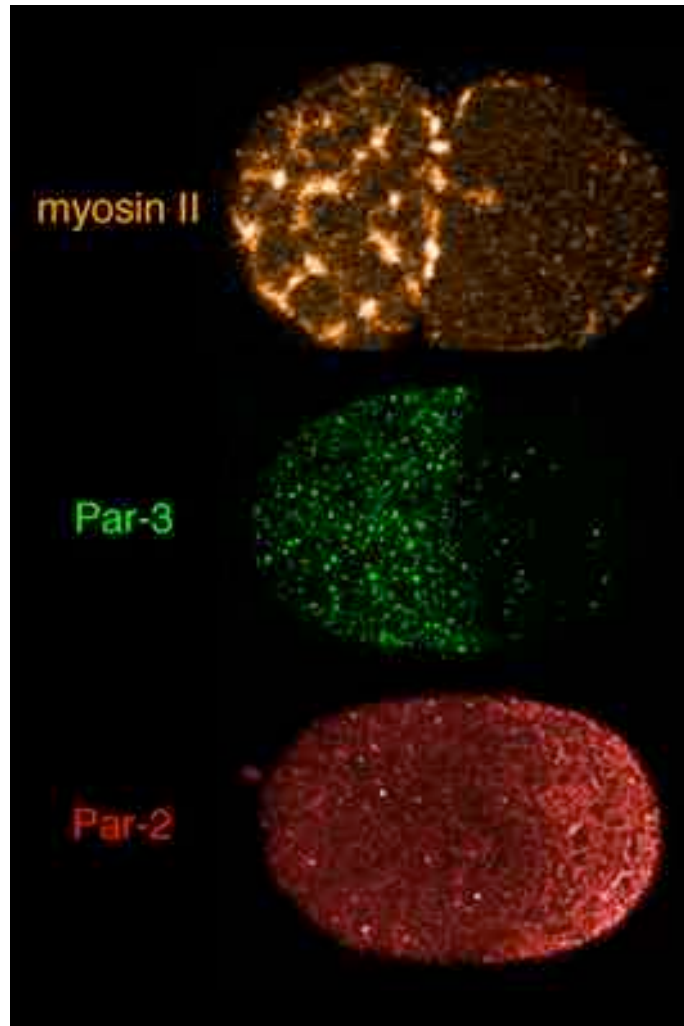
(B)



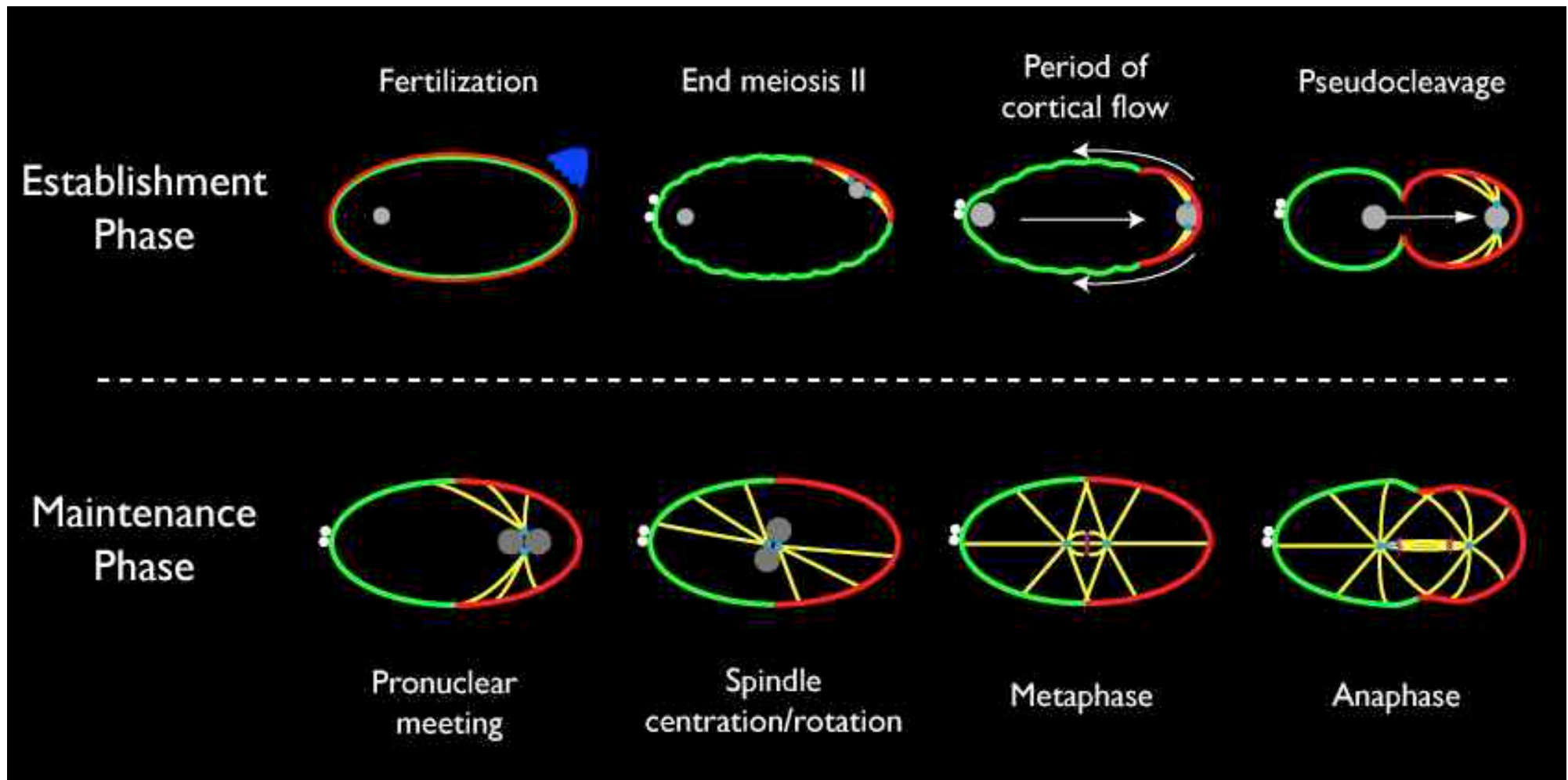




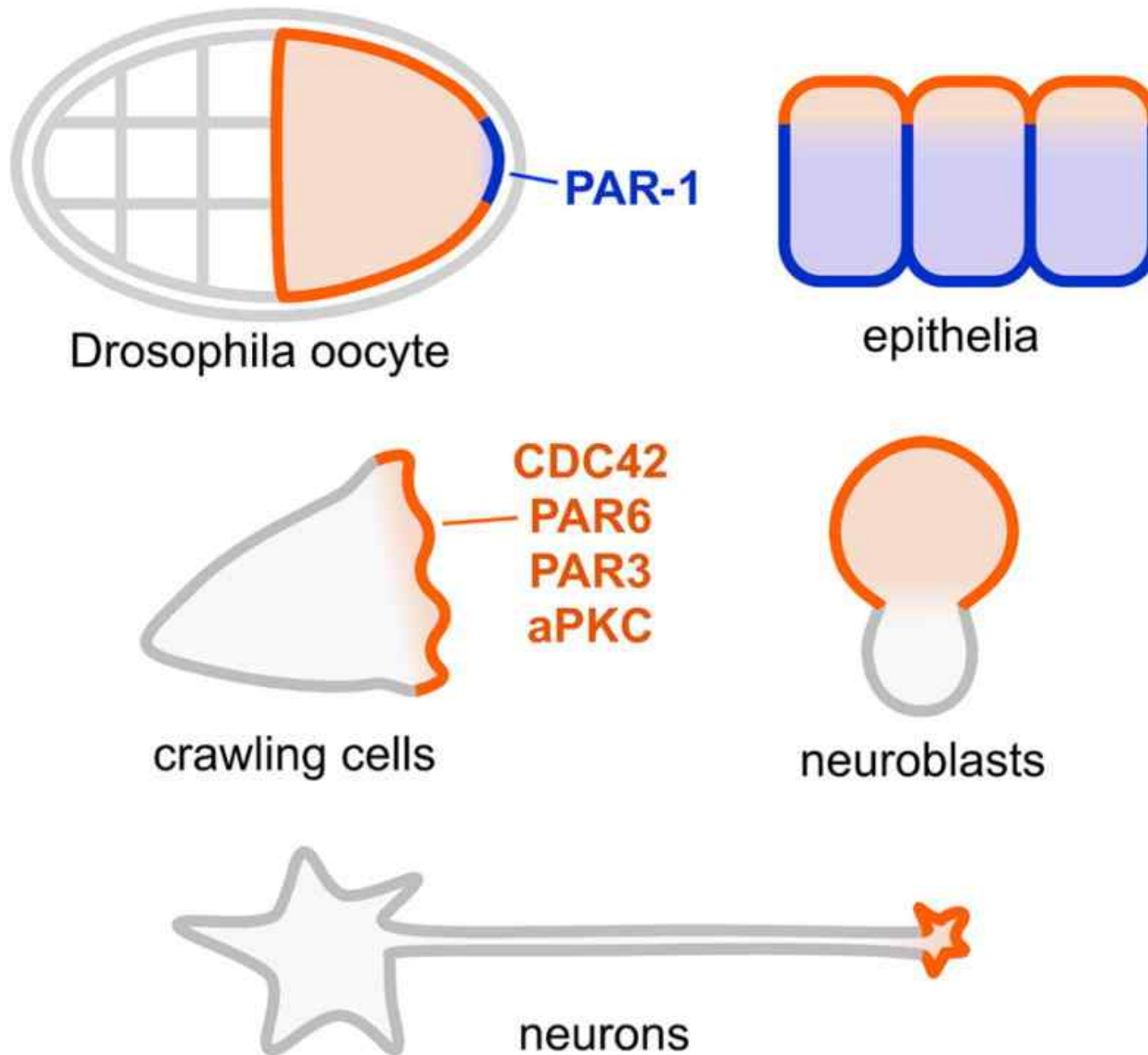
Divisiones
asimétricas:
Kemphues
(1988)
identifica
PARs en
nemátodos



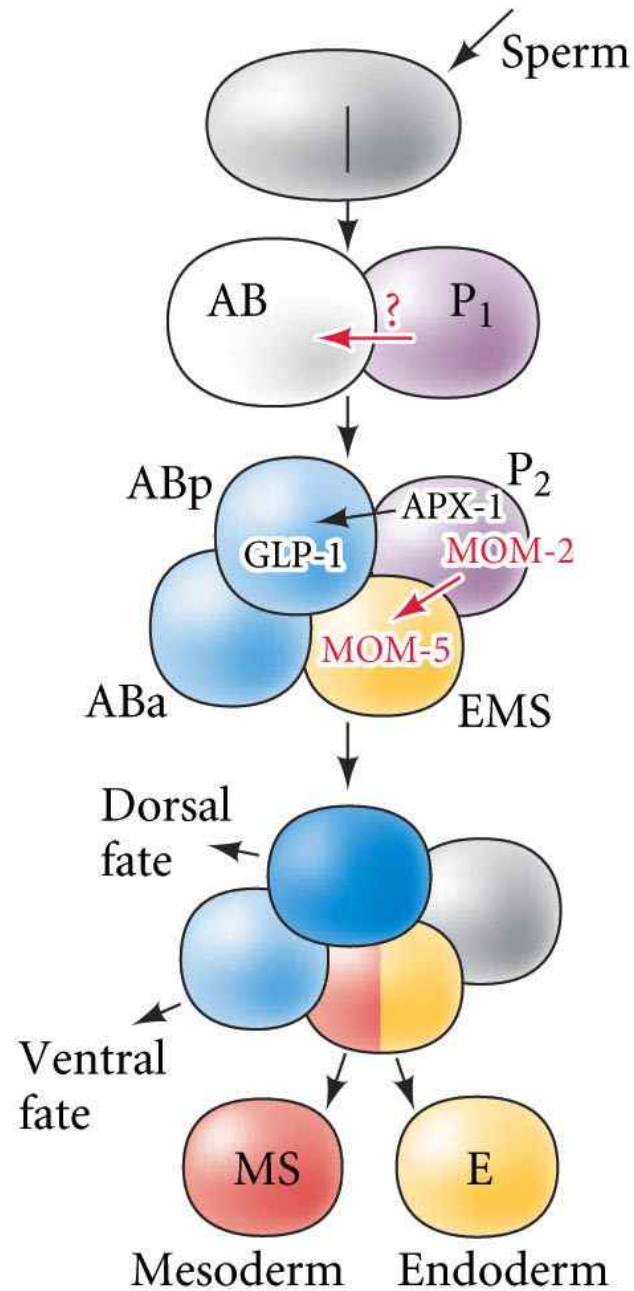
Munro Lab:



PAR Localization in Multiple Systems

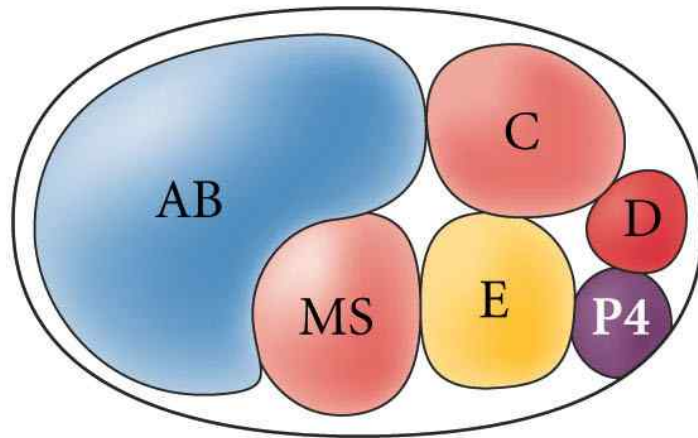


Cell-cell signaling in the 4-cell embryo of *C. elegans*

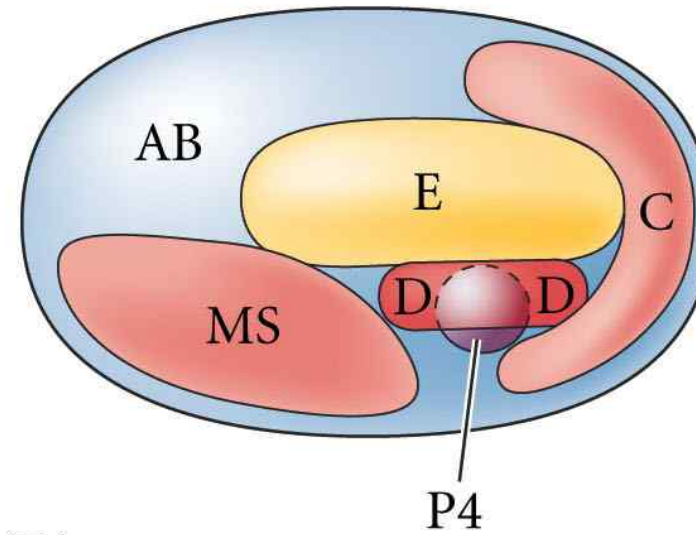


Gastrulação em *C. elegans*

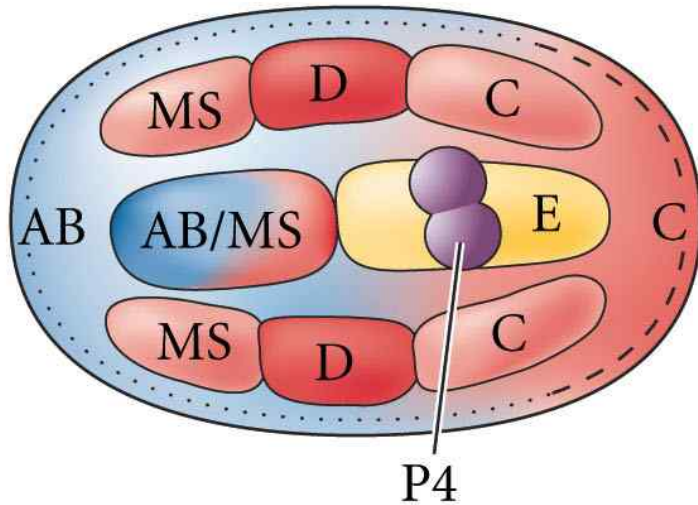
(A)



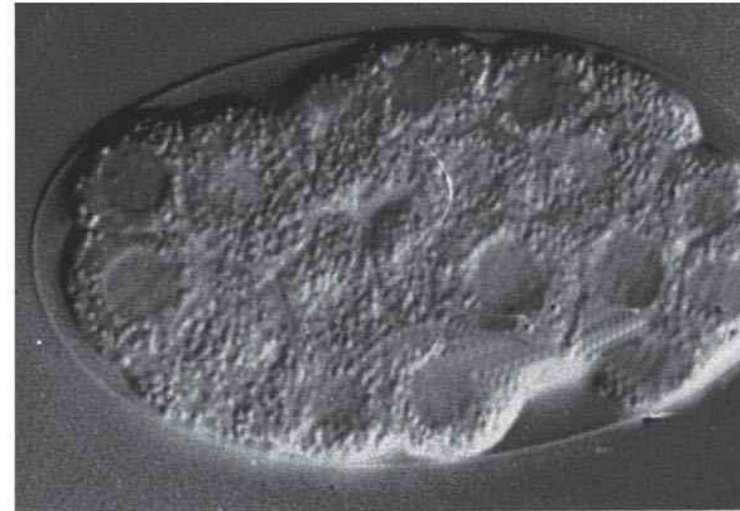
(B)

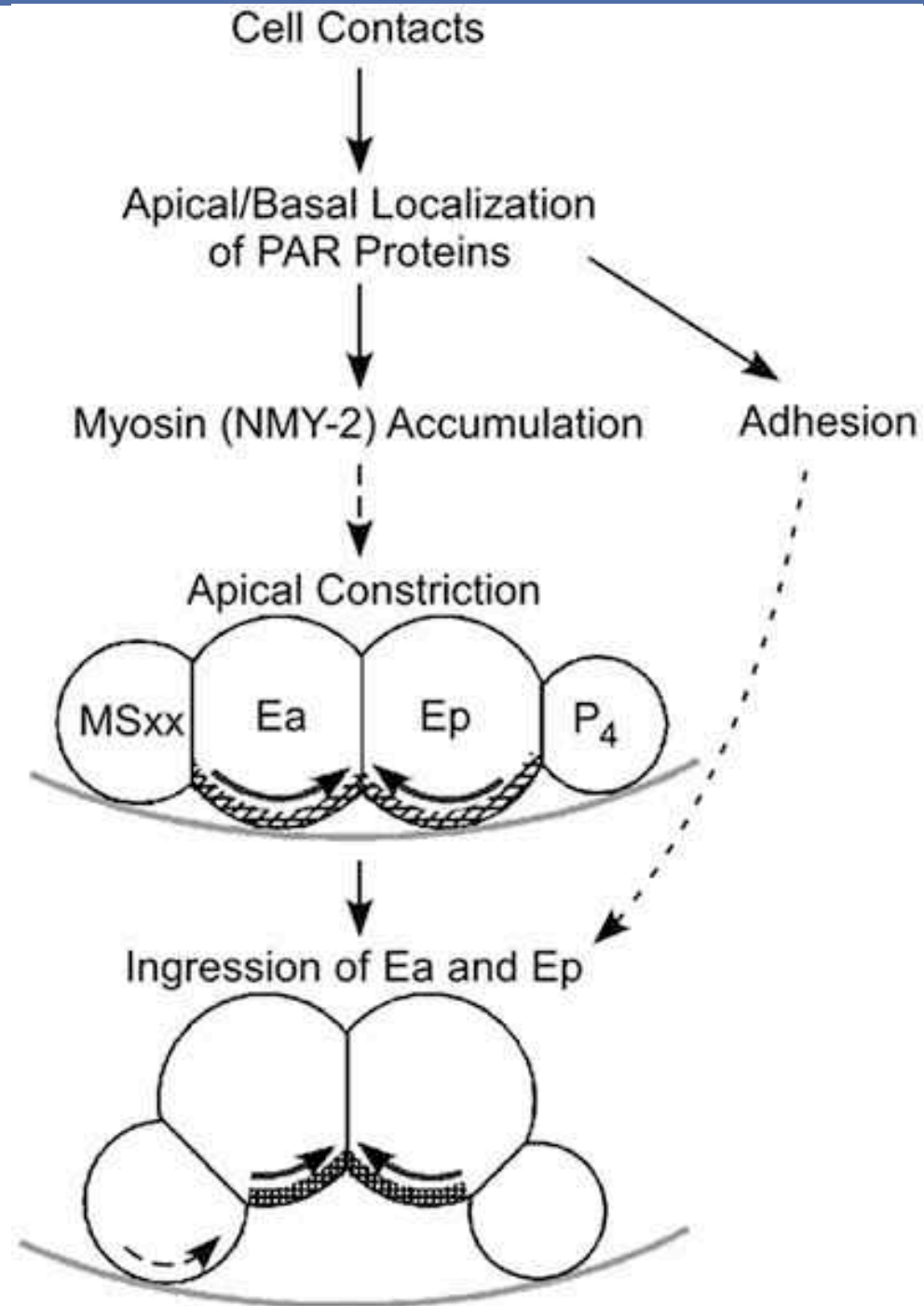


(C)

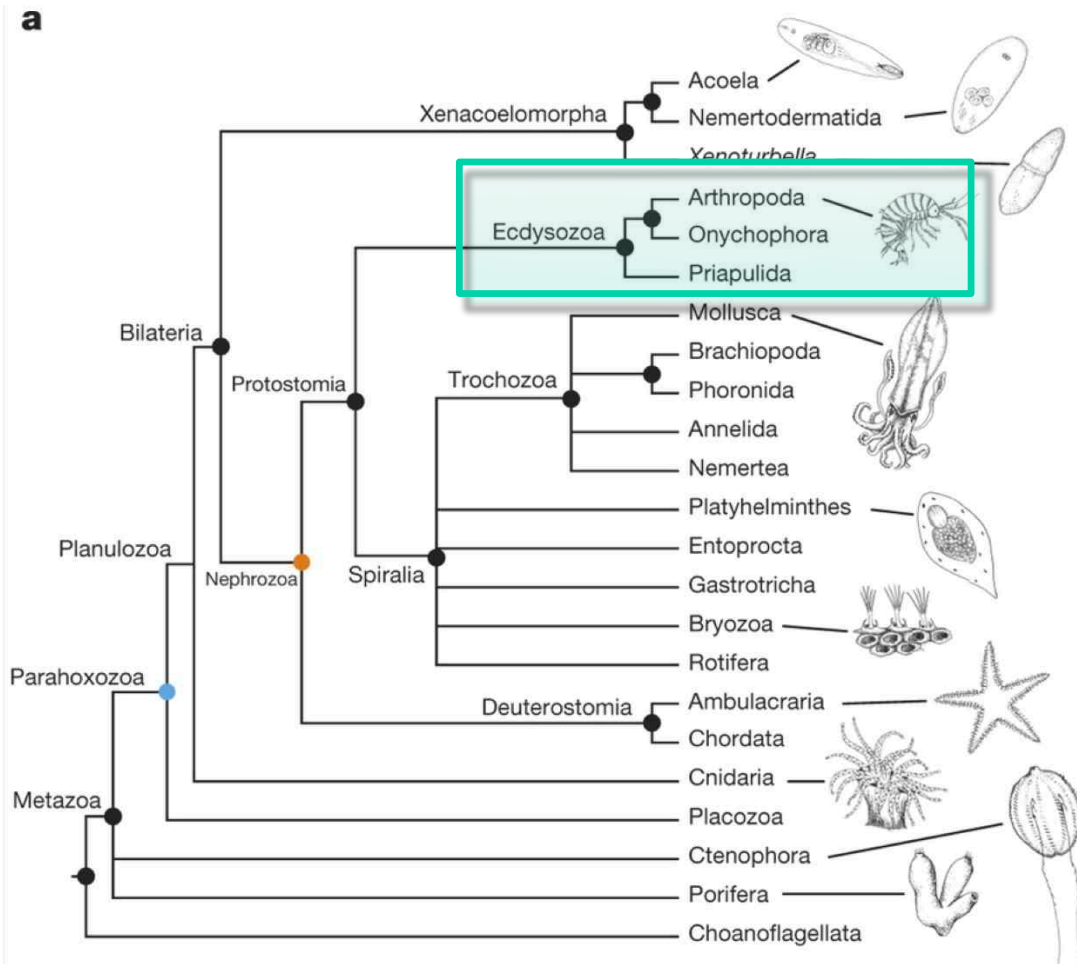


(D)





Pattern of development in the Metazoans:



Cannon et al. 2016

Ecdysozoa:

Superficial cleavage
Most insects

4. Rotational cleavage
Mammals, nematodes

Spiralia:

1. Bilateral cleavage
Cephalopod molluscs

2. Spiral cleavage
Annelids, molluscs, flatworms

Deuterostomia:

4. Rotational cleavage
Mammals, nematodes

2. Discoidal cleavage
Fish, reptiles, birds

B. Mesolecithal

Displaced radial cleavage
Amphibians

3. Bilateral cleavage
Tunicates

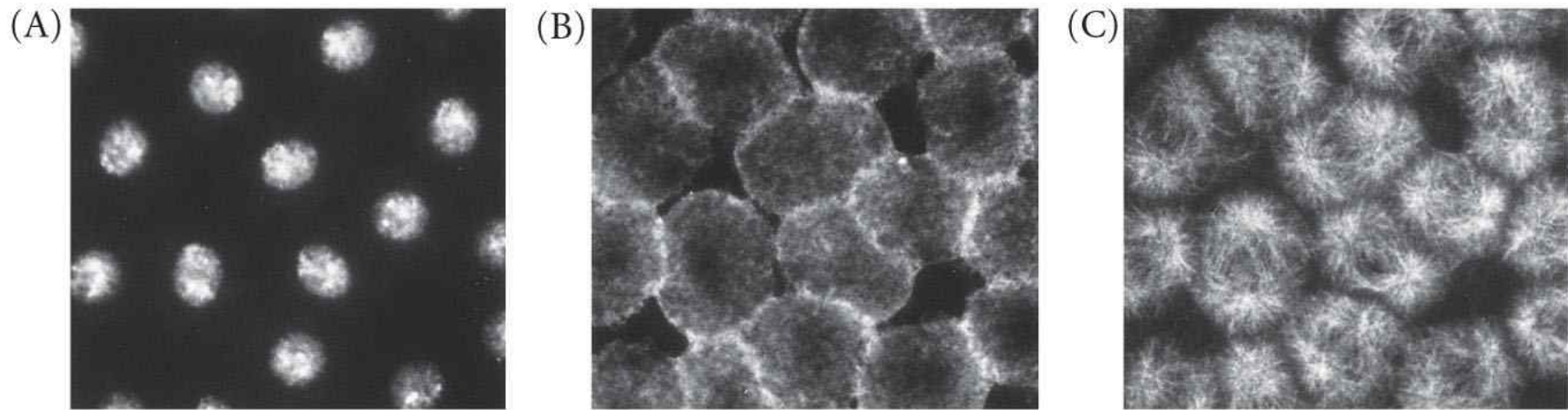
A. Isolecithal

1. Radial cleavage
Echinoderms, amphioxus

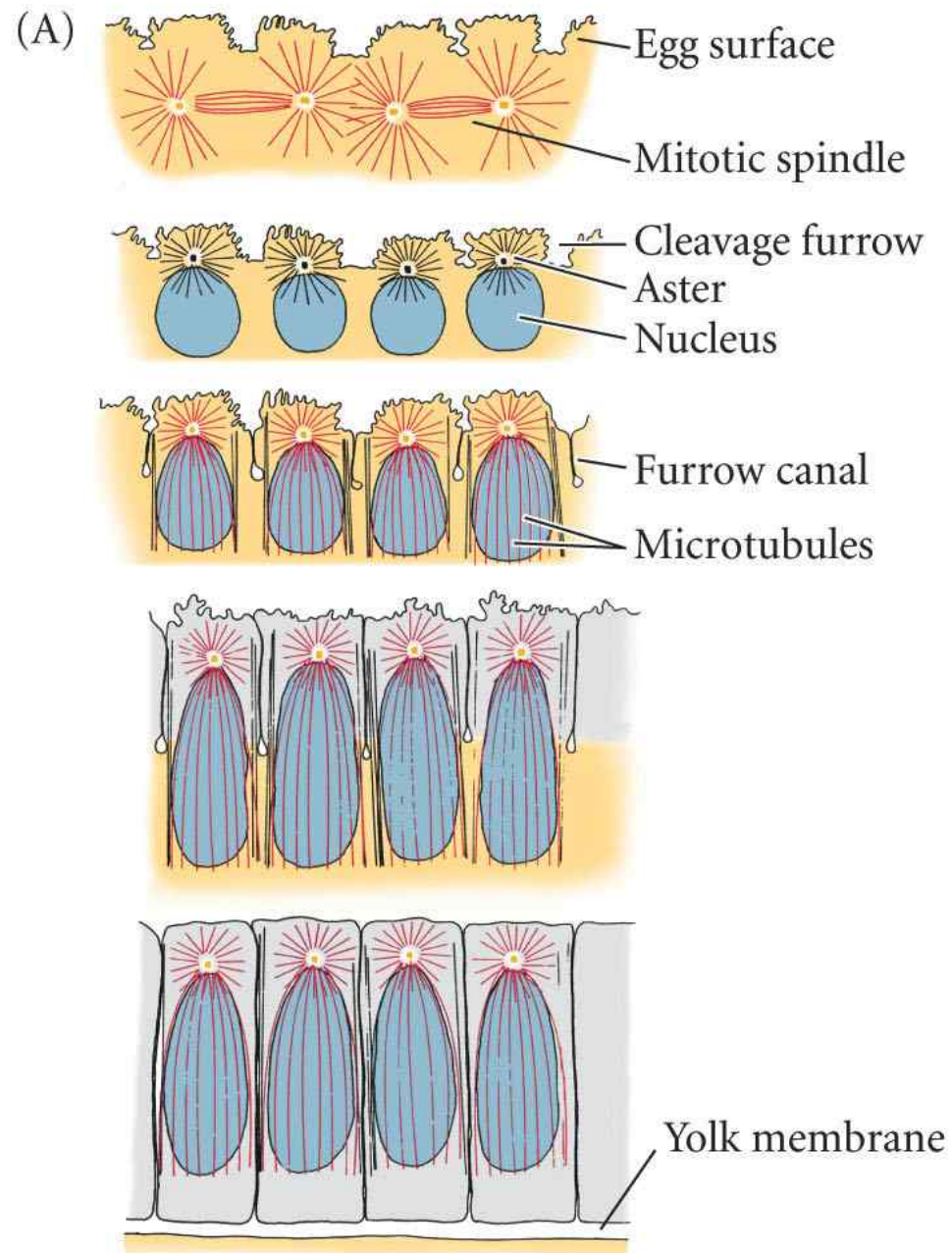
Laser confocal micrographs of stained chromatin showing superficial cleavage in a *Drosophila* embryo



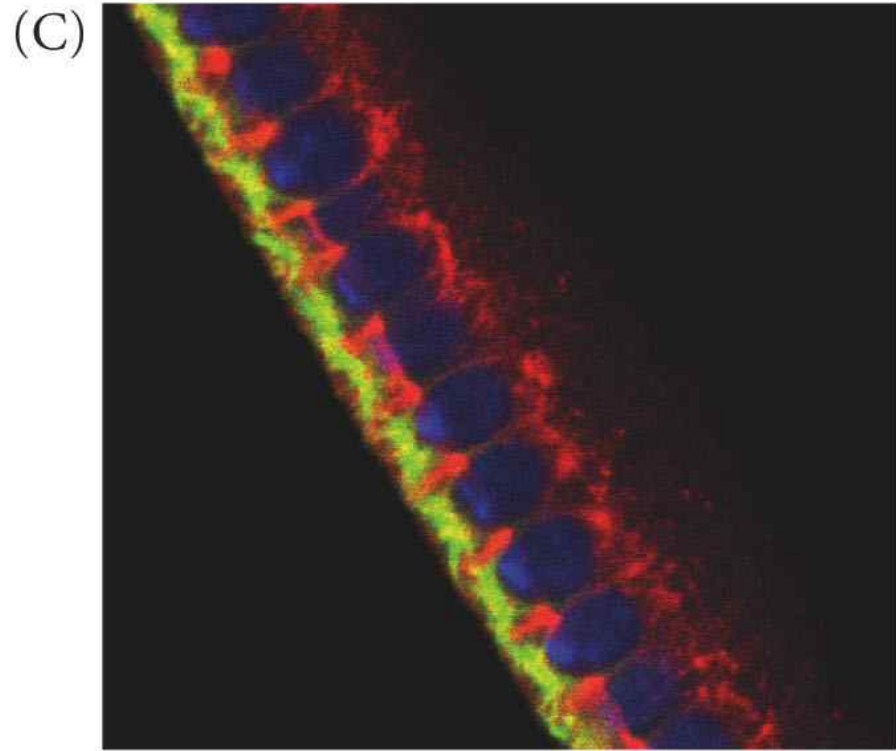
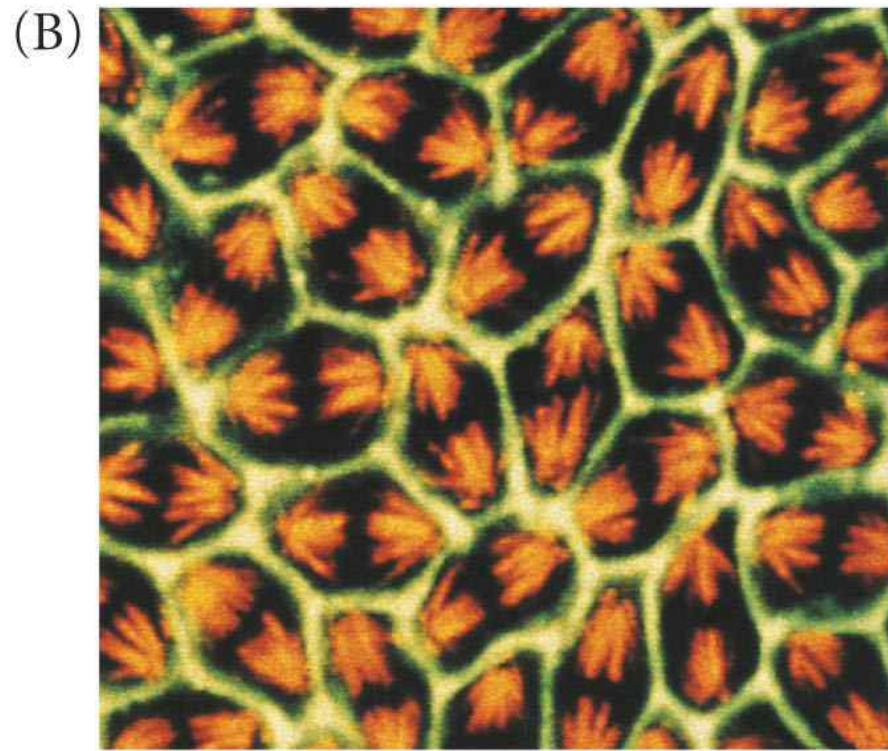
9.2 Localization of the cytoskeleton around nuclei in the syncytial blastoderm of *Drosophila*



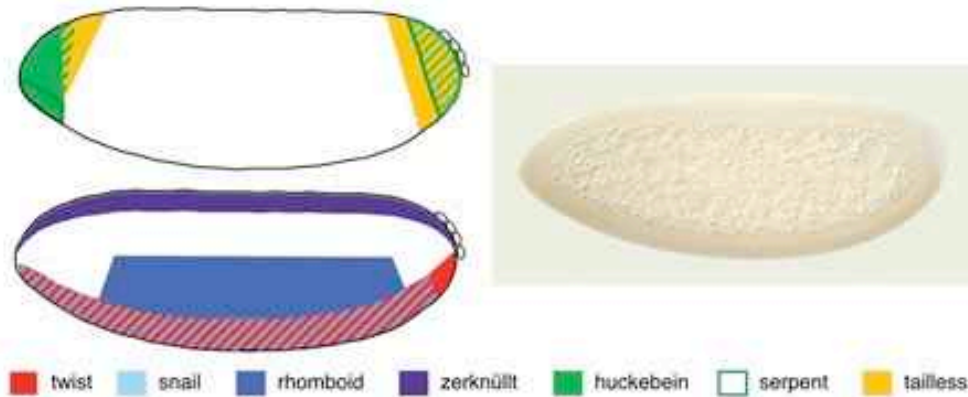
9.3 Formation of the cellular blastoderm in *Drosophila* (Part 1)



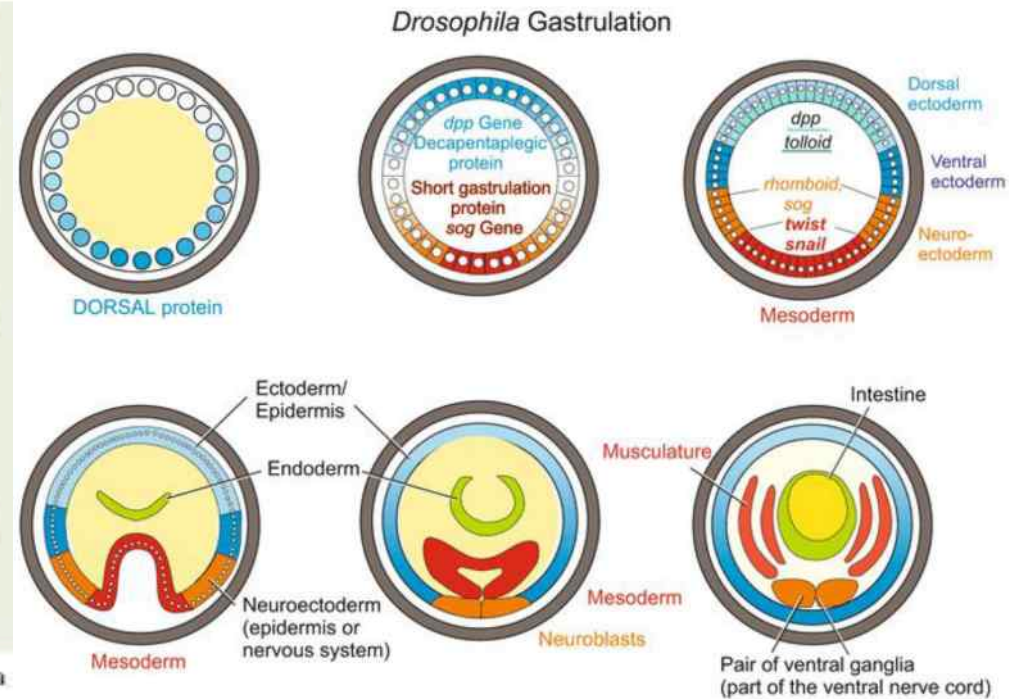
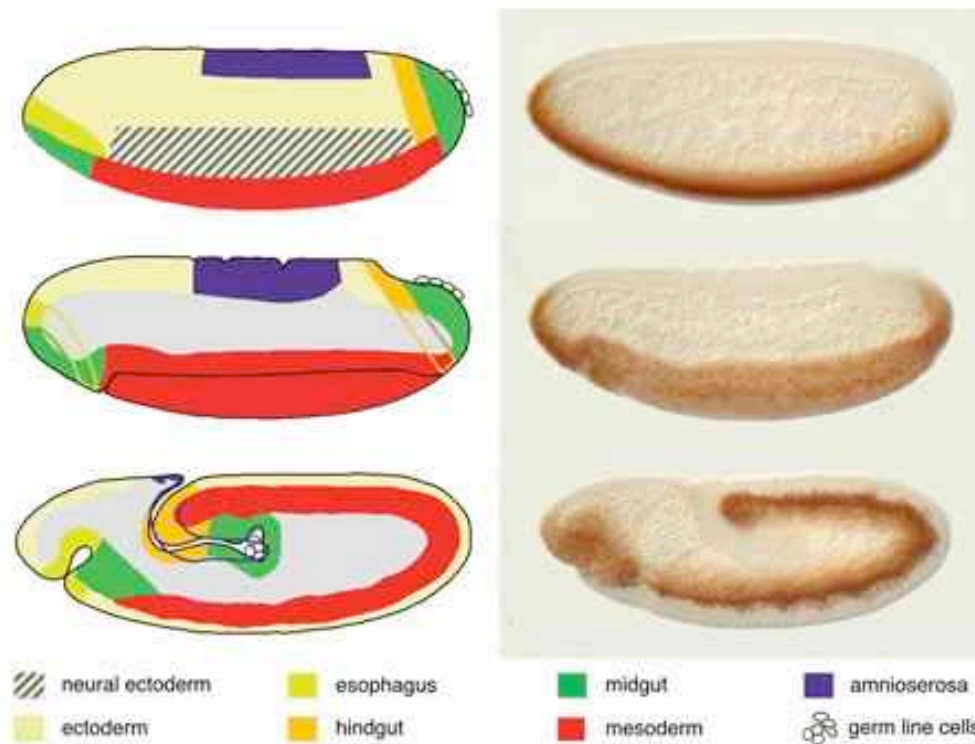
9.3 Formation of the cellular blastoderm in *Drosophila* (Part 2)



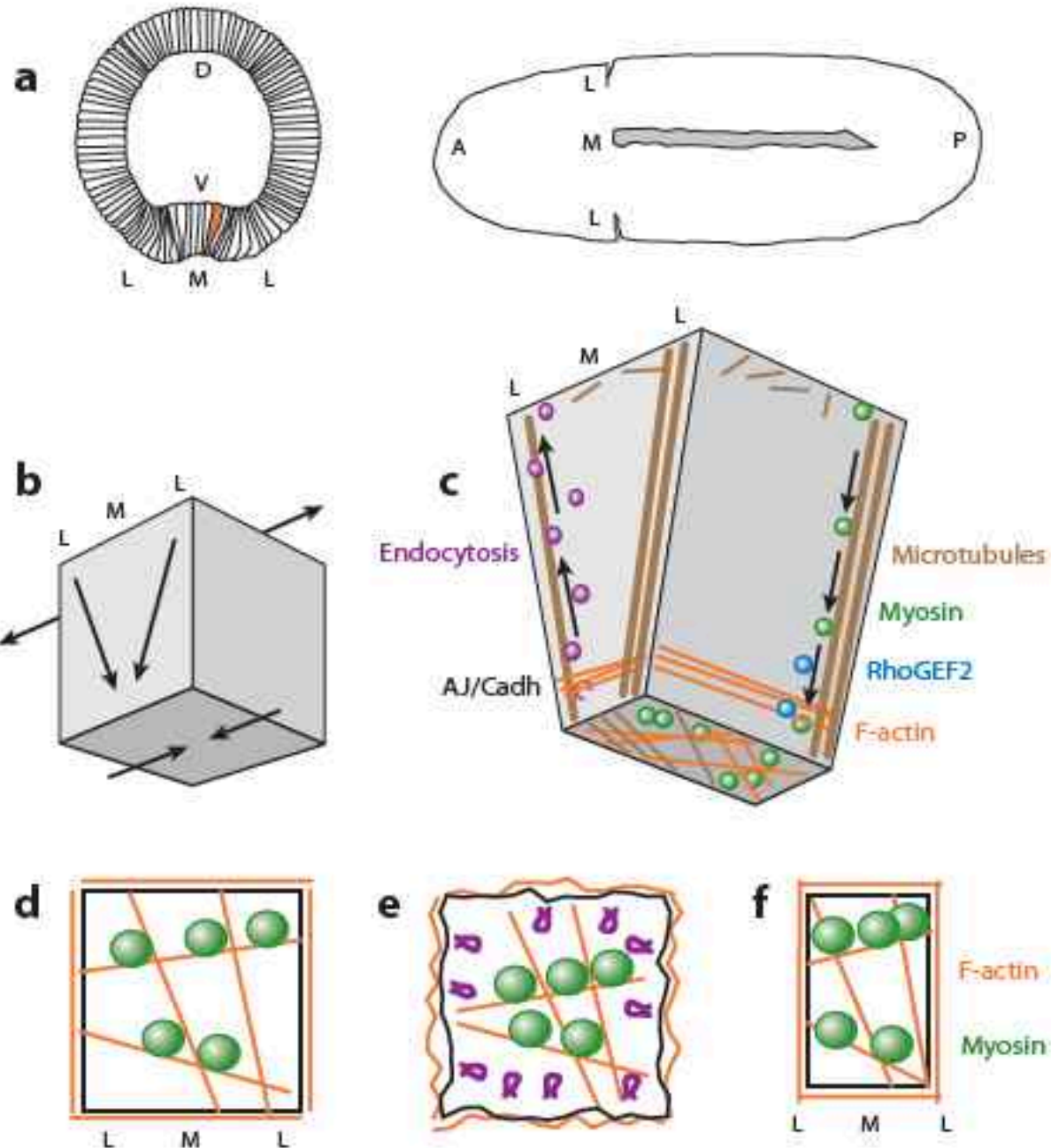
Gastrulação em *Drosophila*



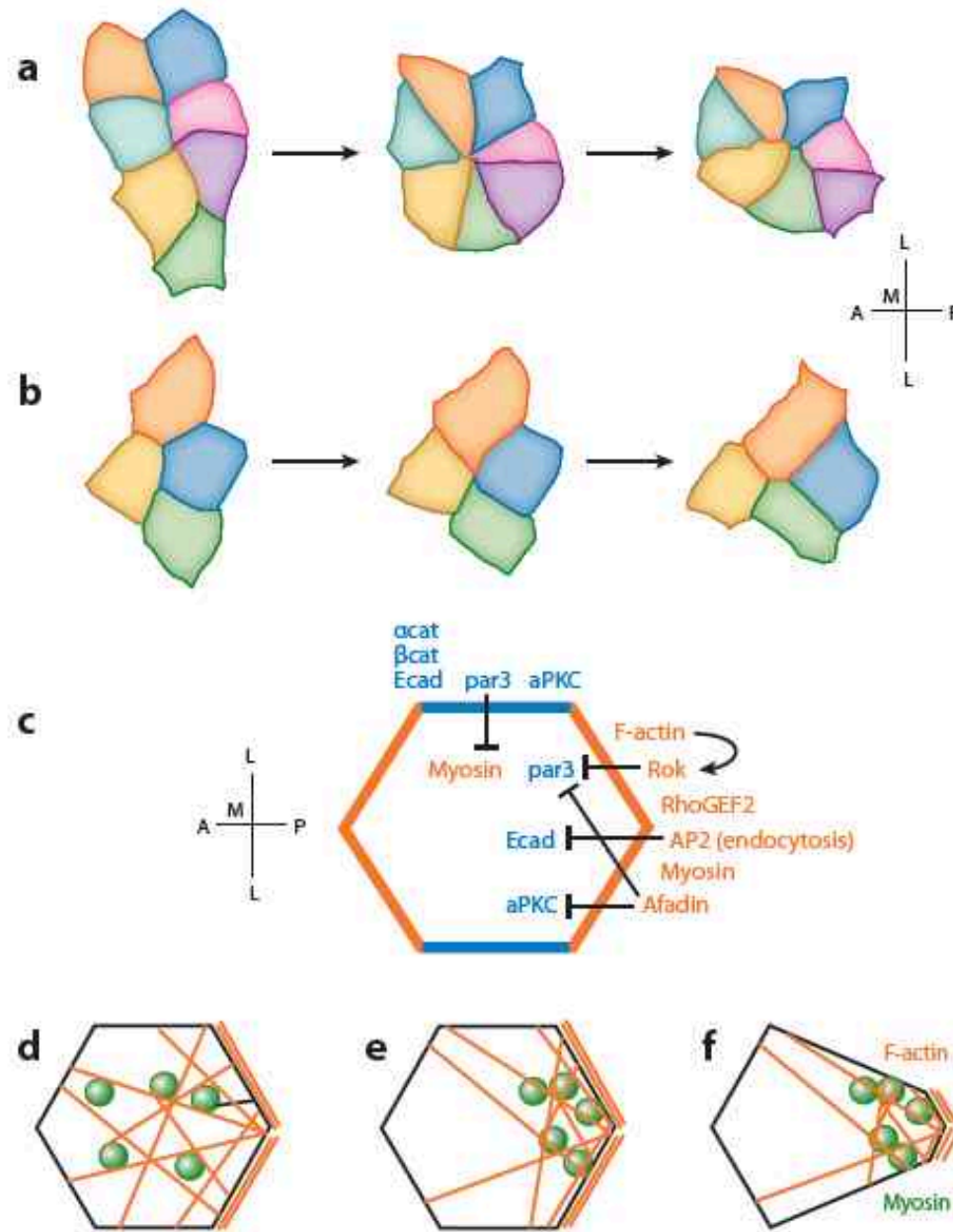
Formação do sulco ventral
(mesoderme e intestino mediano):



Constrição apical durante a invaginação (stage 7)



Intercalação durante o alongamento da banda germinativa



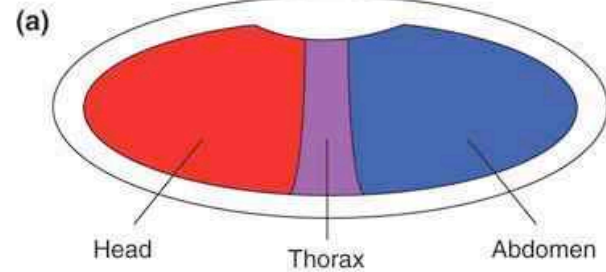
<https://www.youtube.com/watch?v=MefTPoeVQ3w>

Gastrulação em insetos

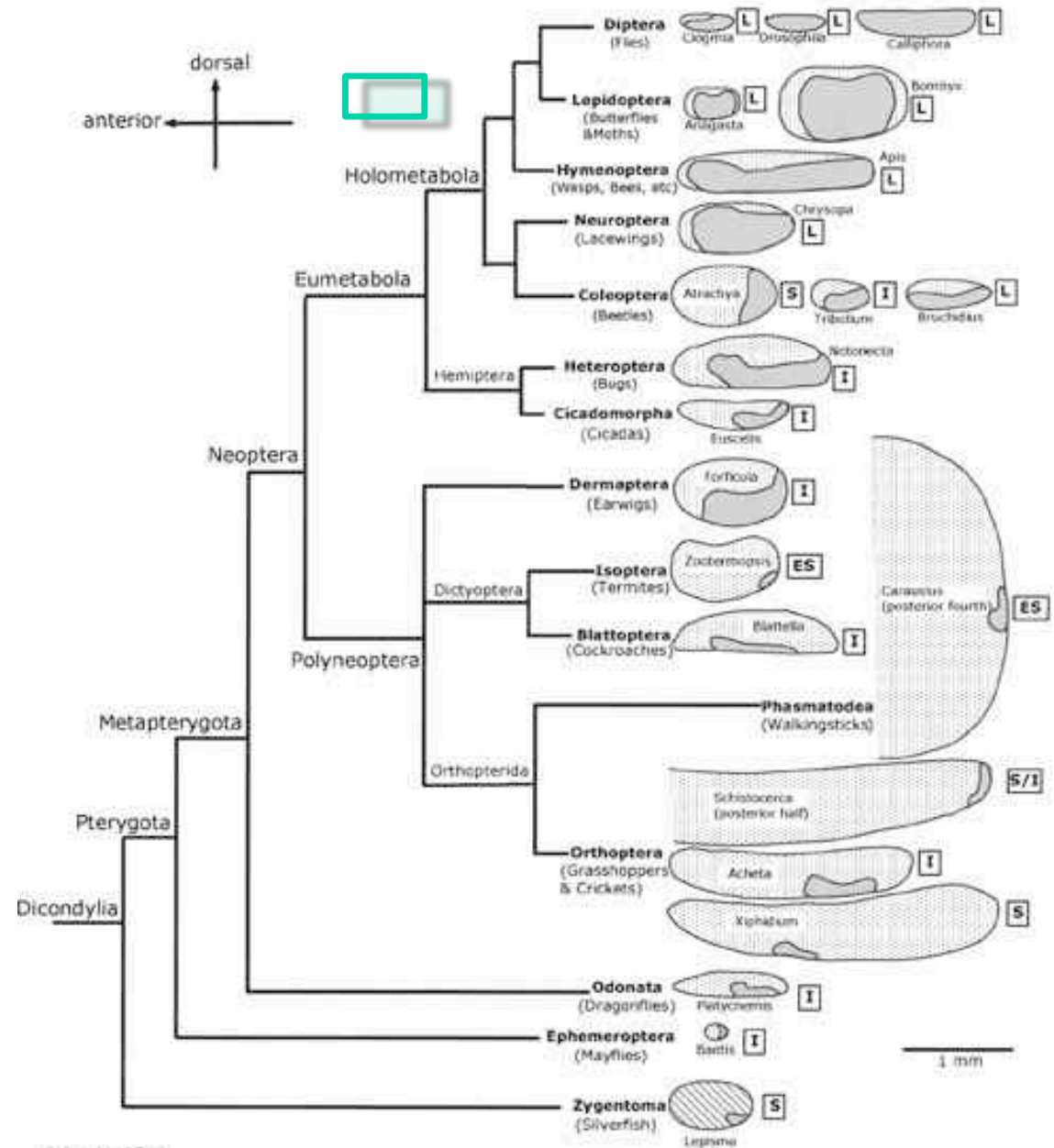
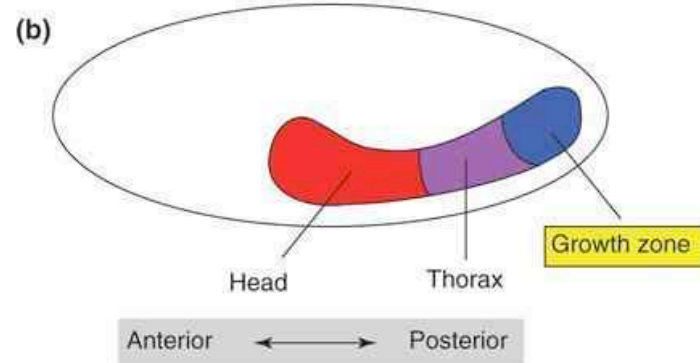


David Kimelman, et al., 2012

Long germ-band: *Drosophila melanogaster*

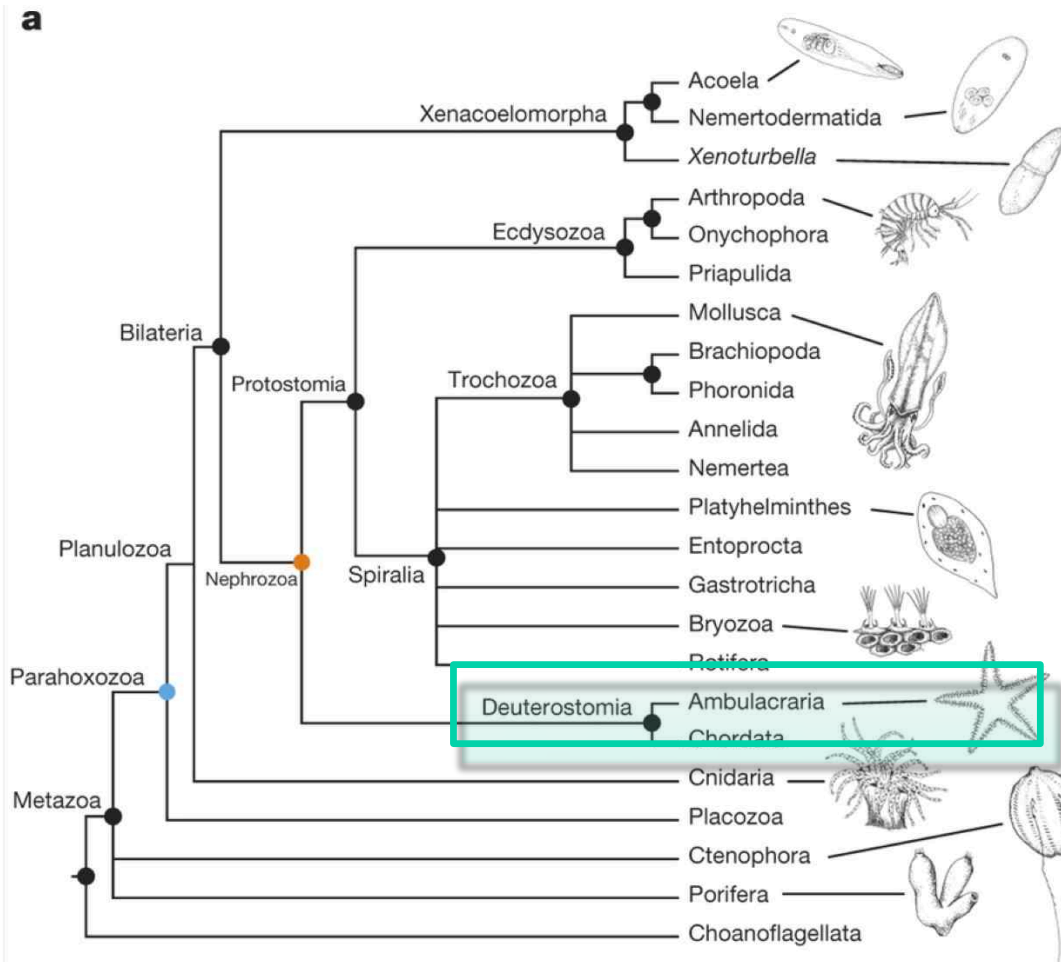


Short germ-band: *Tribolium castaneum*



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From Gastrulation: From Cells to Embryo
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Chapter 8, Figure 2

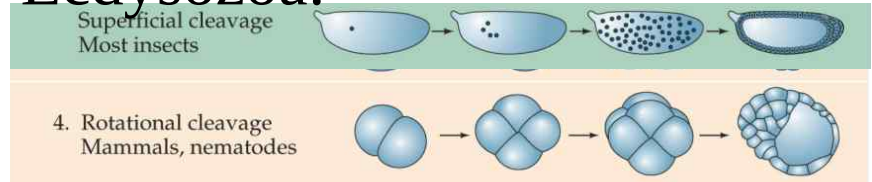
Pattern of development in the Metazoans:



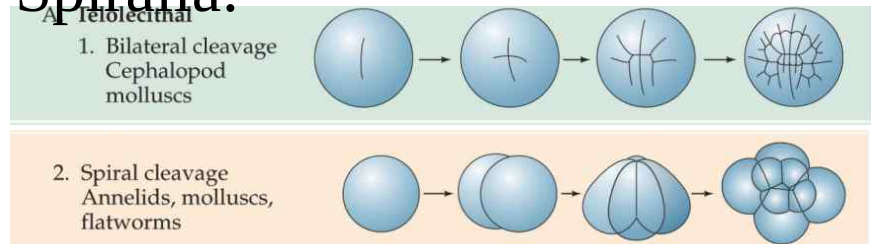
Cannon et al. 2016

Isolecitos
Mesolecitos
Telolecitos
Centrolecitos

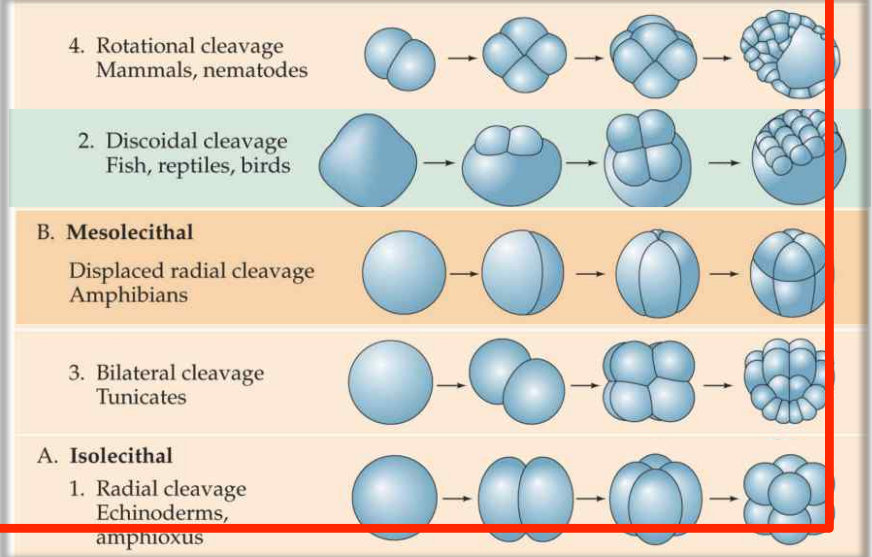
Ecdysozoa:



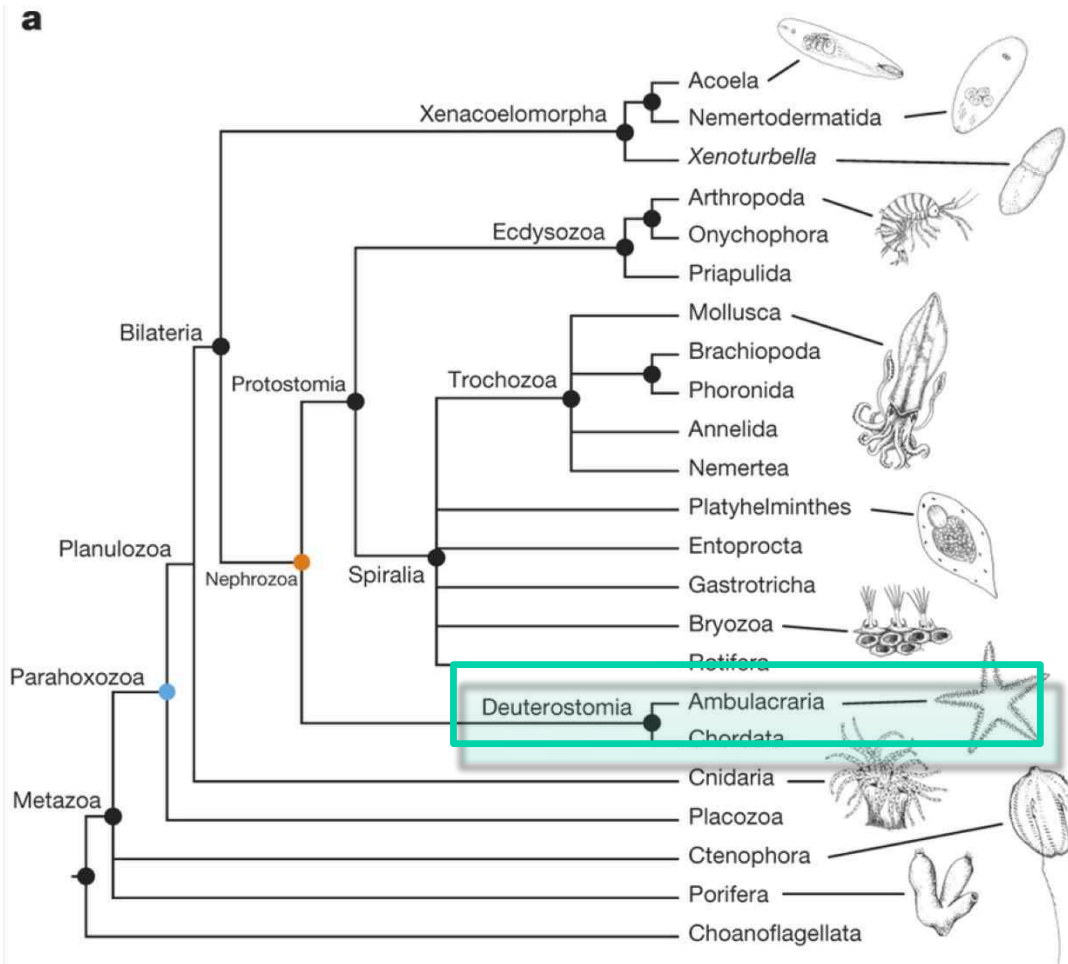
Spiralia:



Deuterostomia:



Pattern of development in the Metazoans:



Cannon et al. 2016

Isolecitos
Mesolecitos
Telolecitos
Centrolecitos

Ecdysozoa:

Superficial cleavage
Most insects

4. Rotational cleavage
Mammals, nematodes

Spiralia:

1. Bilateral cleavage
Cephalopod molluscs

2. Spiral cleavage
Annelids, molluscs, flatworms

Deuterostomia:

4. Rotational cleavage
Mammals, nematodes

2. Discoidal cleavage
Fish, reptiles, birds

B. Mesolecithal

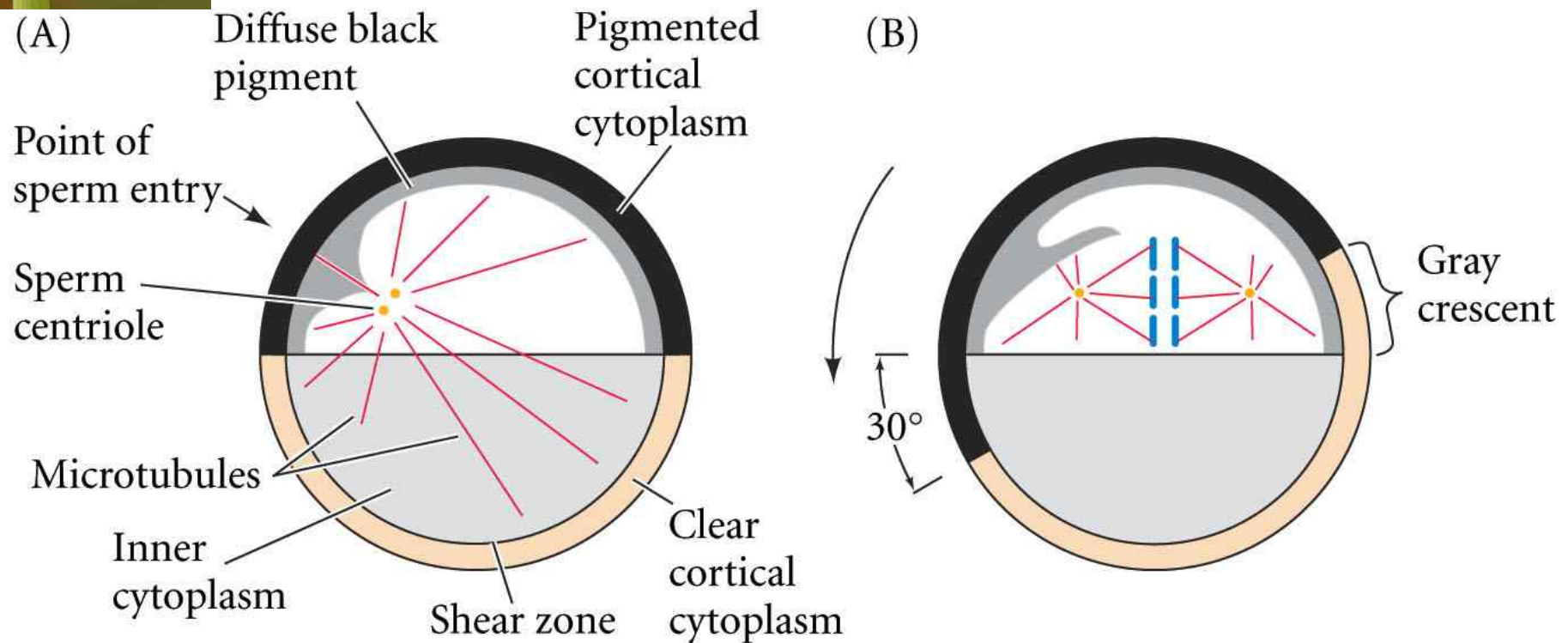
Displaced radial cleavage
Amphibians

3. Bilateral cleavage
Tunicates

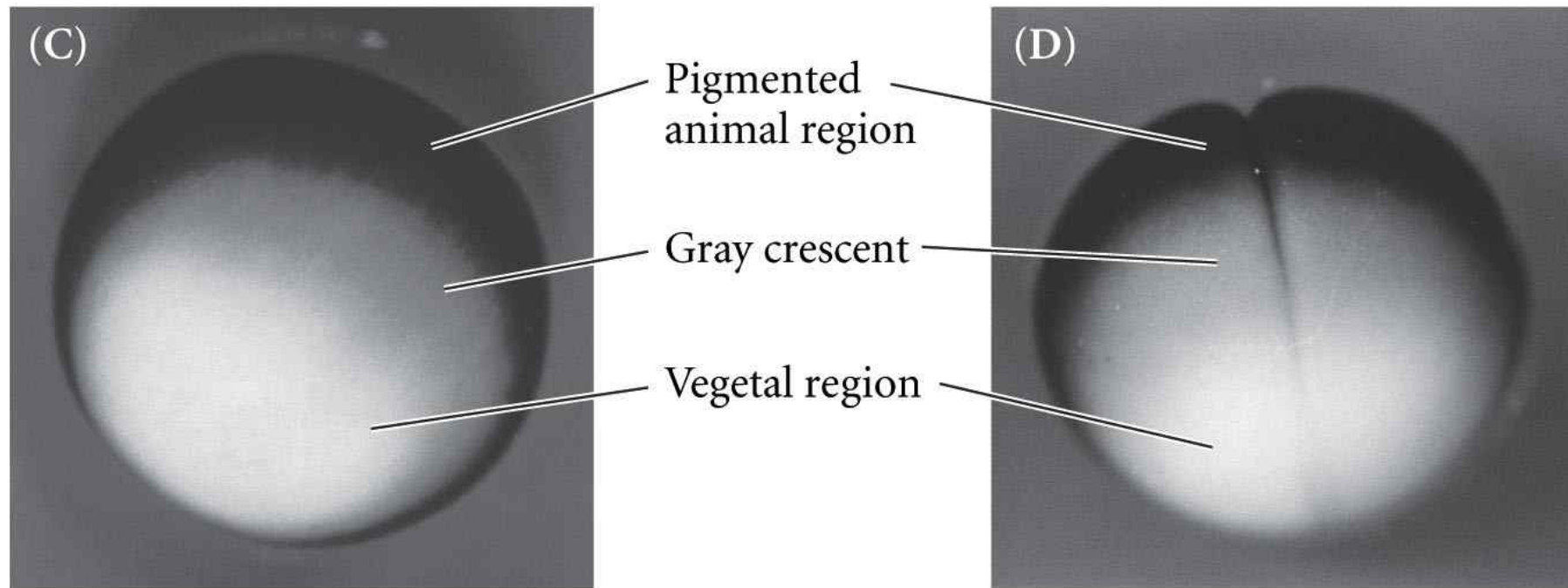
A. Isolecithal

1. Radial cleavage
Echinoderms, amphioxus

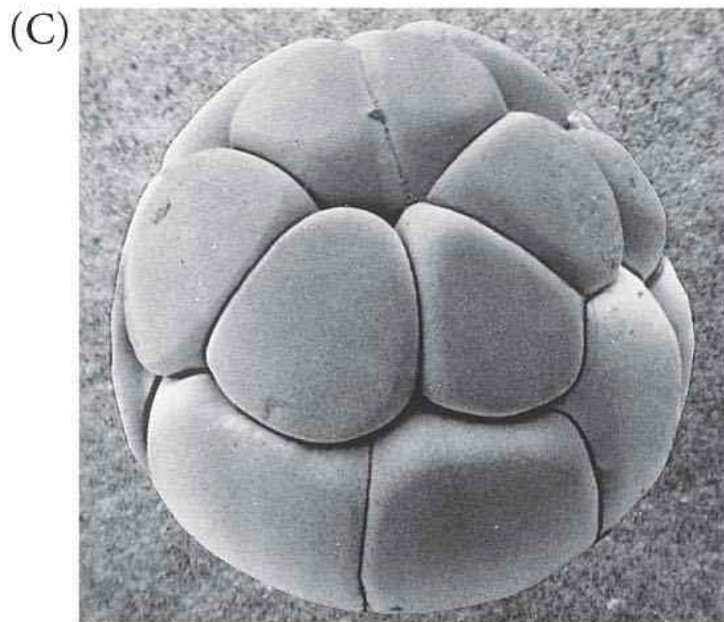
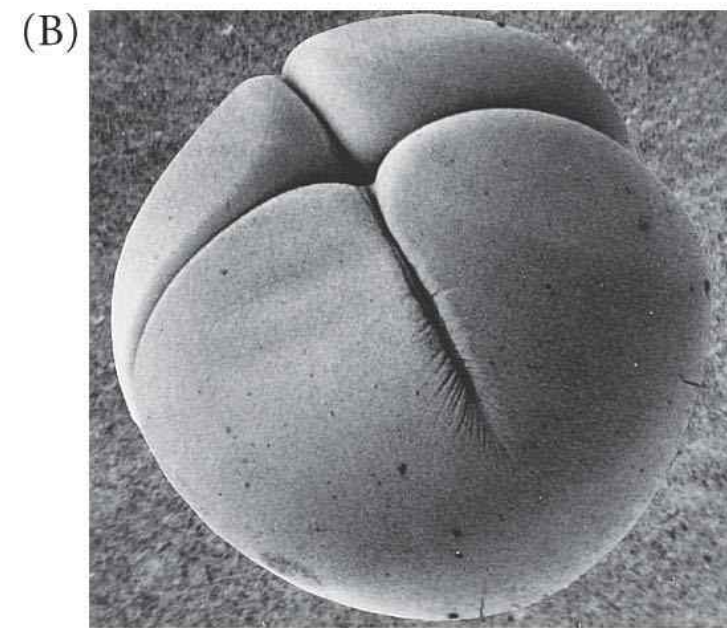
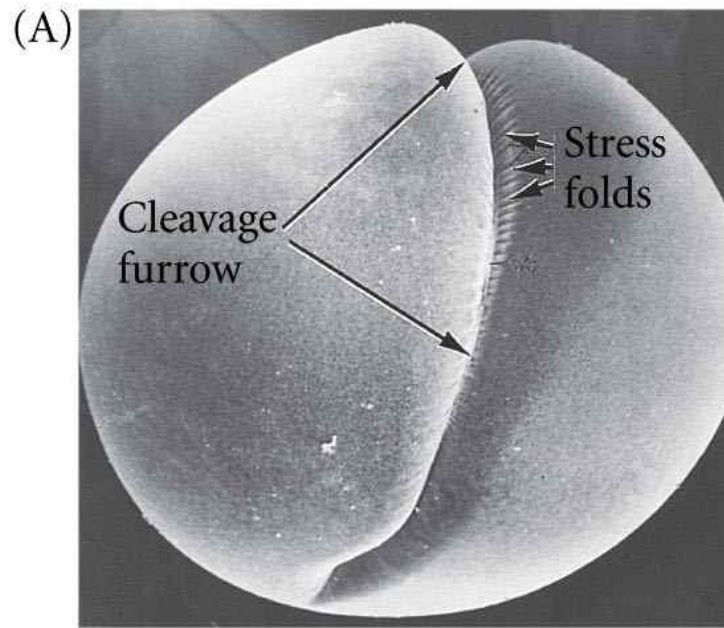
10.2 Reorganization of cytoplasm in the newly fertilized frog egg (Part 1)



10.2 Reorganization of cytoplasm in the newly fertilized frog egg (Part 2)

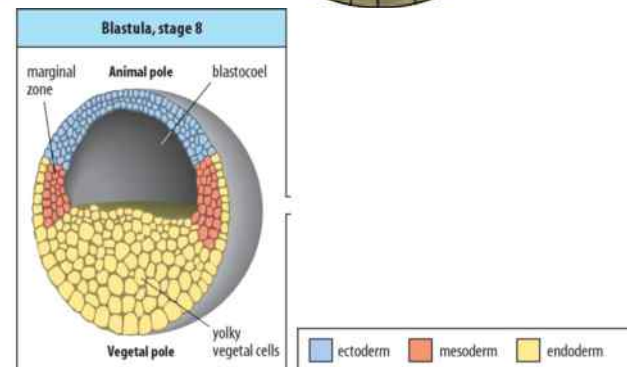
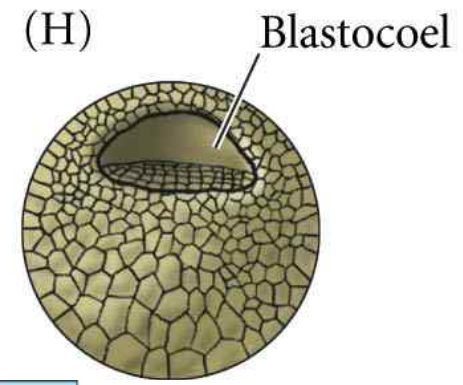
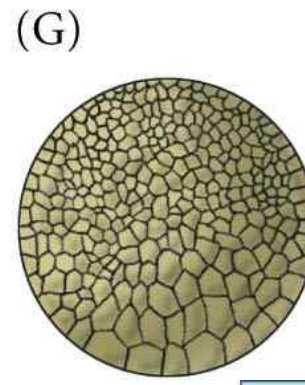
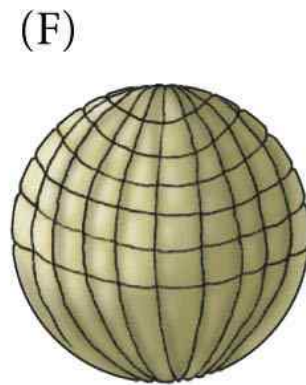
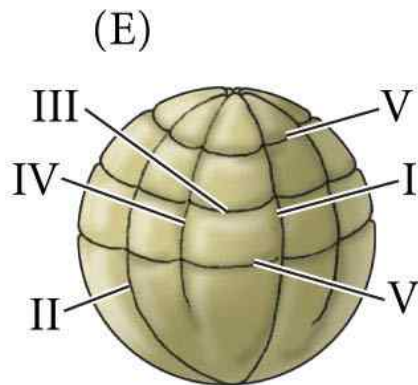
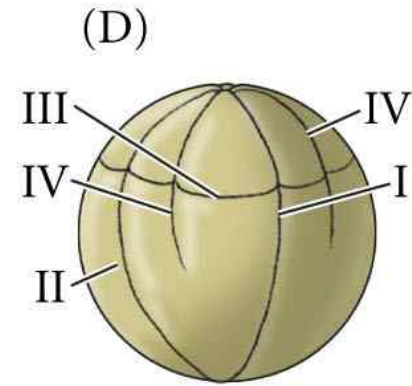
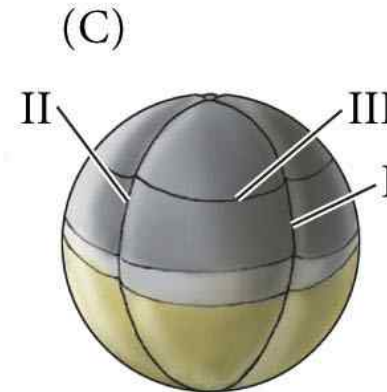
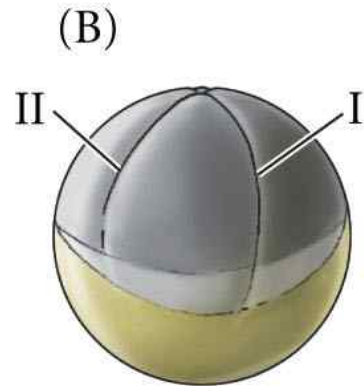
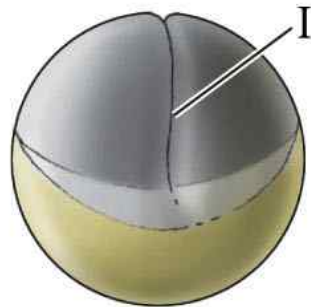


10.4 Scanning electron micrographs of frog egg cleavage

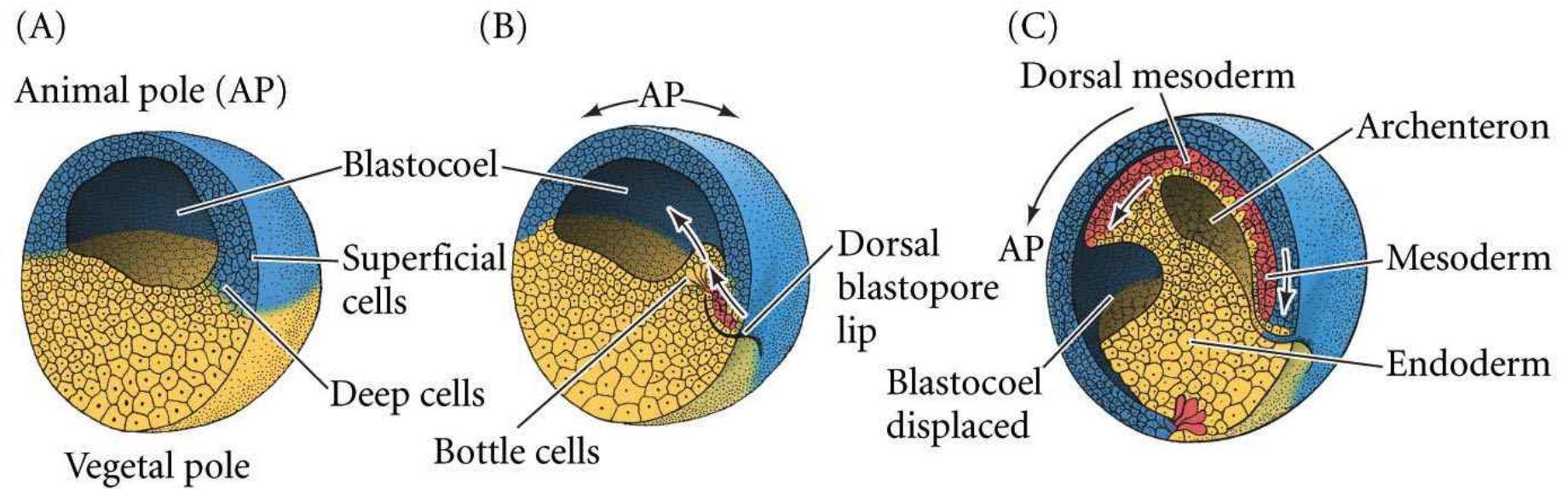


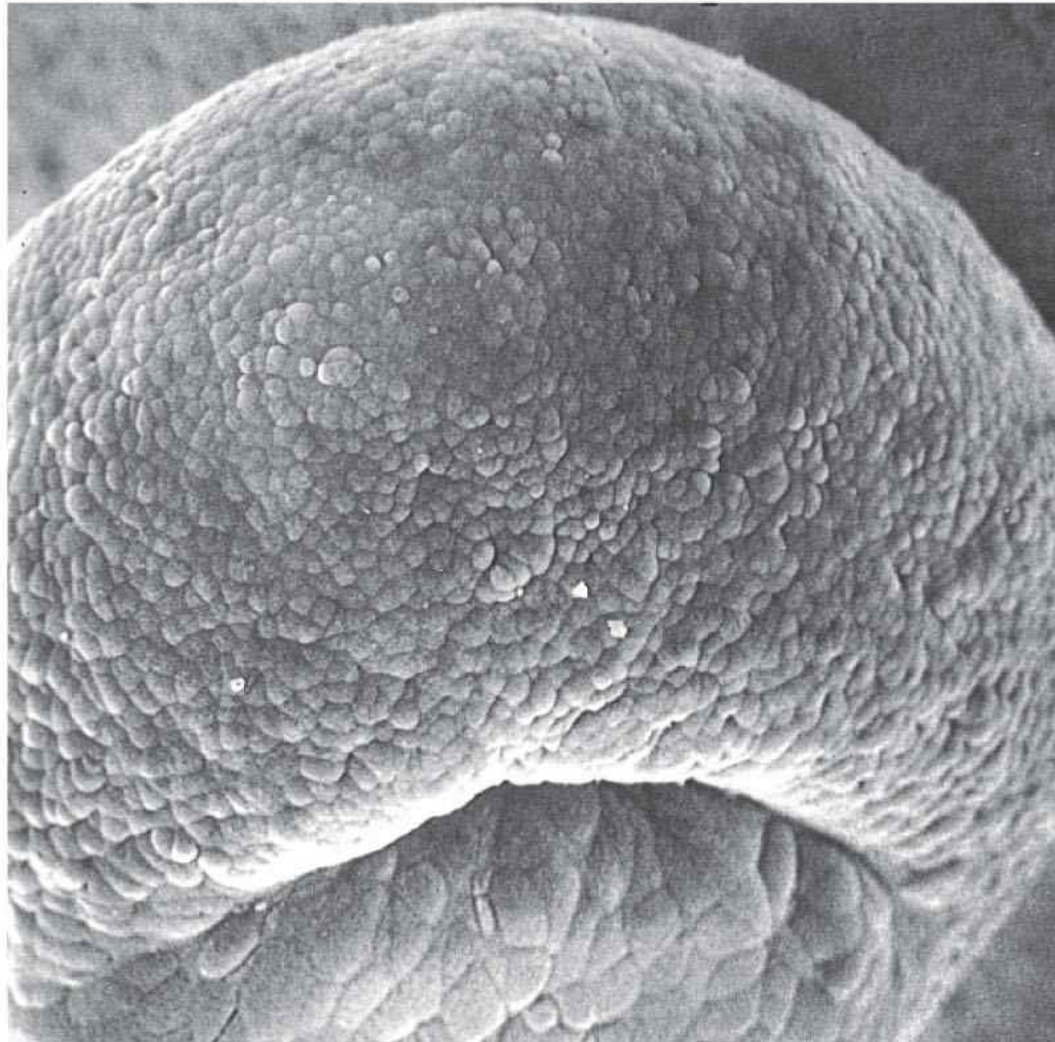


cleavage, morula, blastula

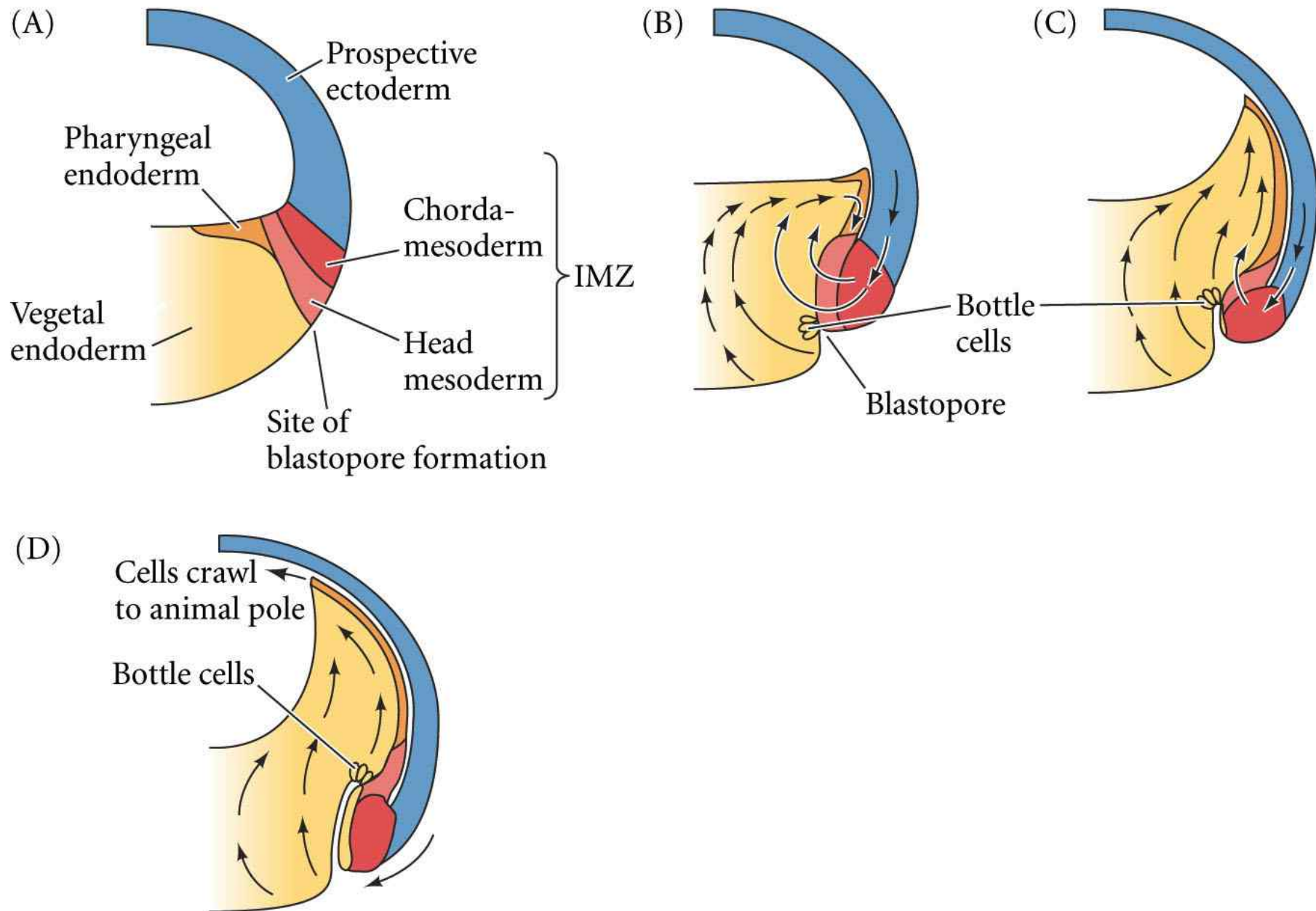


Movimentos celulares da gastrulação de rã

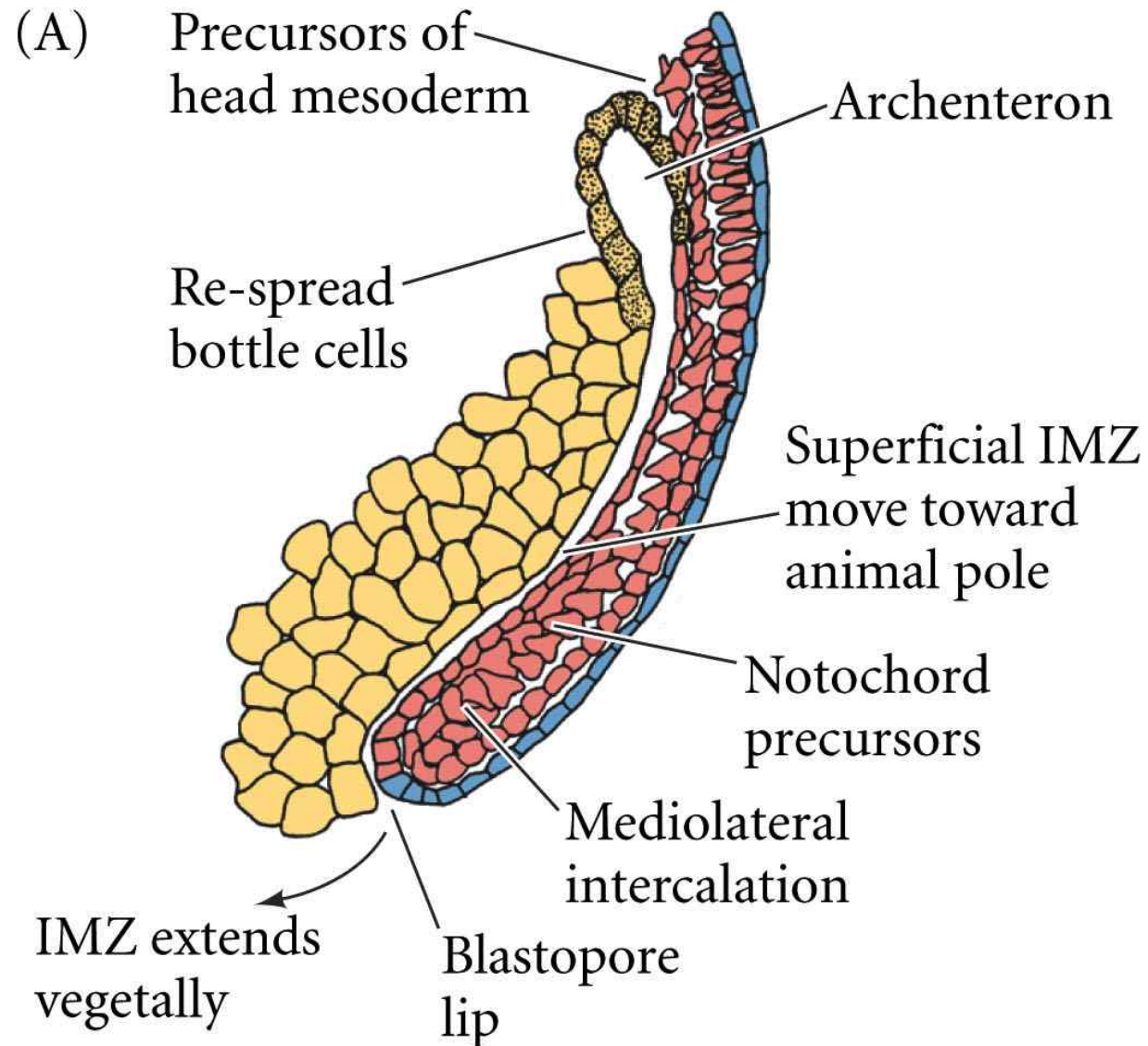




Movimentos iniciais da gastrulação de *Xenopus*



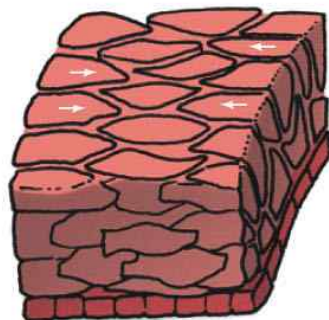
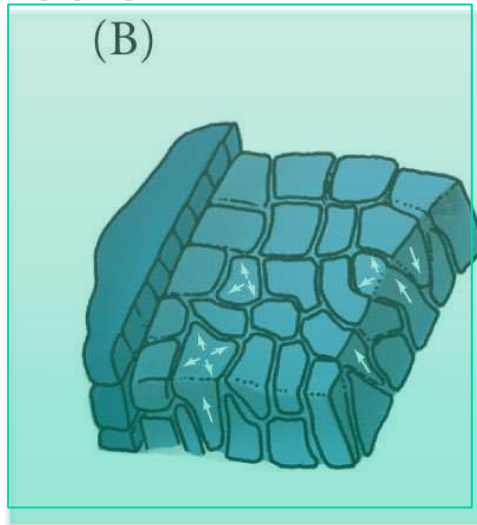
Movimentos celulares da gastrulação de rã



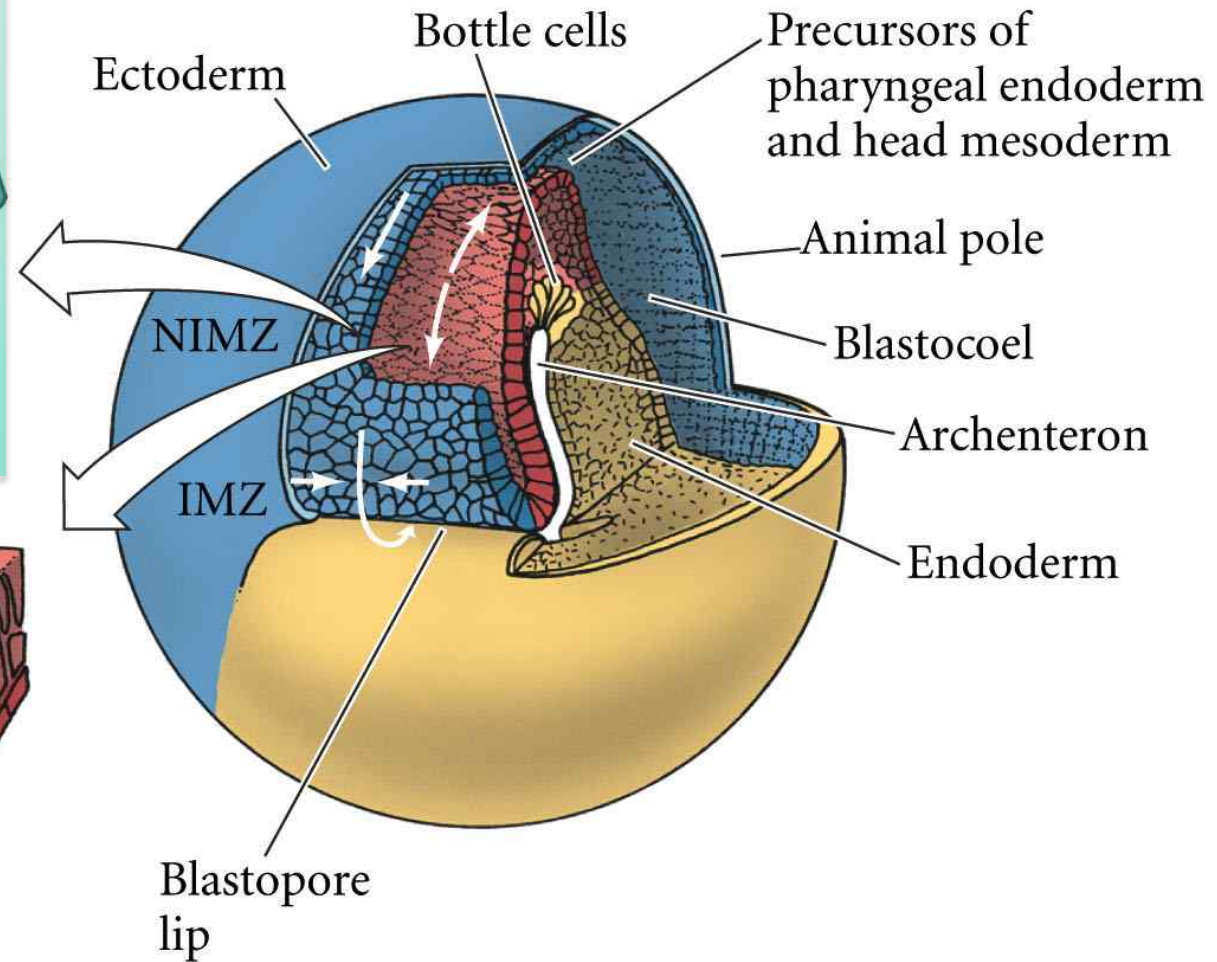
Movimentos celulares da gastrulação de rã

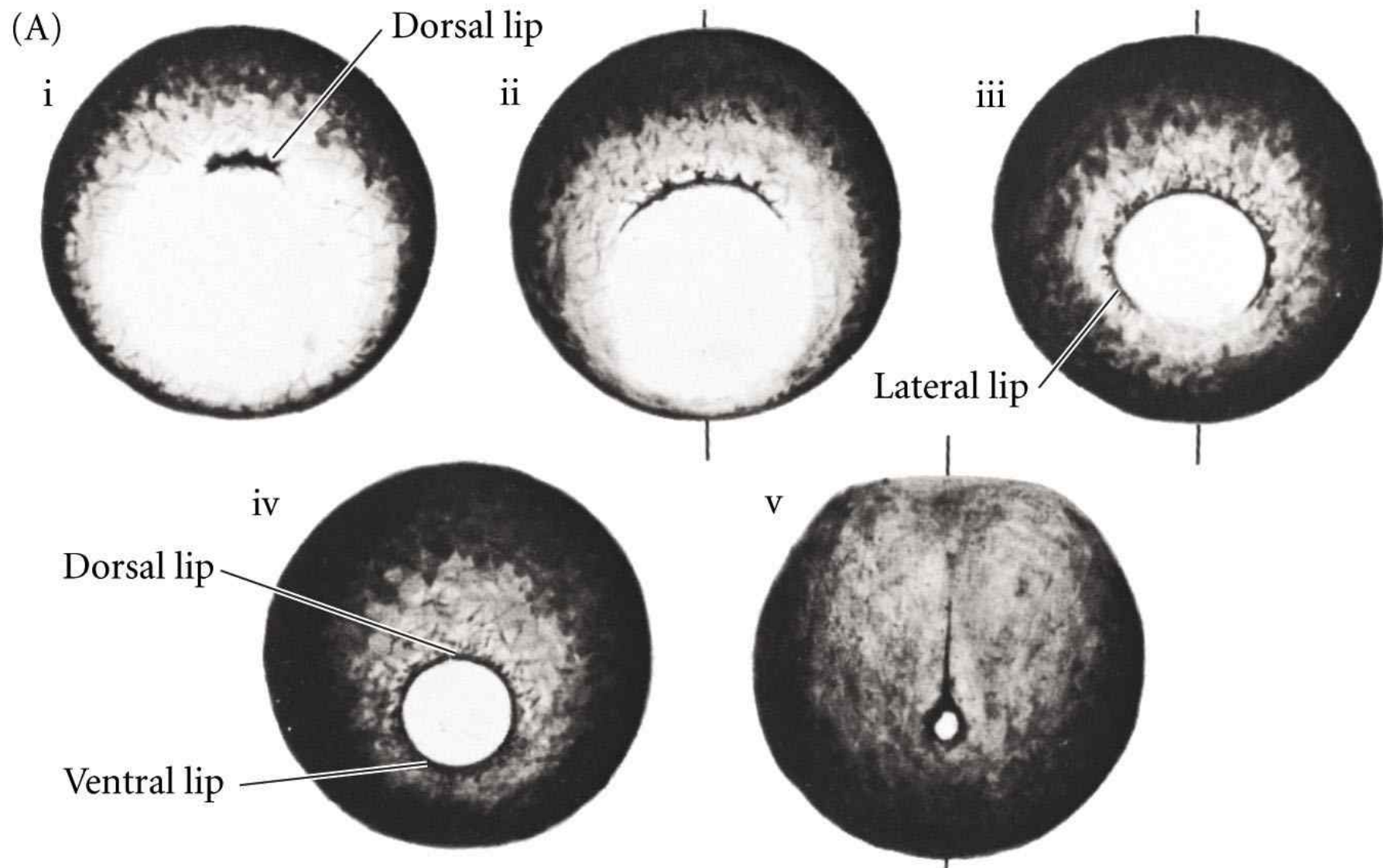
epíbole

(B)



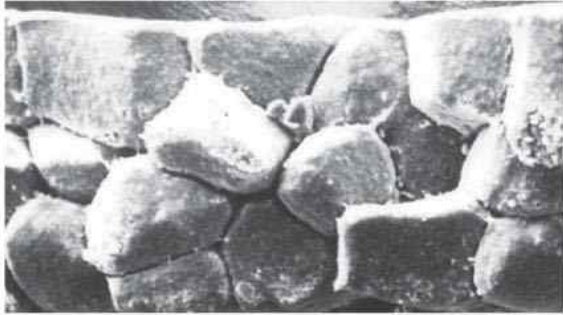
Intercalação
(convergência
extensão)



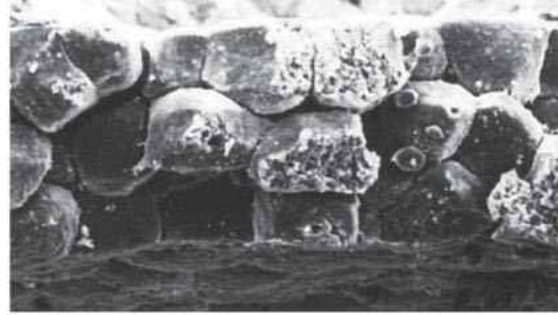


Epíbole da ectoderme se dá por divisões celulares e intercalação

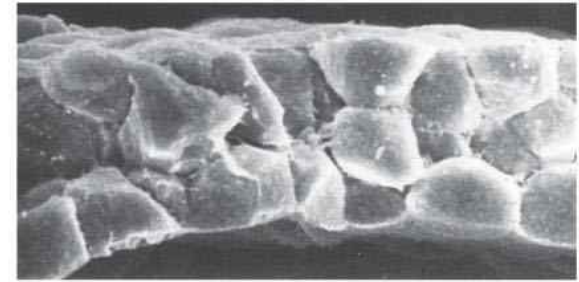
(C)



8



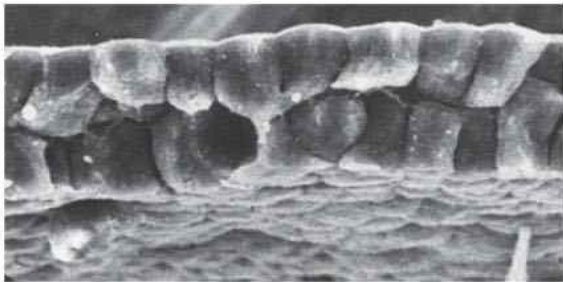
9



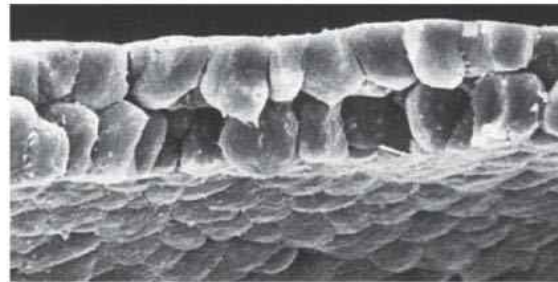
10

Stage

10.5



11

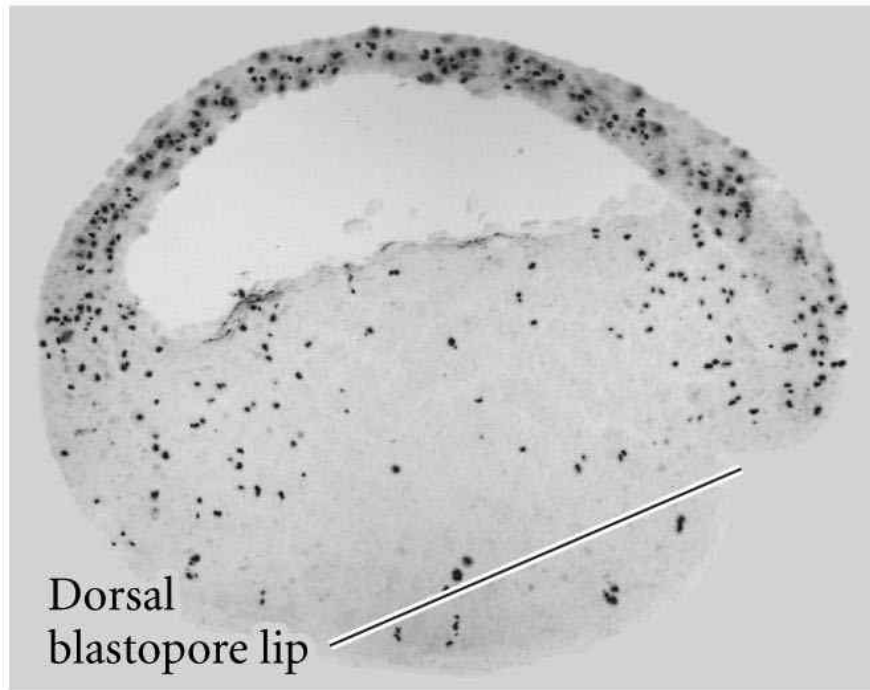


11.5

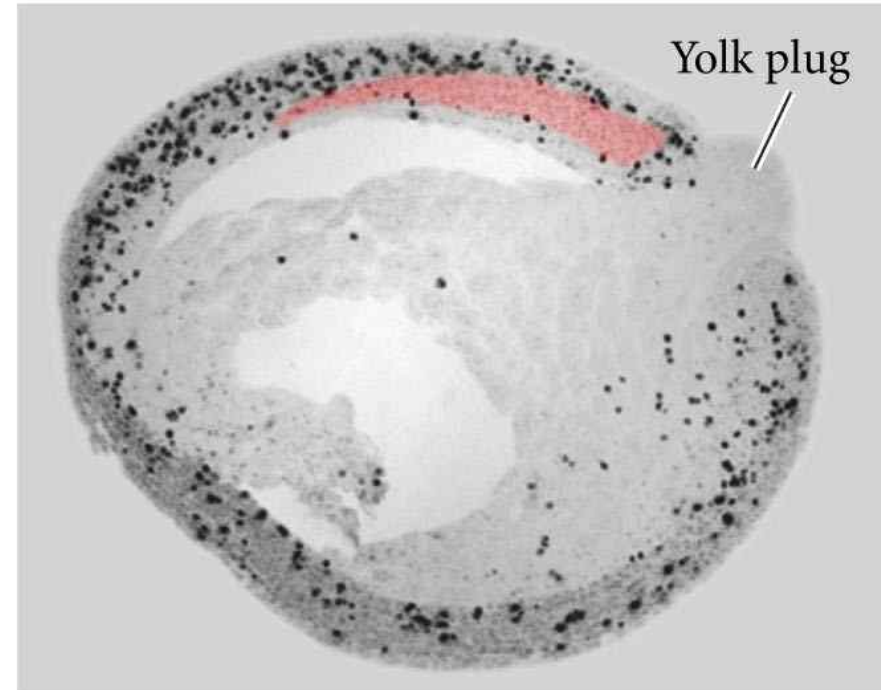


Epiboly of the ectoderm is accomplished by cell division and intercalation

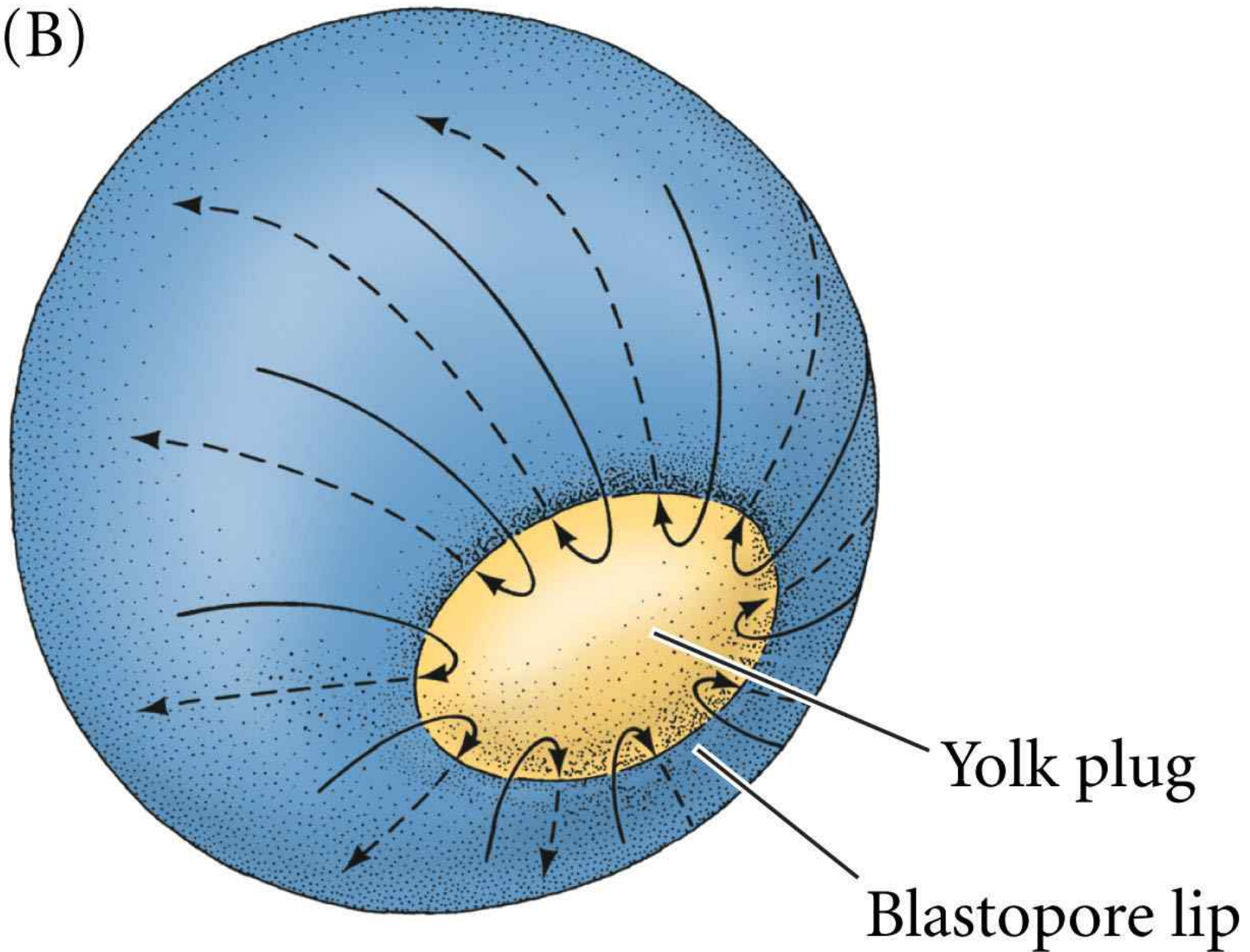
(A)



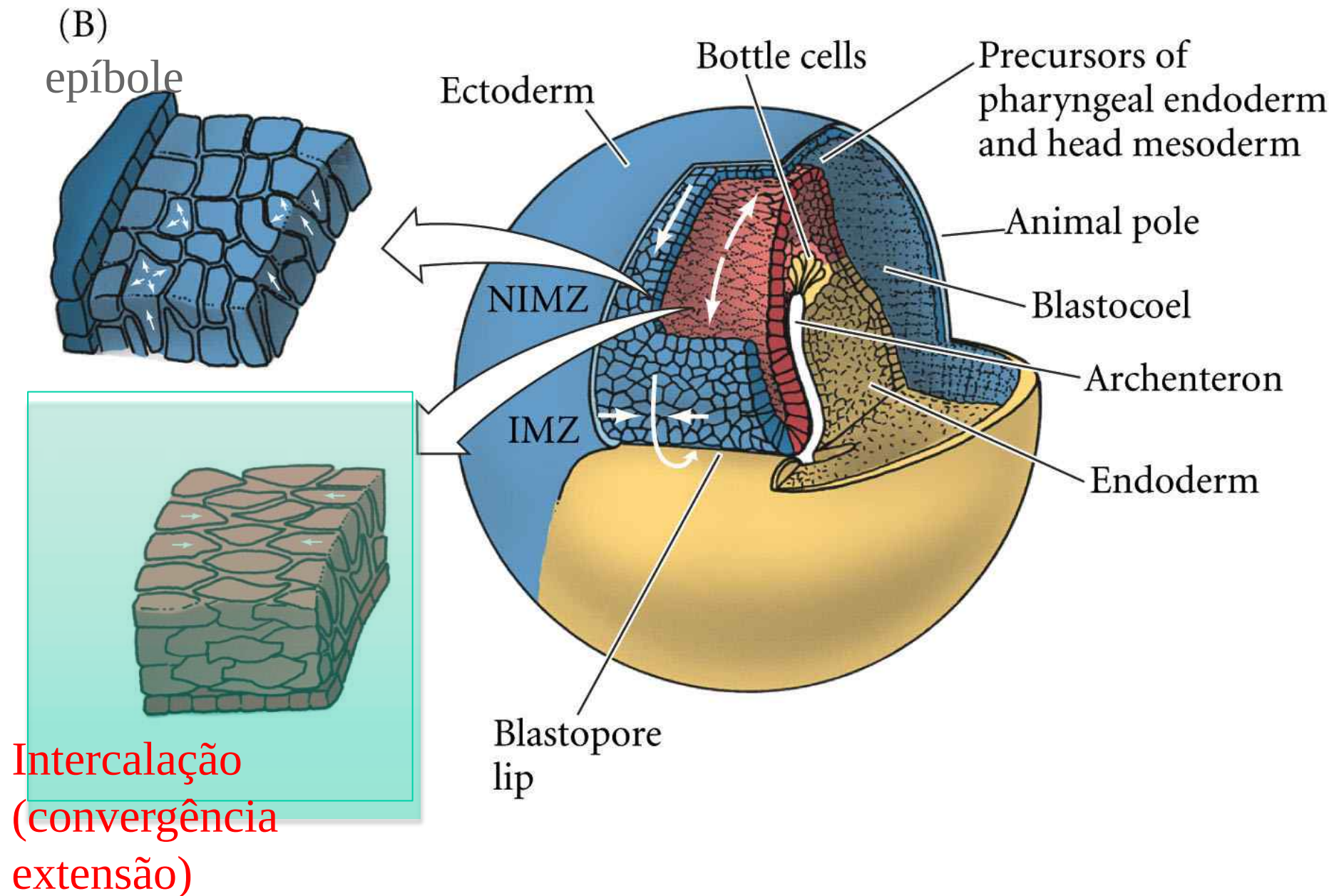
(B)



(B)

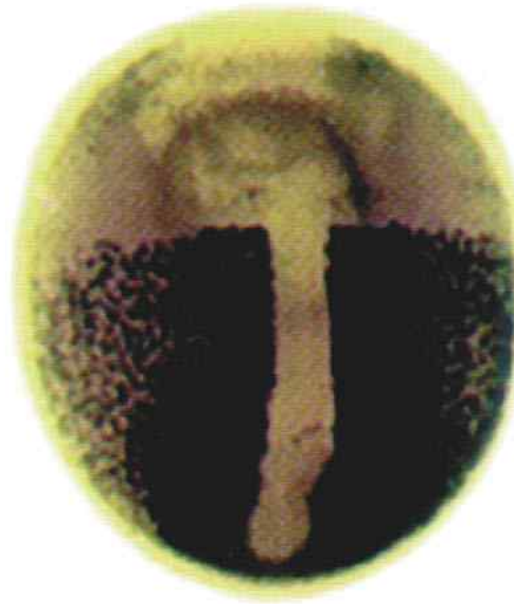


Movimentos celulares da gastrulação de rã: convergência e extensão

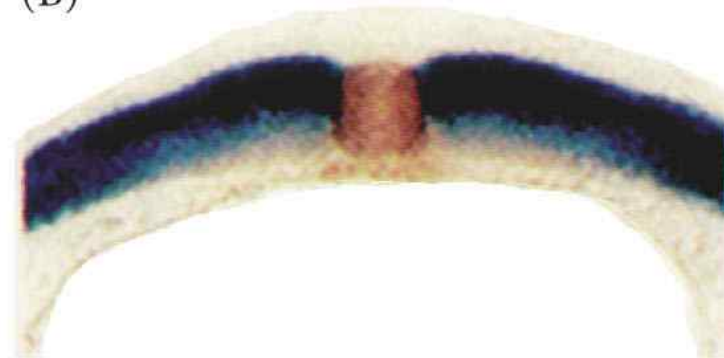


The expression of paraxial protocadherin for convergence and extension

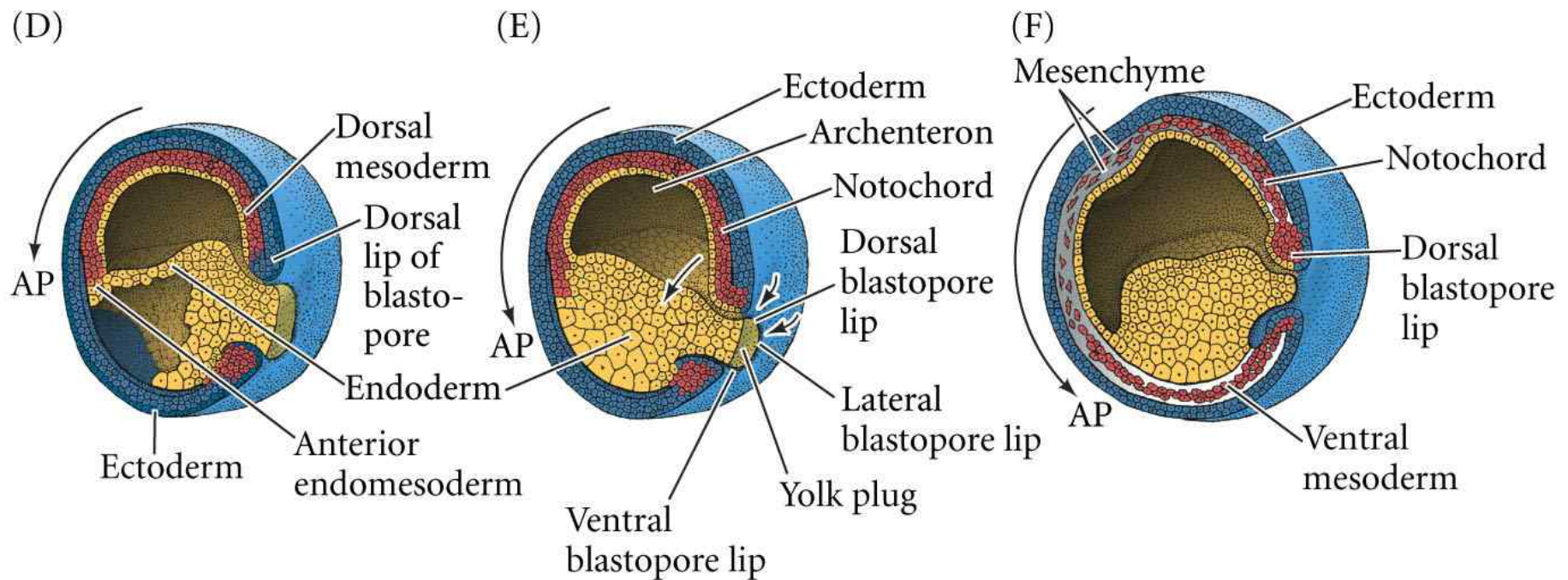
(A)



(B)



Movimentos celulares da gastrulação de rã





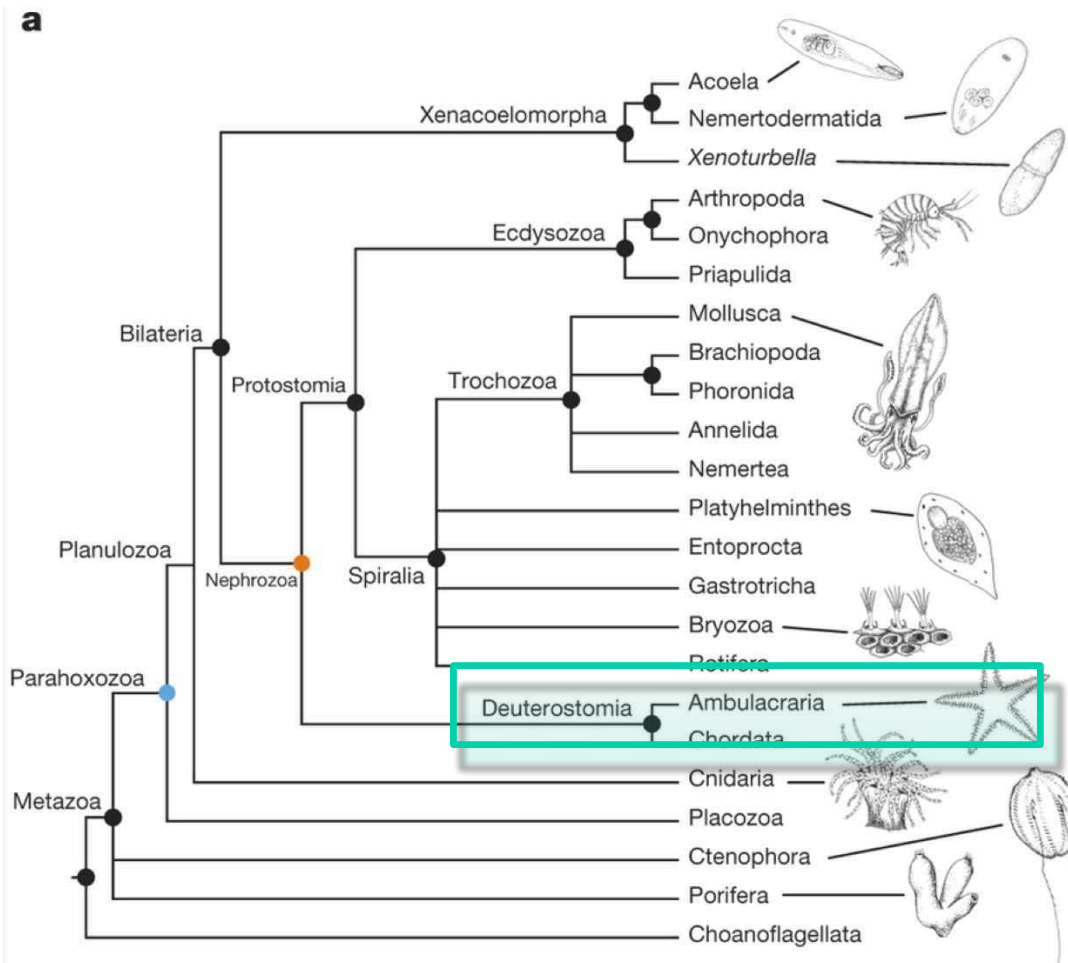
Eugenia del Pino, PUCE

Gastrulação em anfíbios com diferentes histórias de vida (20min; 2012-39´):

<http://www.youtube.com/watch?v=hKhMRtfoWUE>

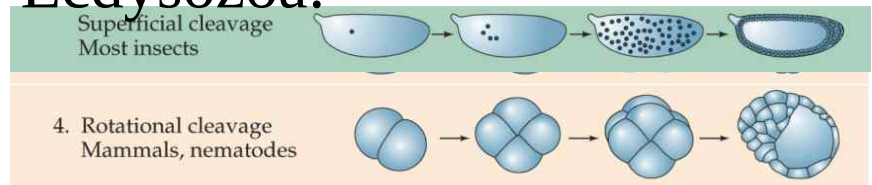


Pattern of development in the Metazoans:

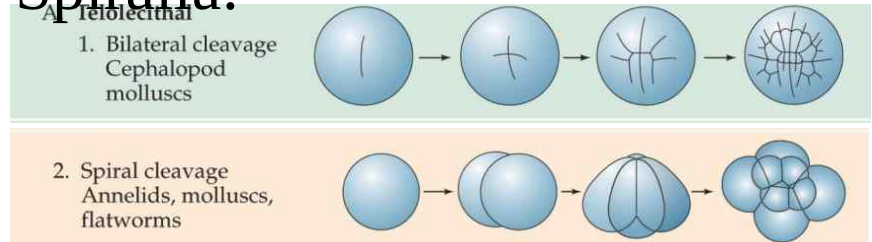


Cannon et al. 2016

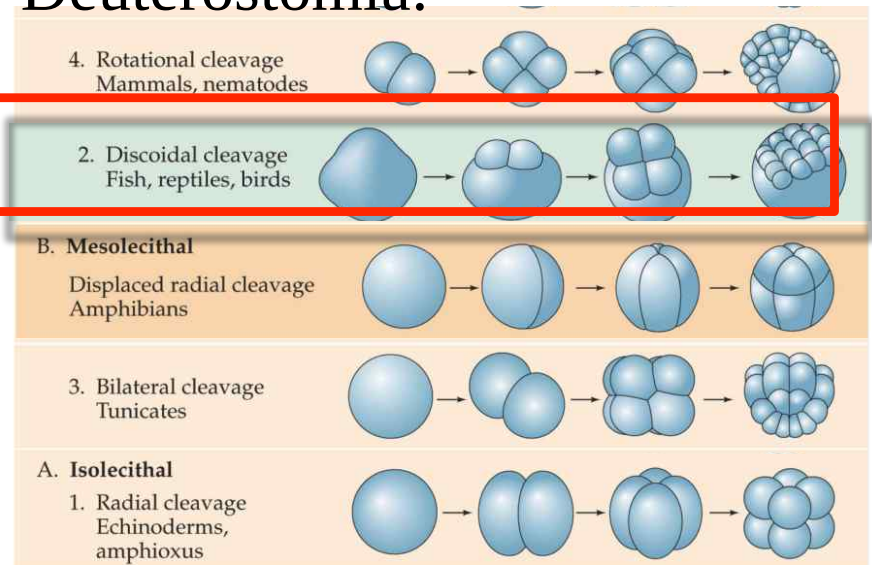
Ecdysozoa:



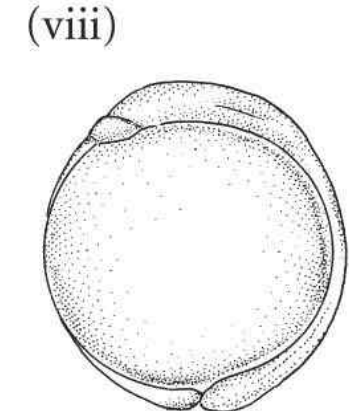
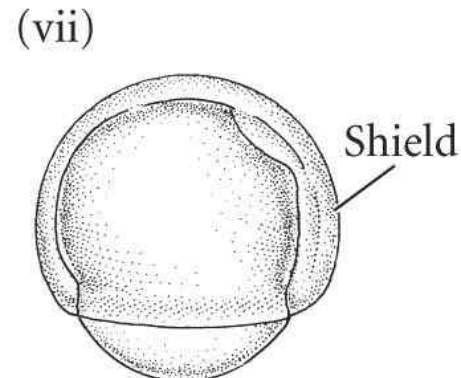
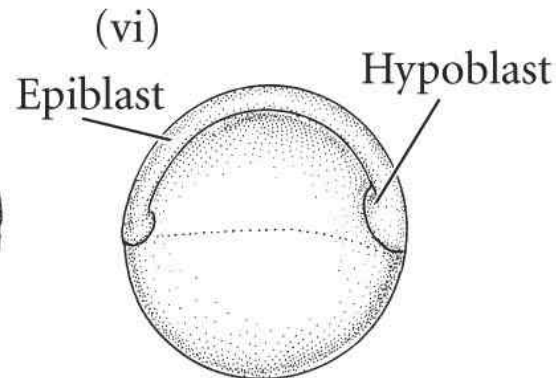
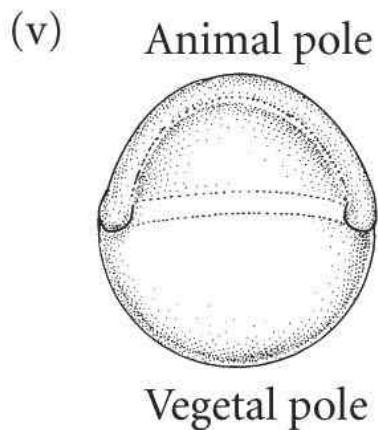
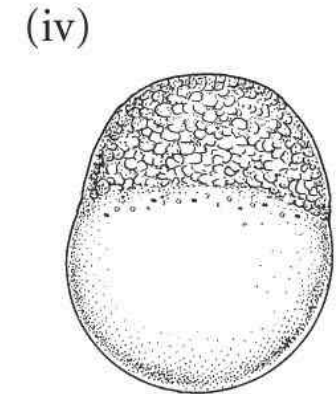
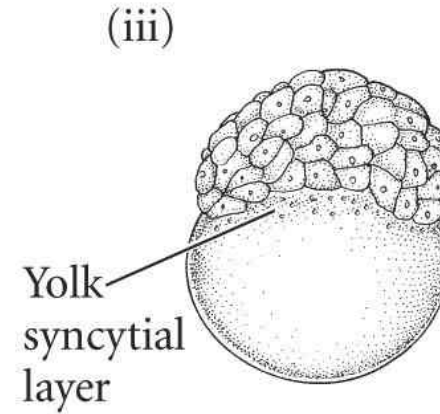
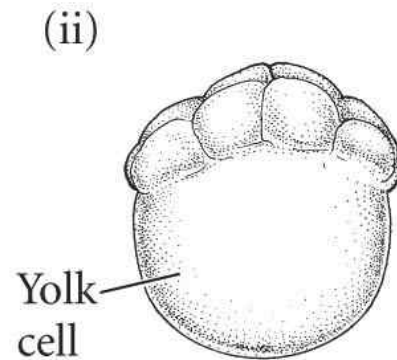
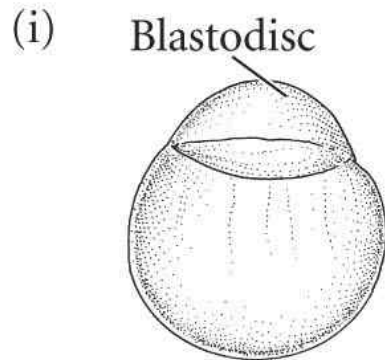
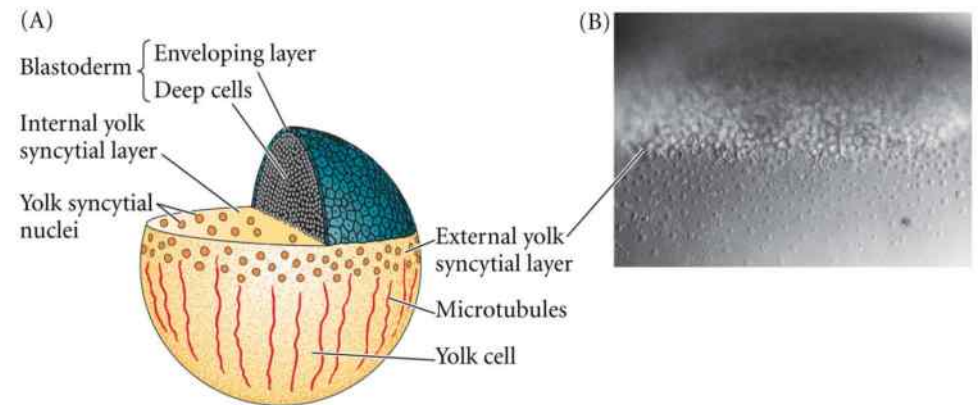
Spiralia:



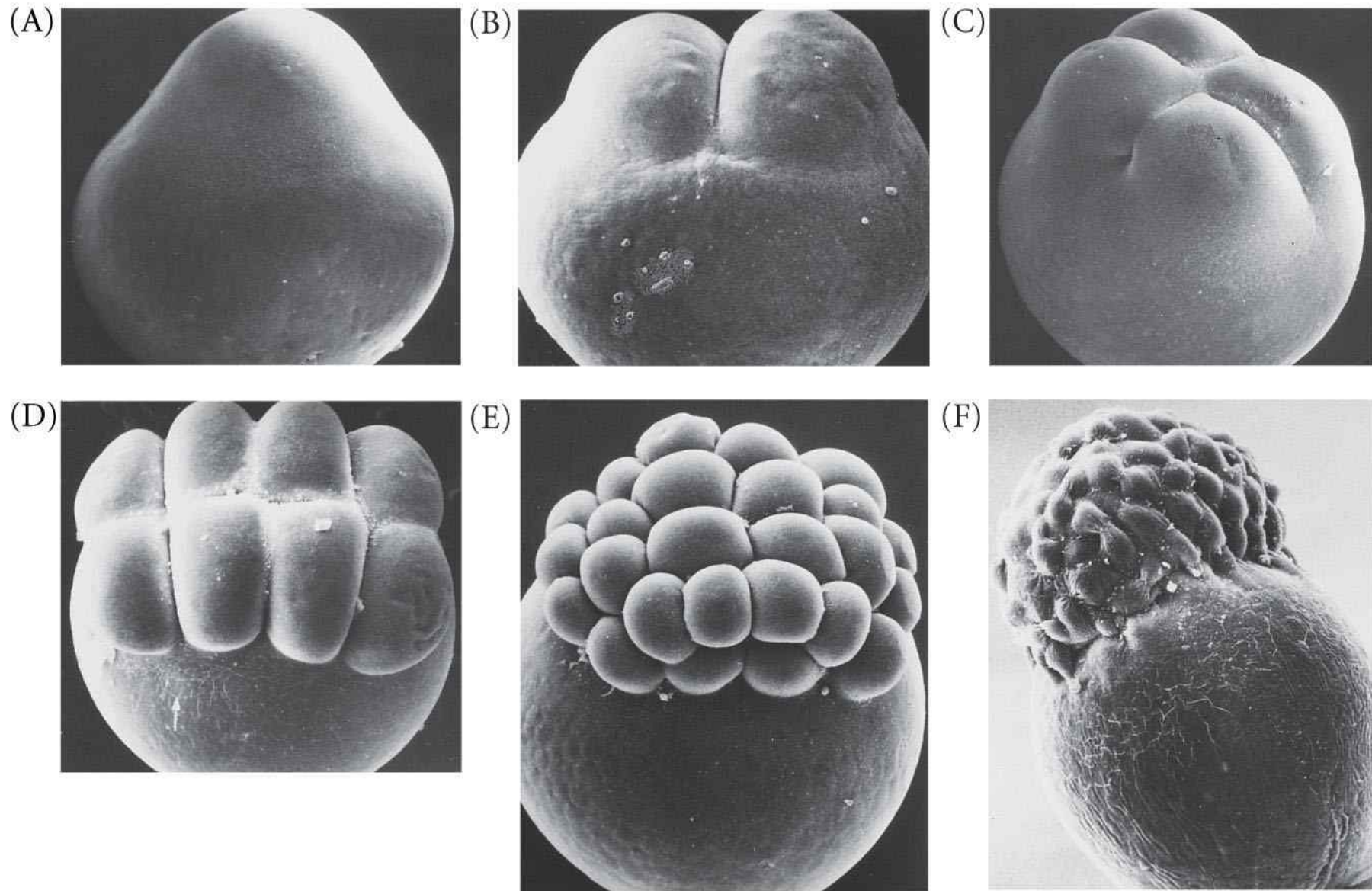
Deuterostomia:



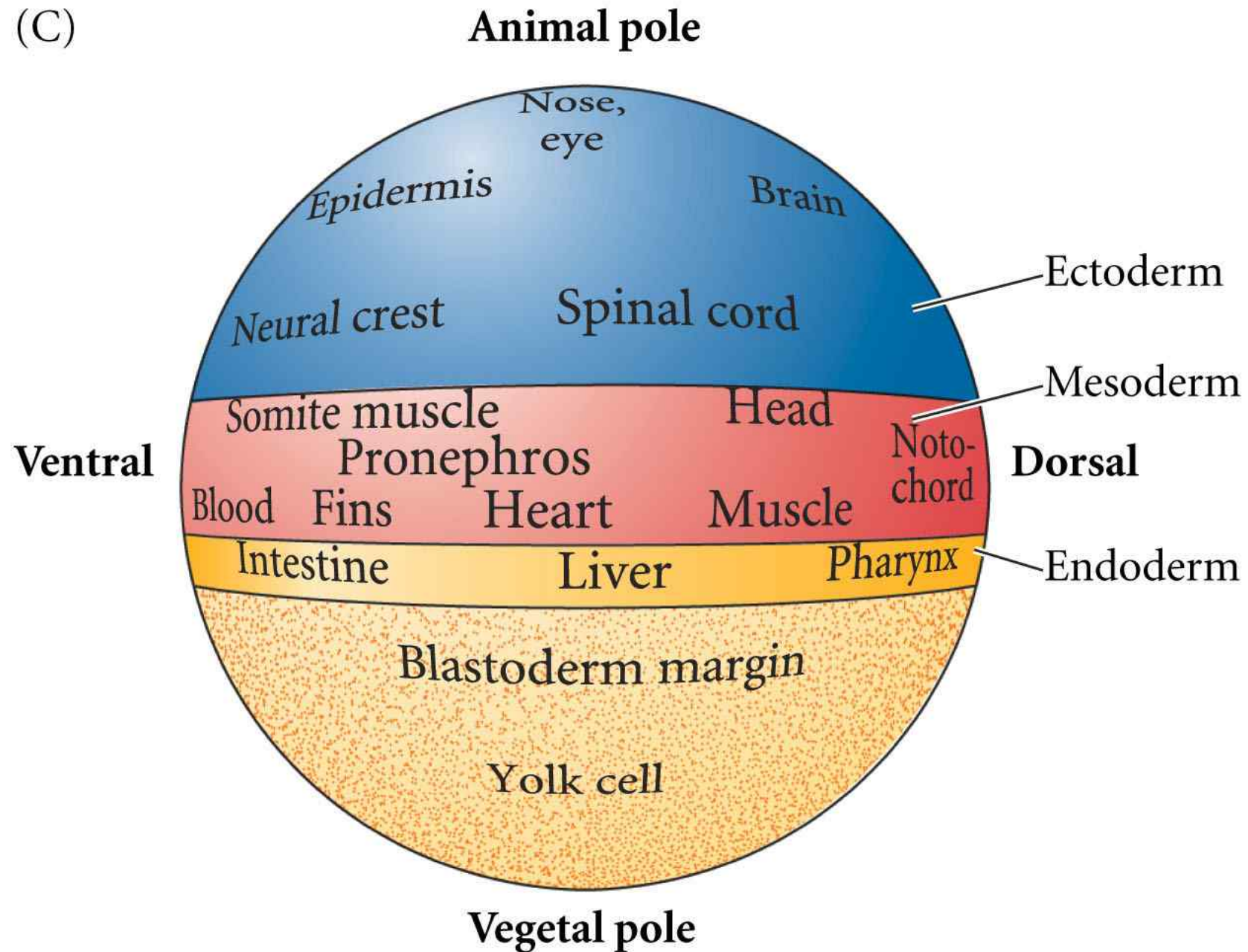
Zebrafish development occurs very rapidly



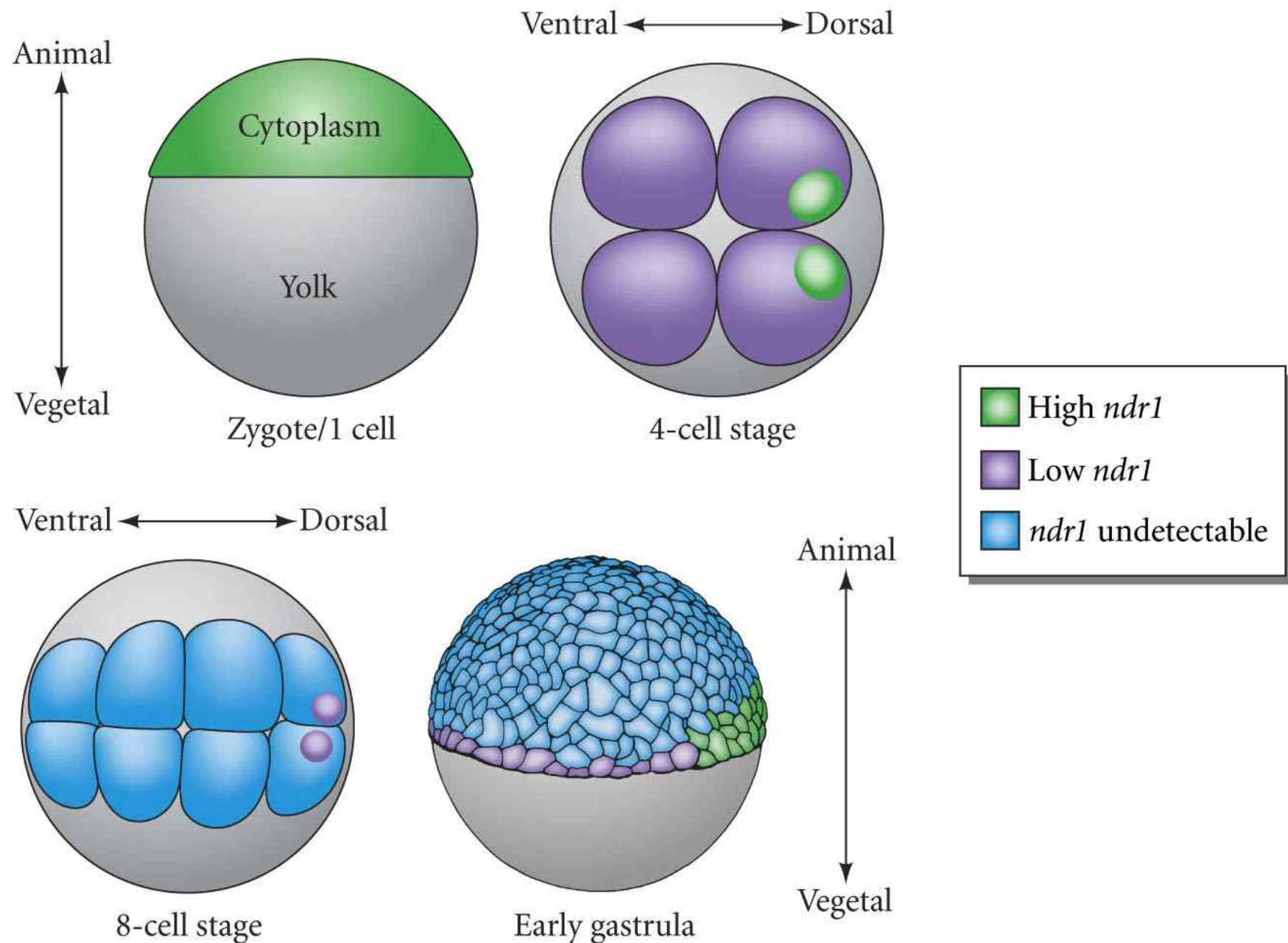
11.4 Discoidal meroblastic cleavage in a zebrafish egg

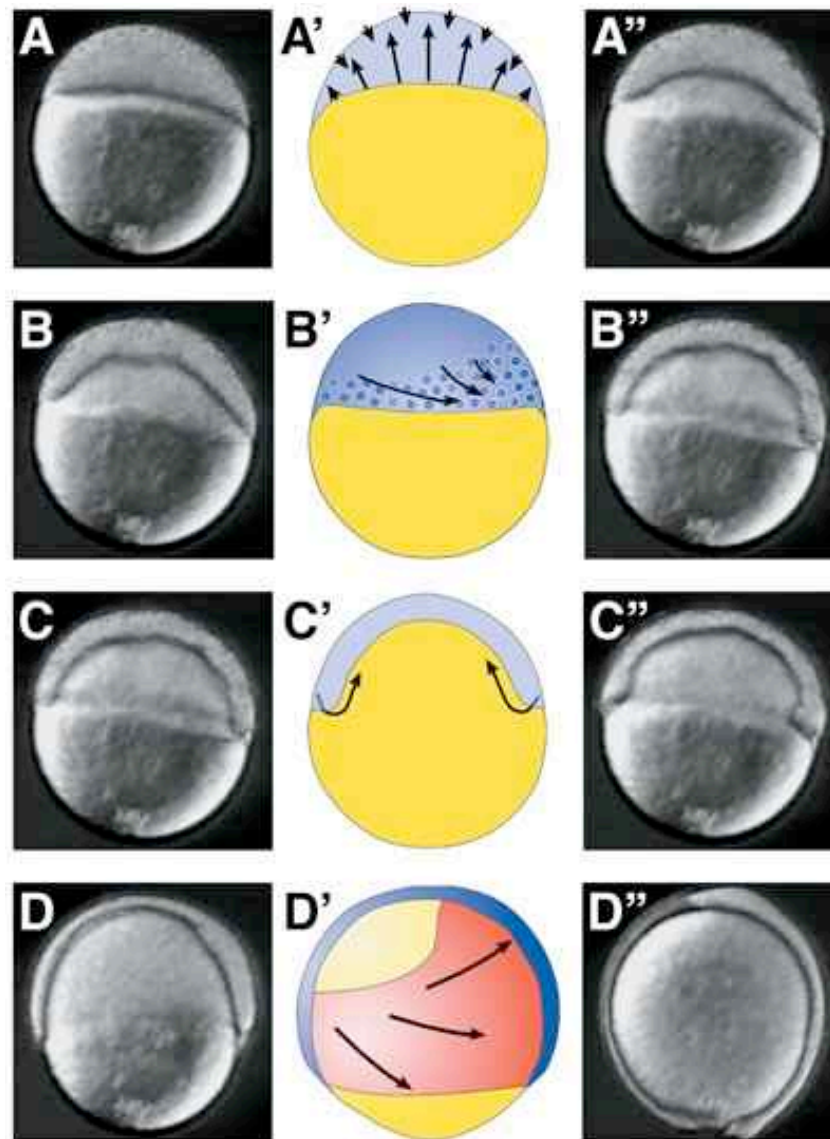


(C)



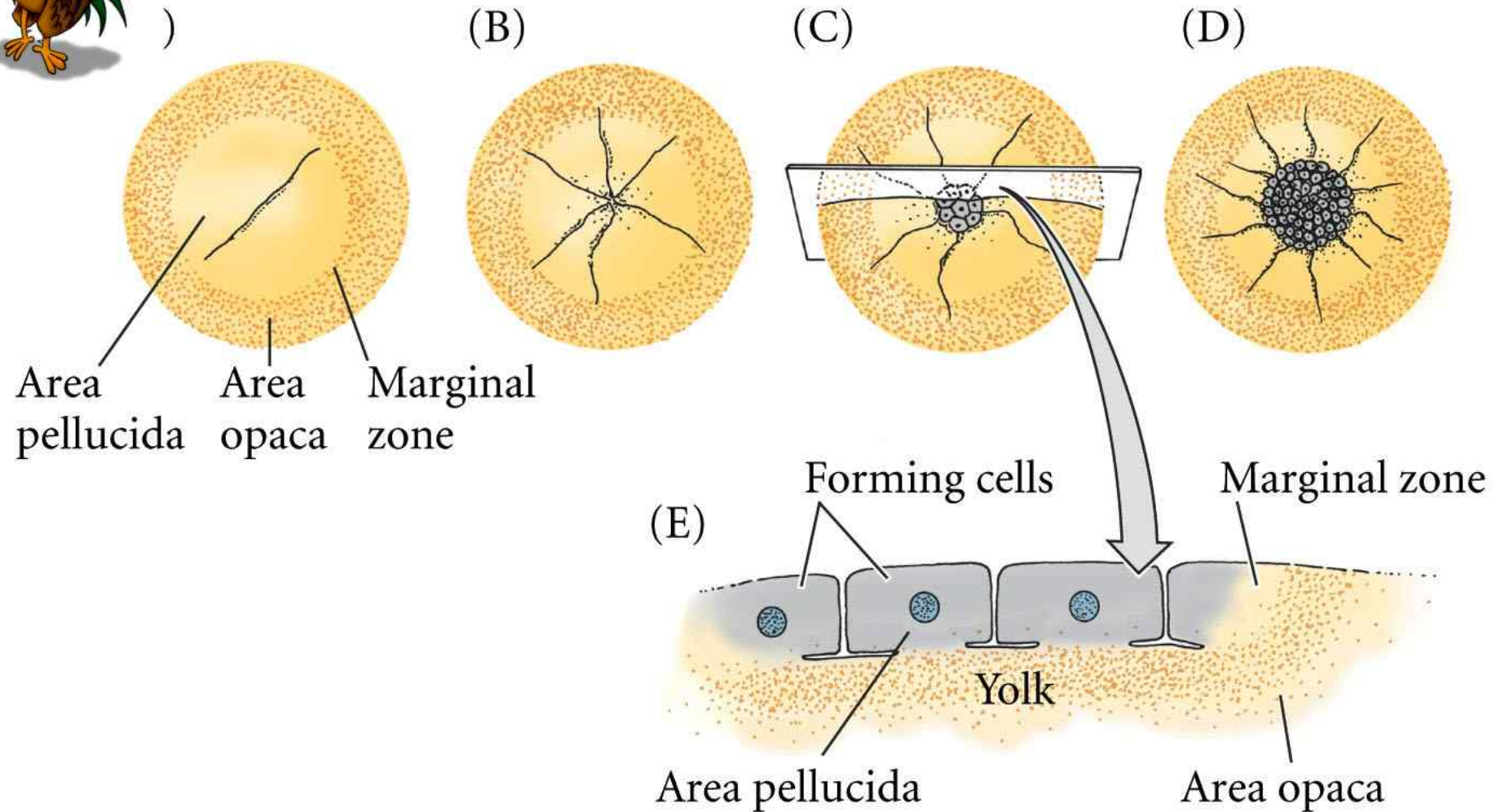
11.11 Maternal mRNA for Nodal-related protein is initially found throughout the egg cytoplasm



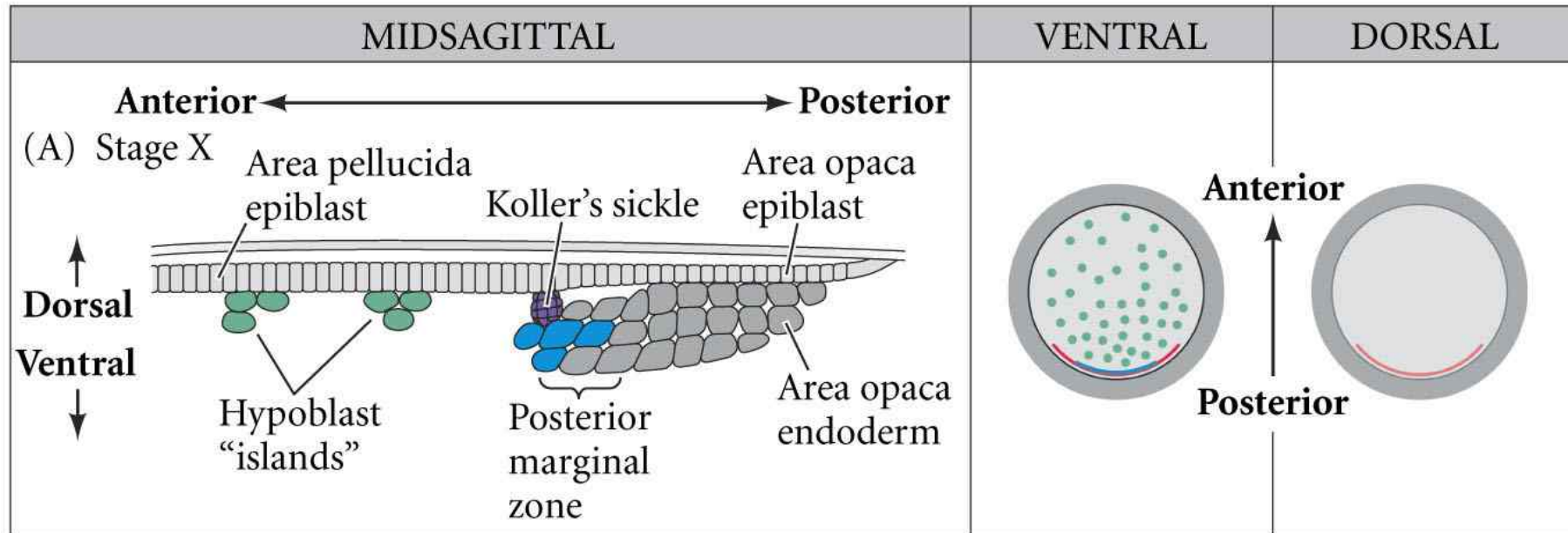


epíbole

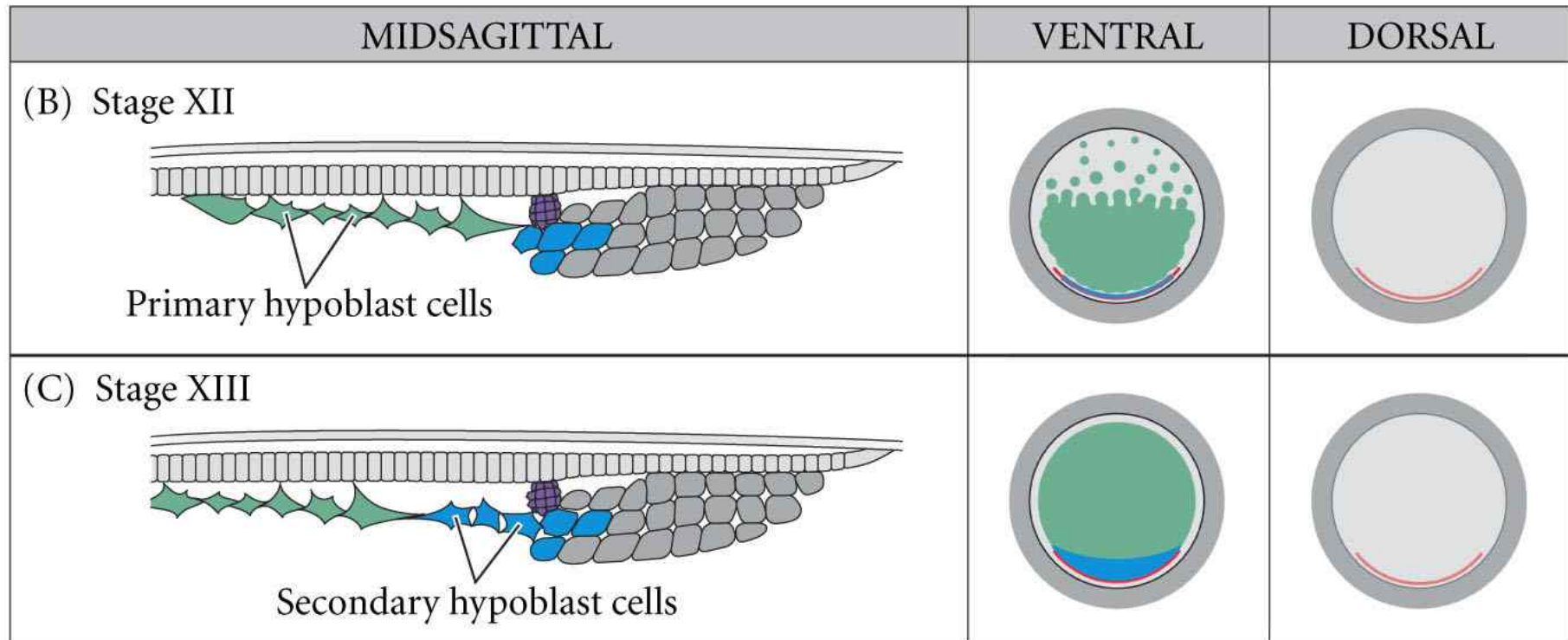
Discoidal meroblastic cleavage in a chick egg



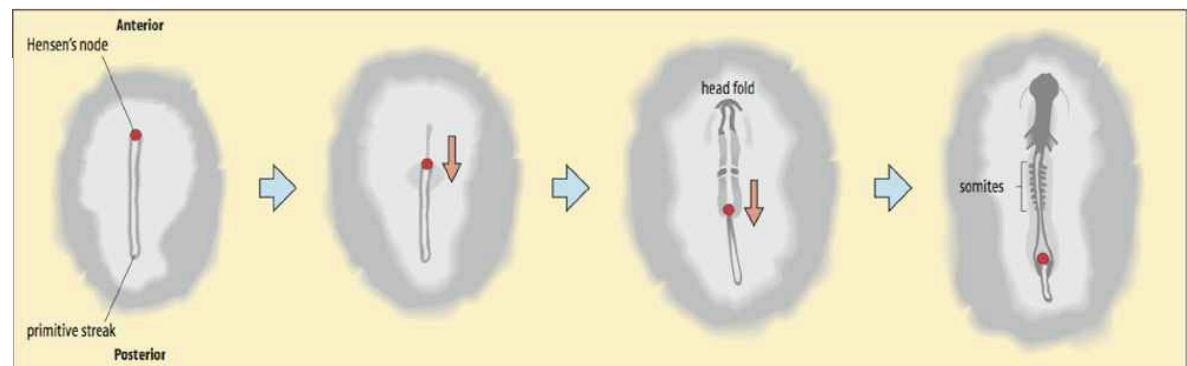
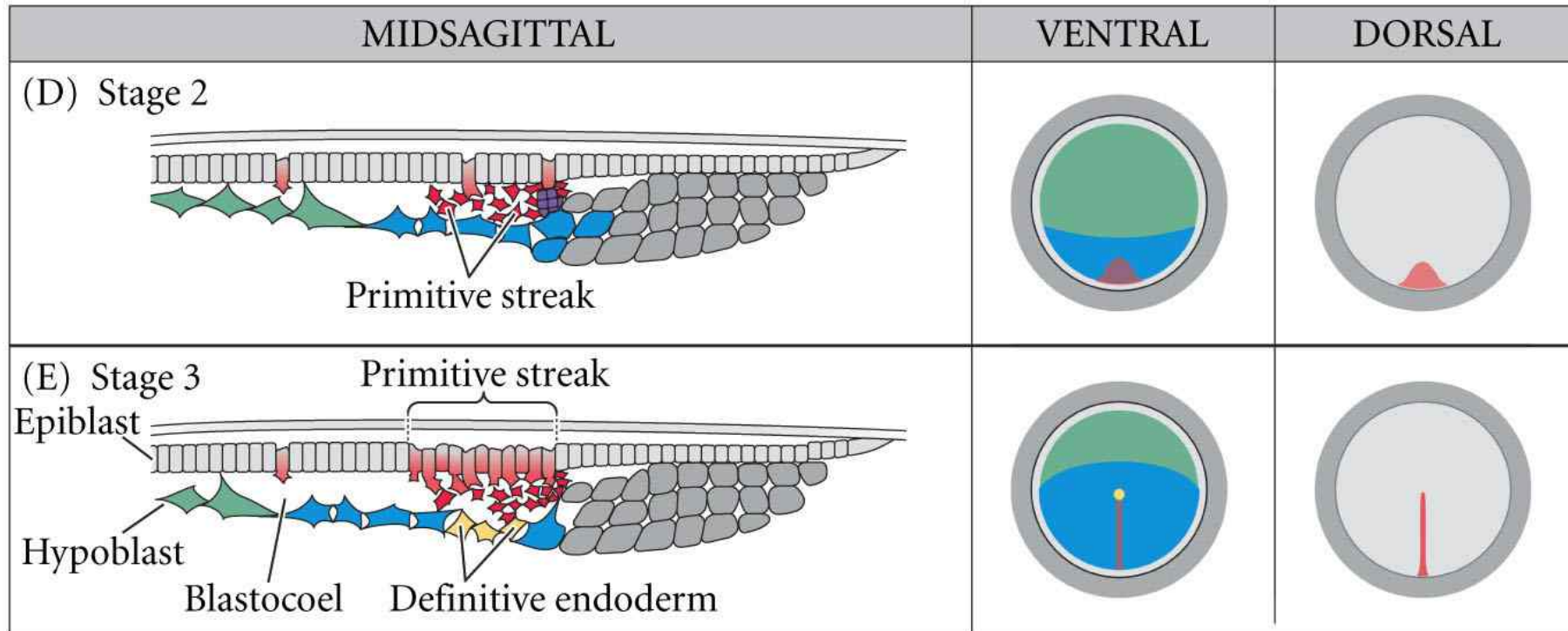
11.15 Formation of the three-layered blastoderm of the chick embryo (Part 1)



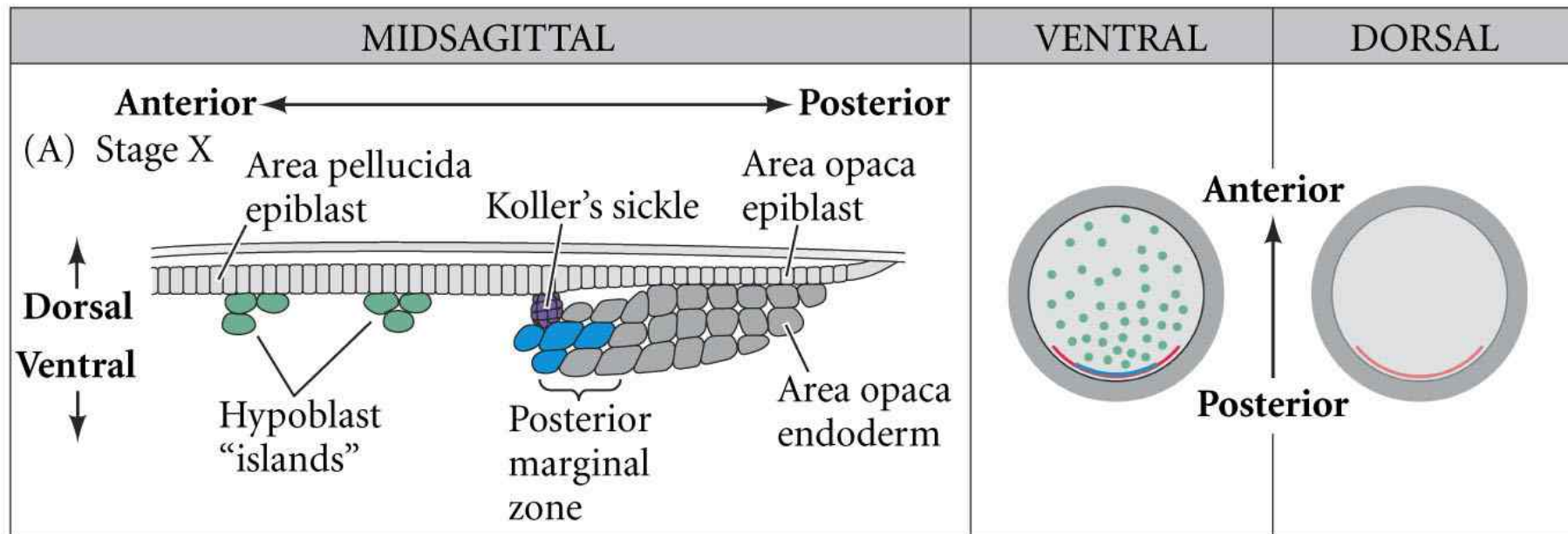
11.15 Formation of the three-layered blastoderm of the chick embryo (Part 2)



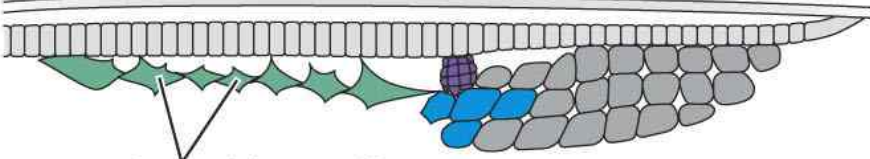
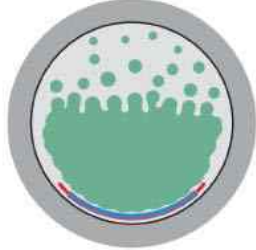
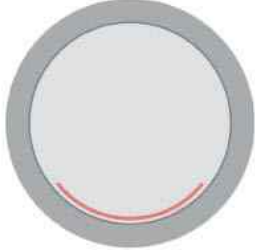
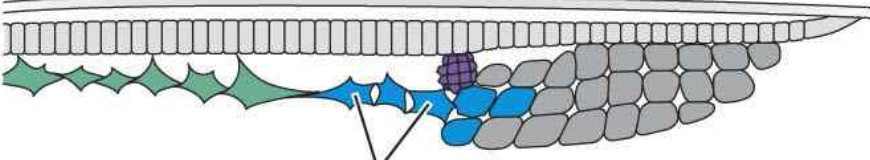
11.15 Formation of the three-layered blastoderm of the chick embryo (Part 3)



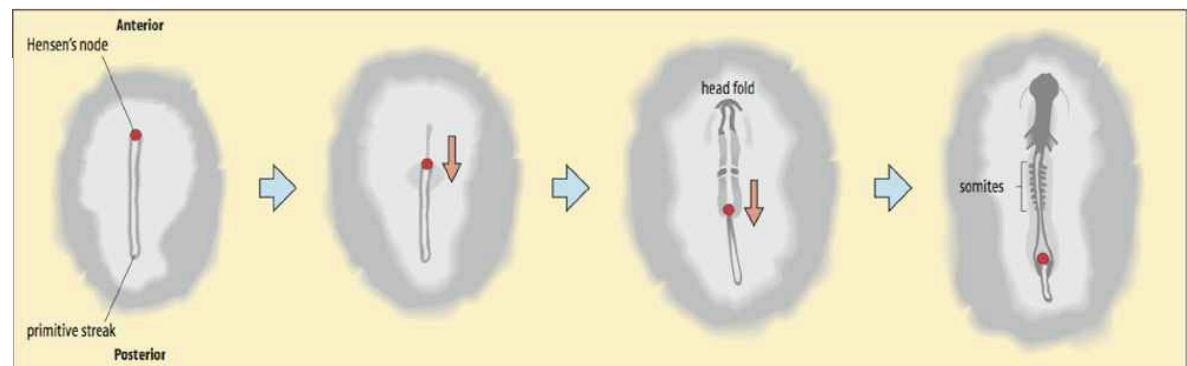
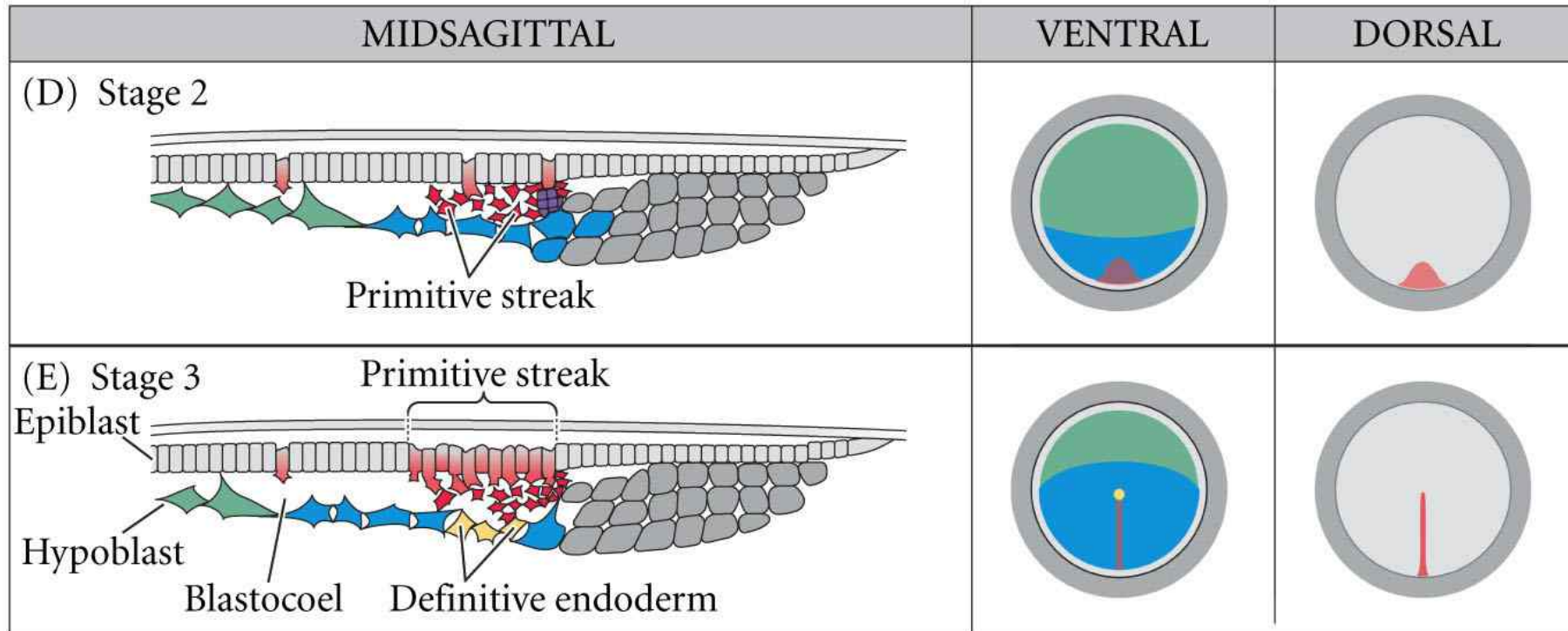
Formação das três camadas da blastoderme de galinha



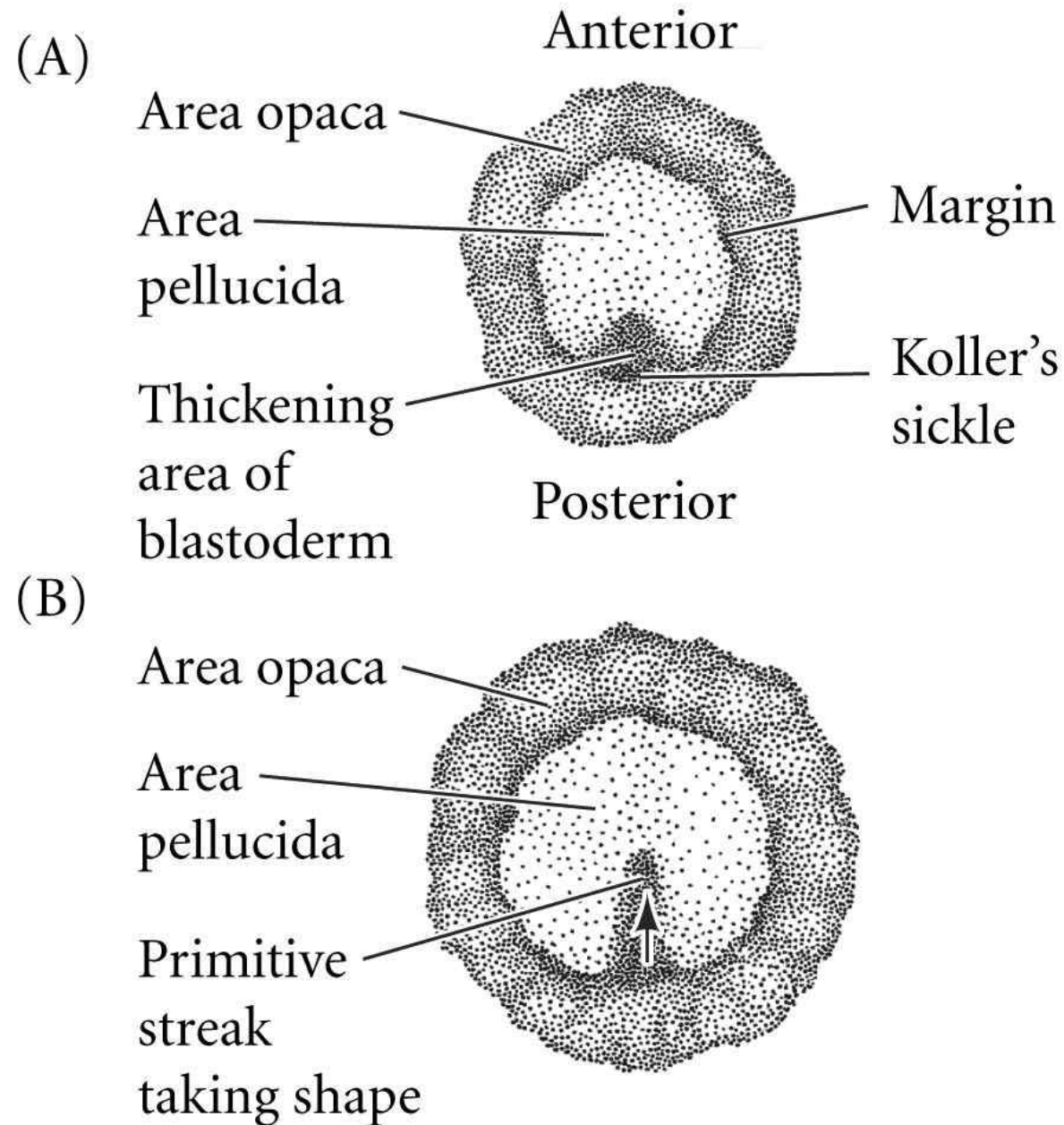
Formação das três camadas da blastoderme de galinha

MIDSAGITTAL	VENTRAL	DORSAL
(B) Stage XII  Primary hypoblast cells		
(C) Stage XIII  Secondary hypoblast cells		

Formação das três camadas da blastoderme de galinha

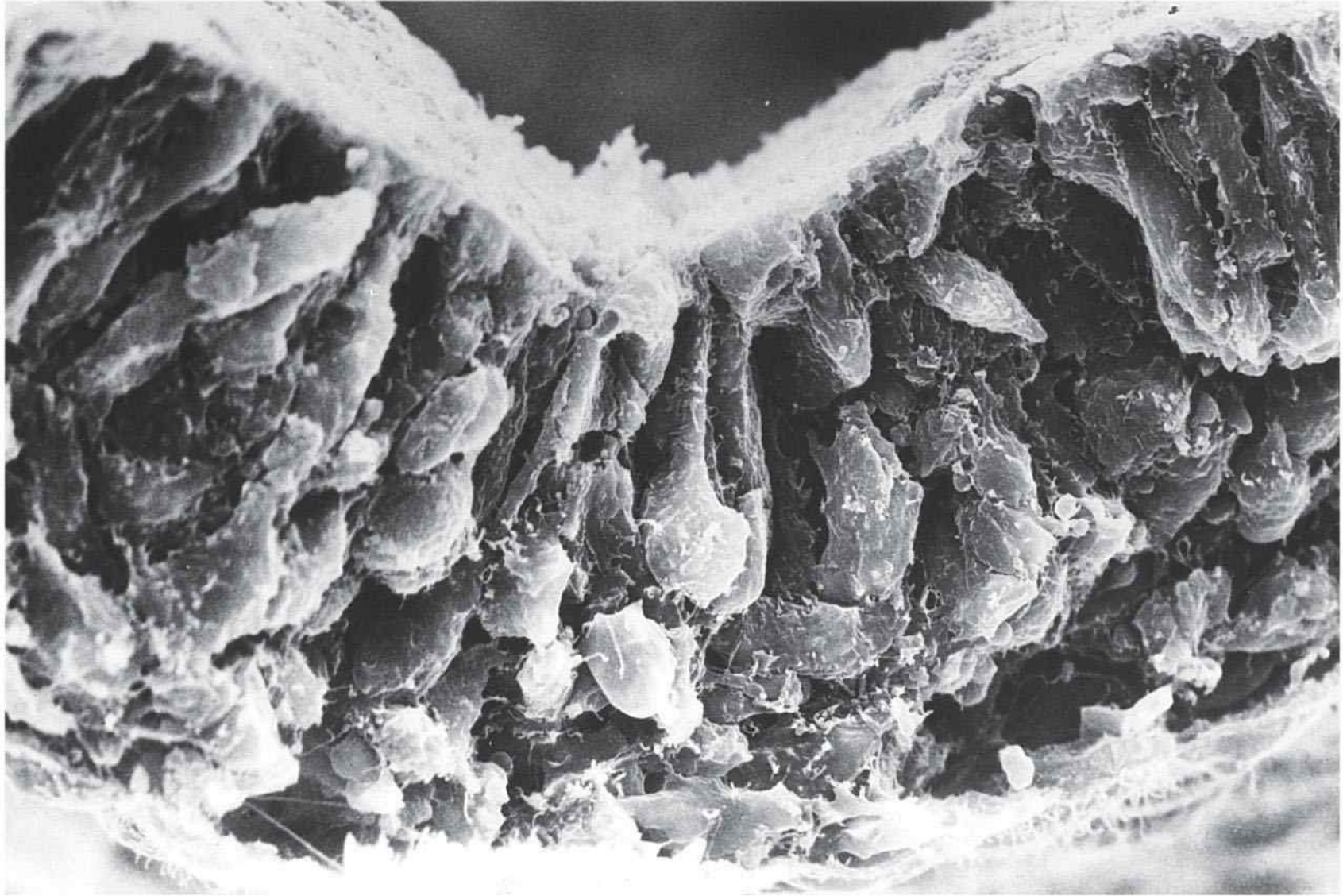


Movimentos celulares da linha primitiva

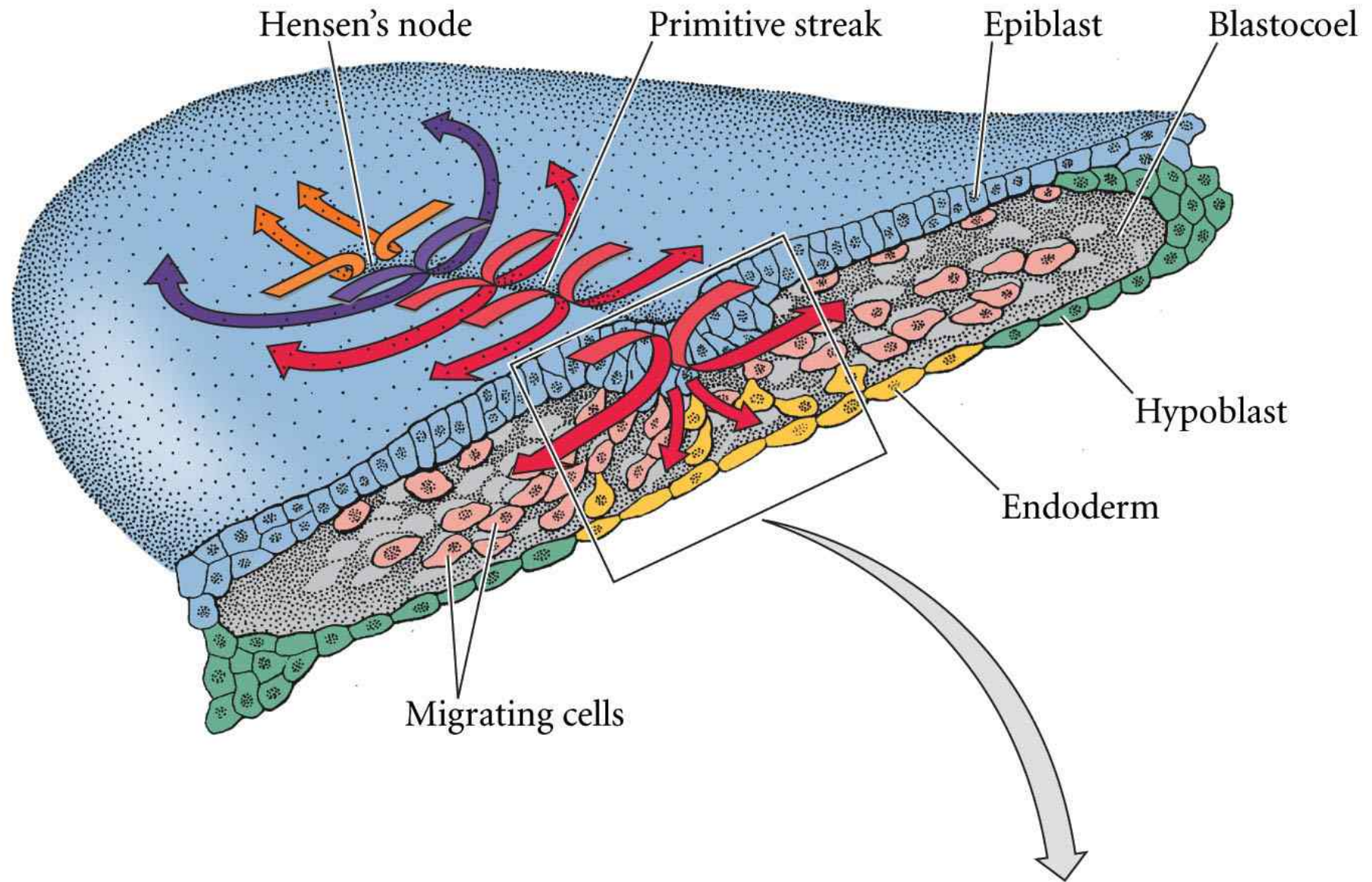


Migração de células endodérmicas e mesodérmicas através da linha primitiva

(B)

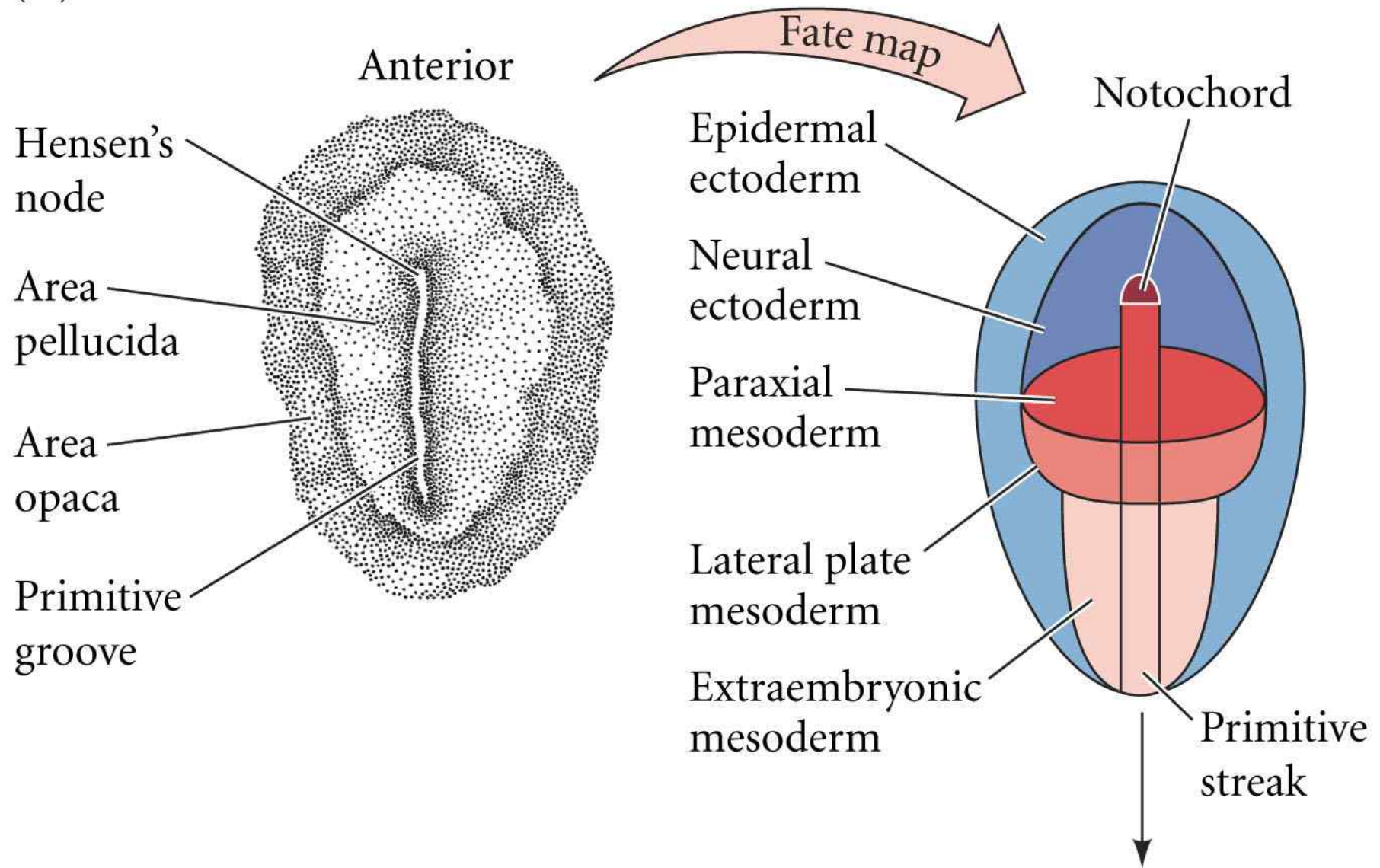


Movimentos celulares da linha primitiva



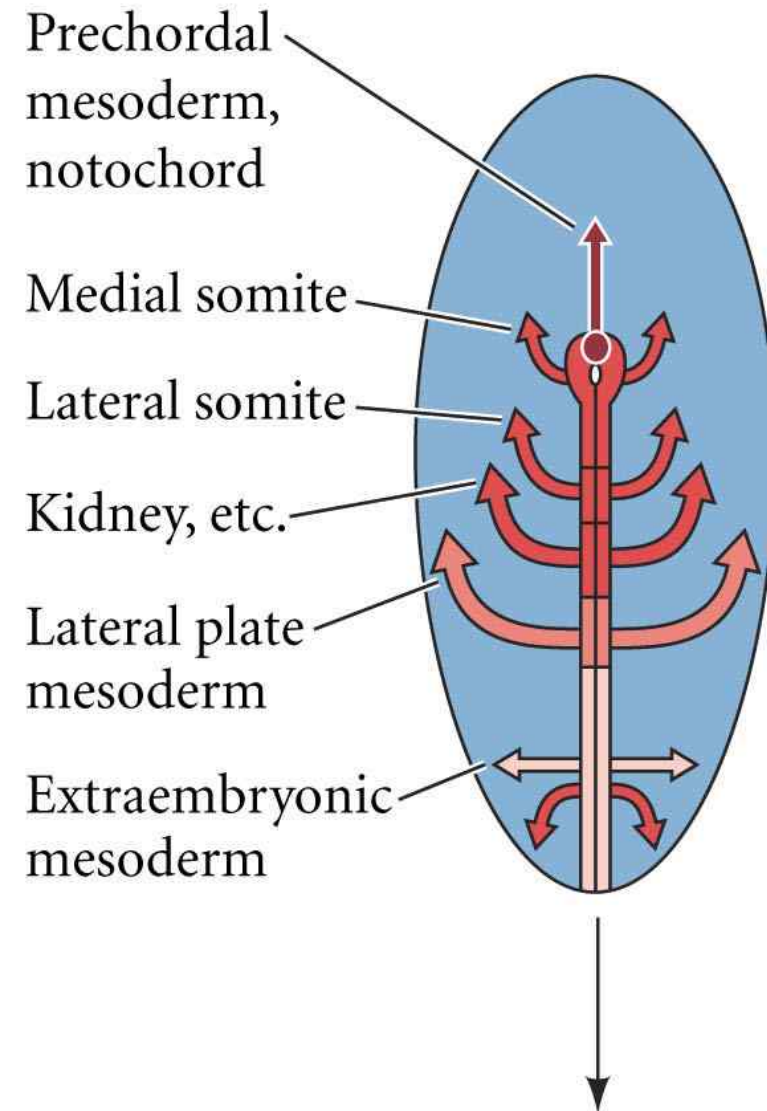
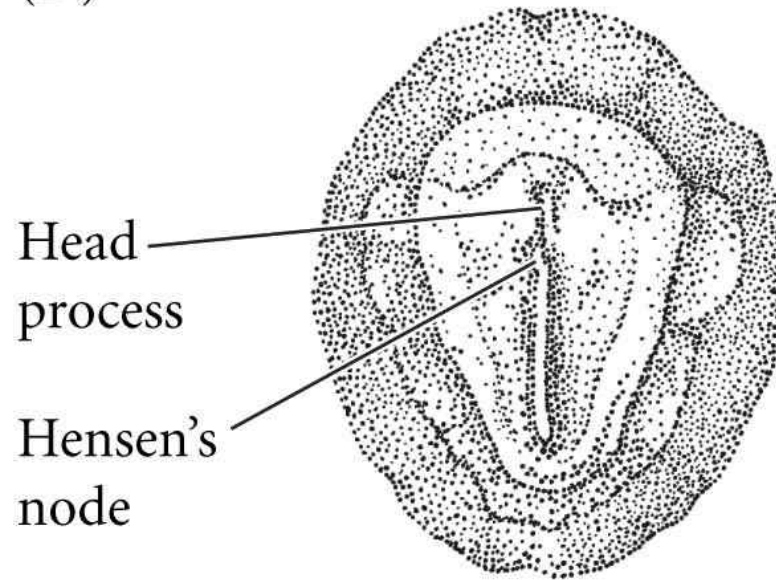
Movimentos celulares da linha primitiva

(C)

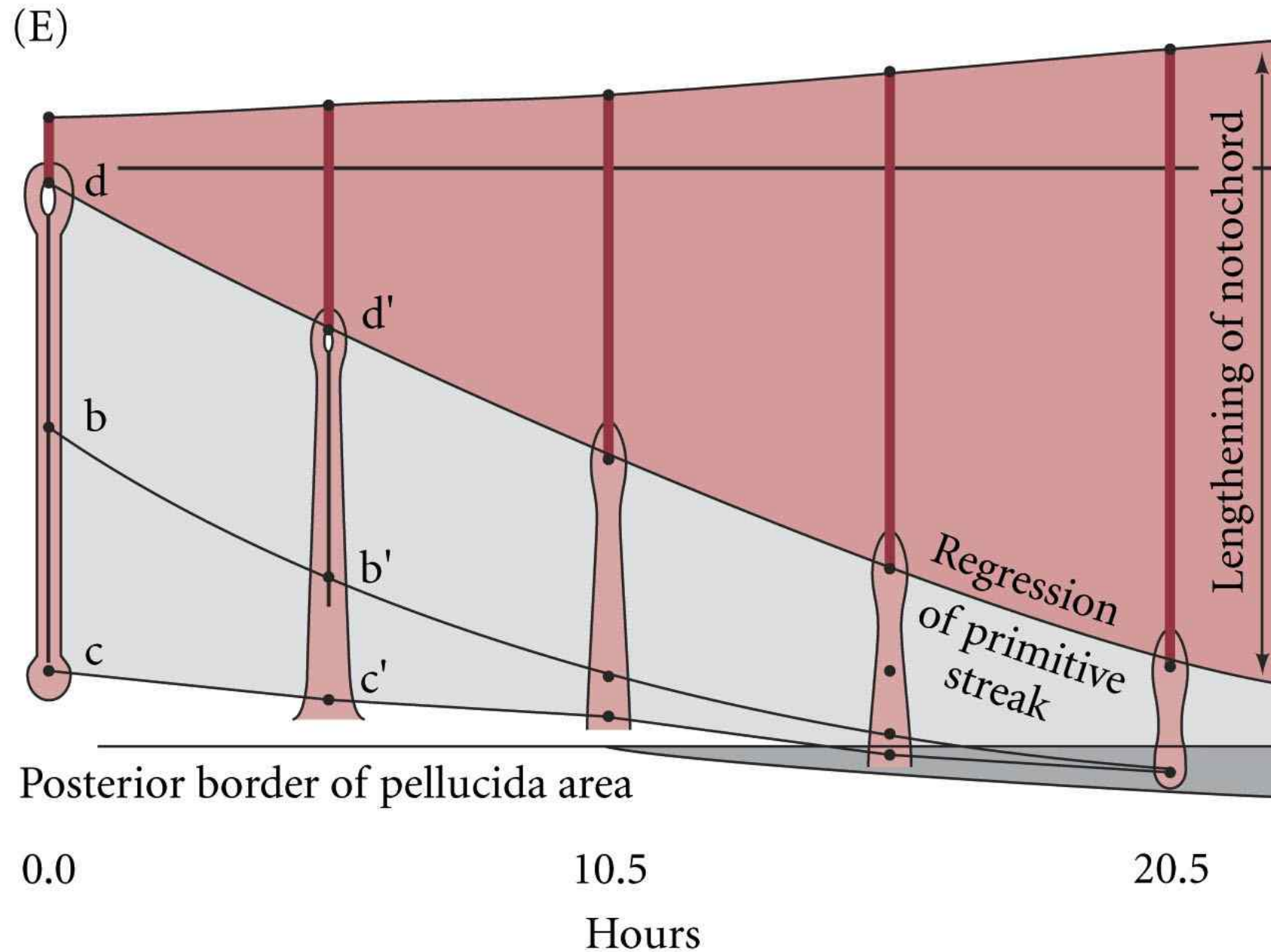


Movimentos celulares da linha primitiva

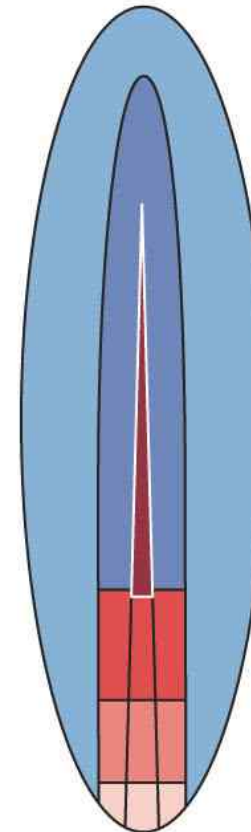
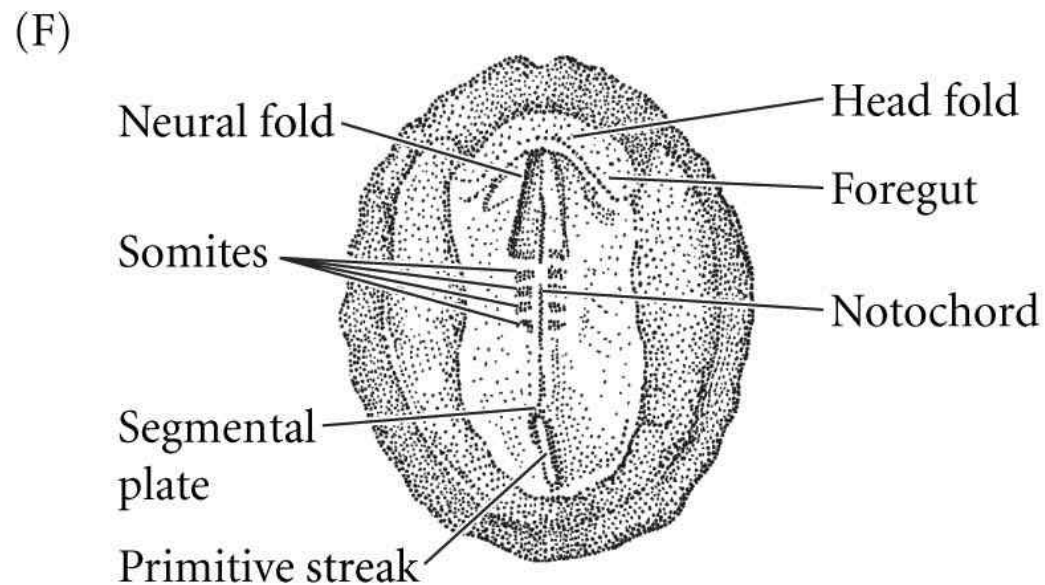
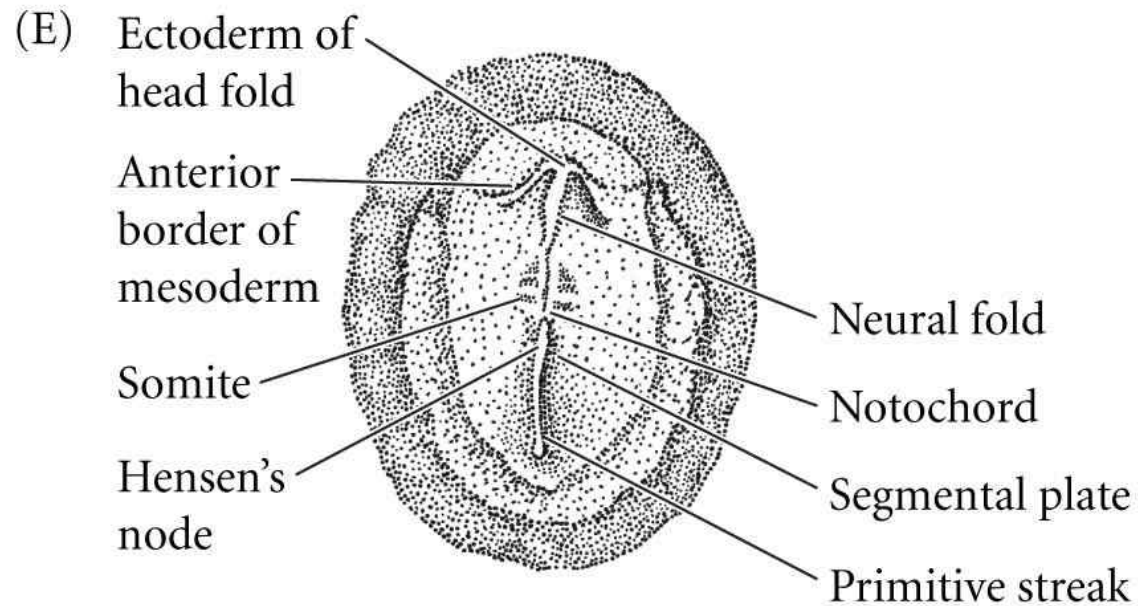
(D)



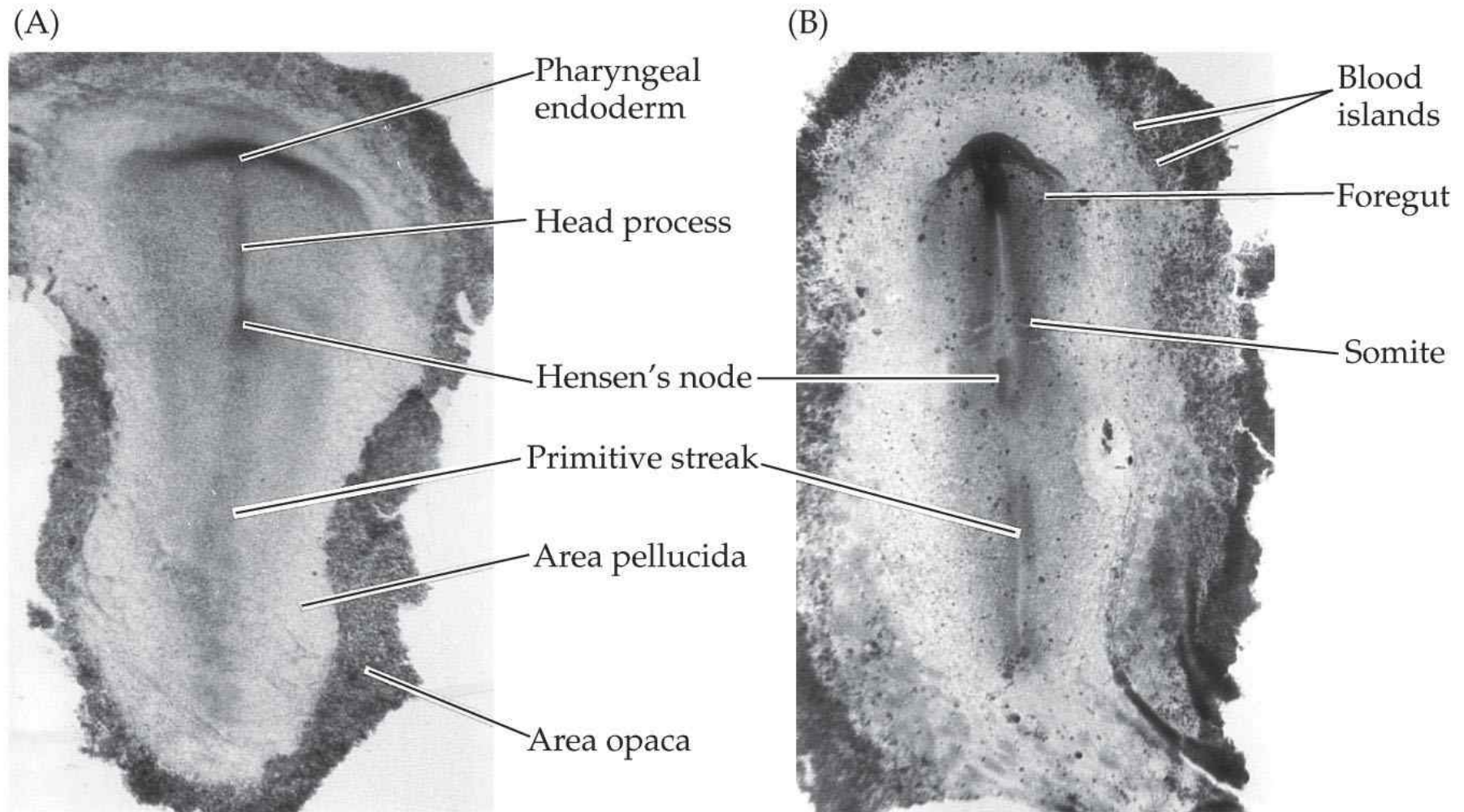
Gastrulation na galinha (24–28 hours)



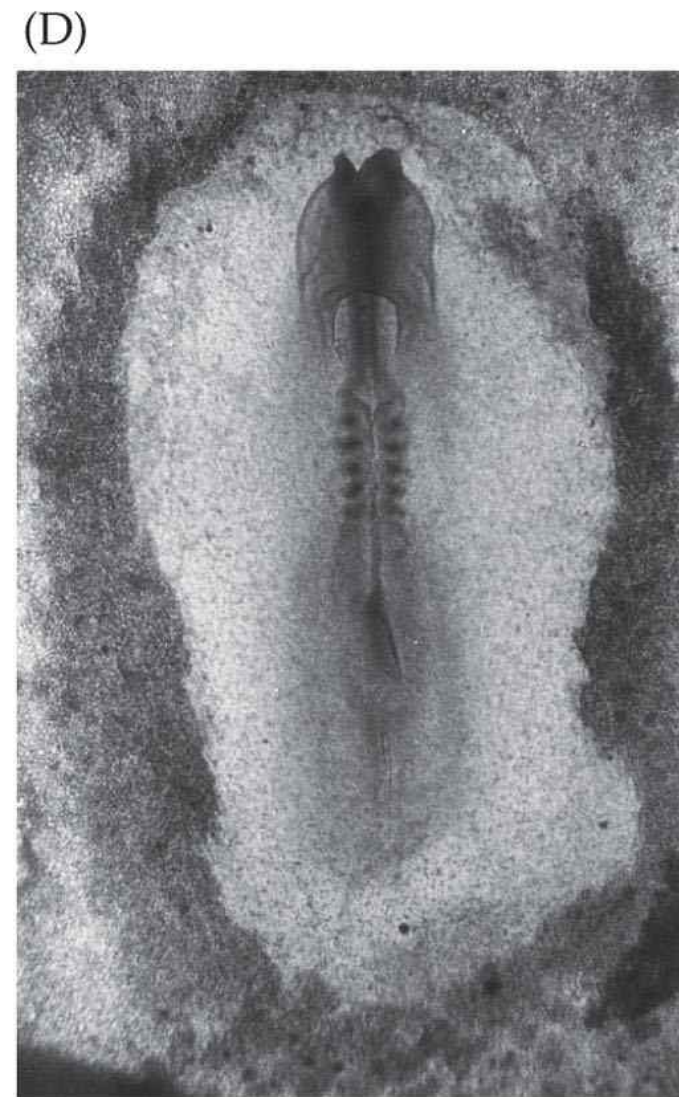
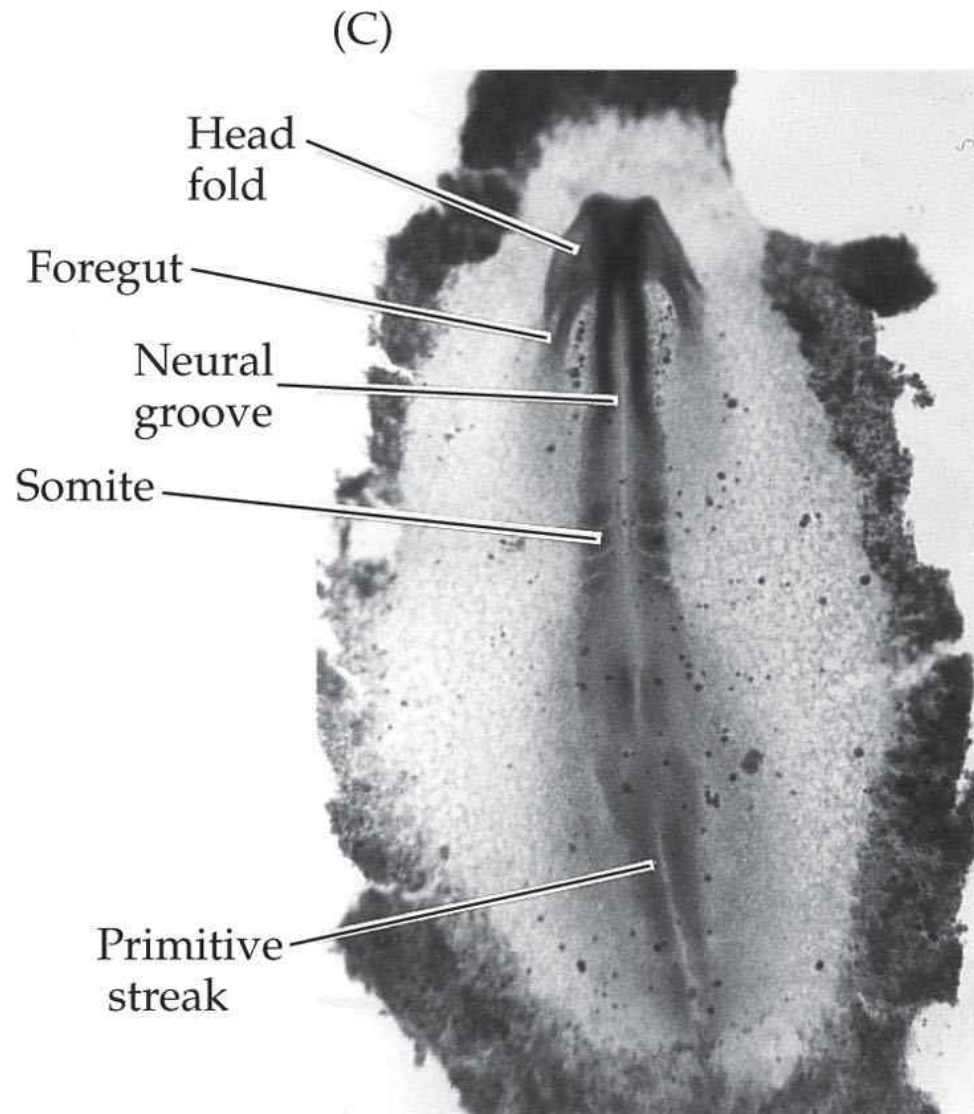
Movimentos celulares da linha primitiva



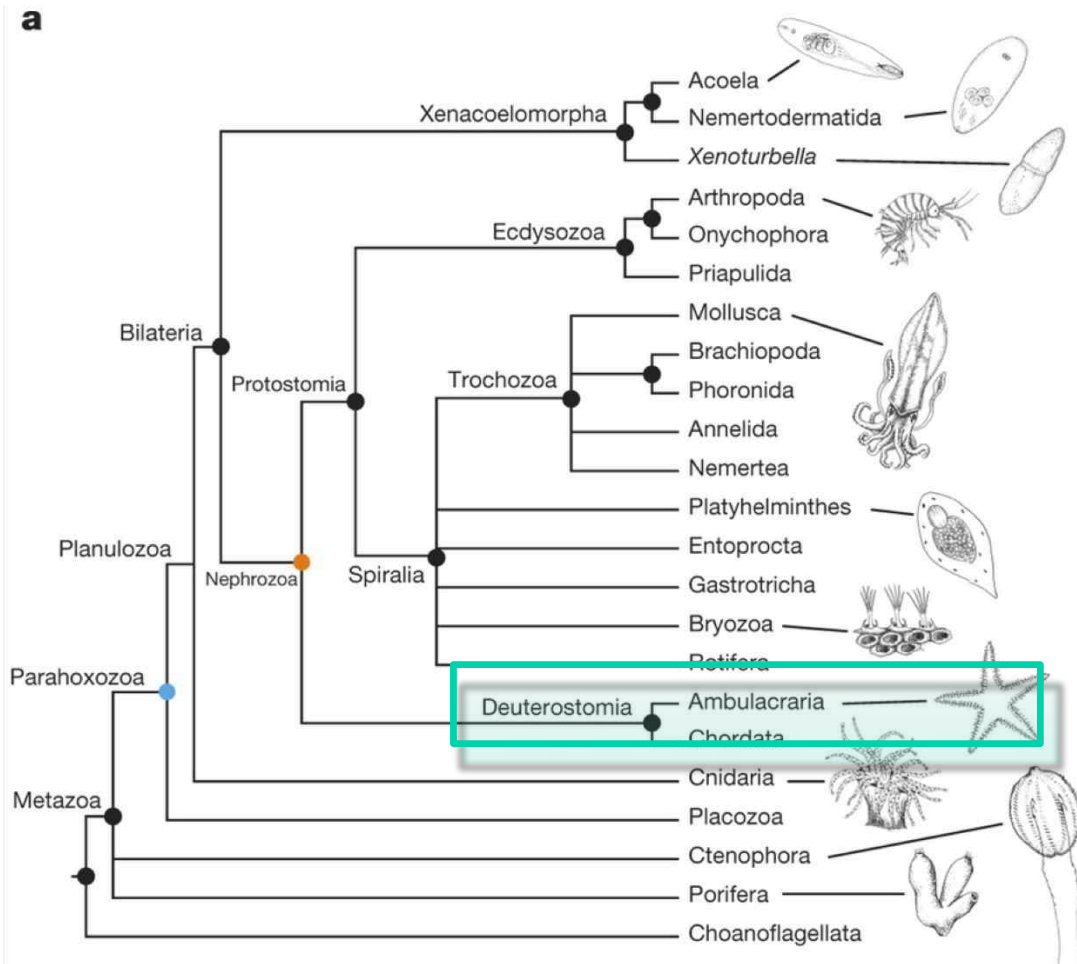
Gastrulação da galinha (24–28 hours)



Gastrulação da galinha (24–28 hours)

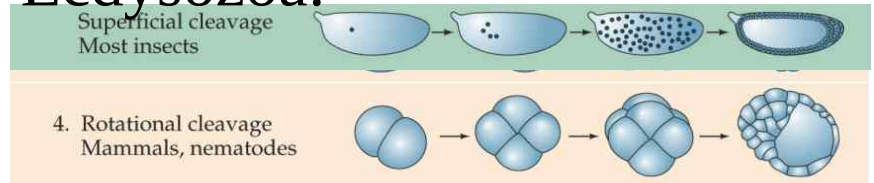


Pattern of development in the Metazoans:

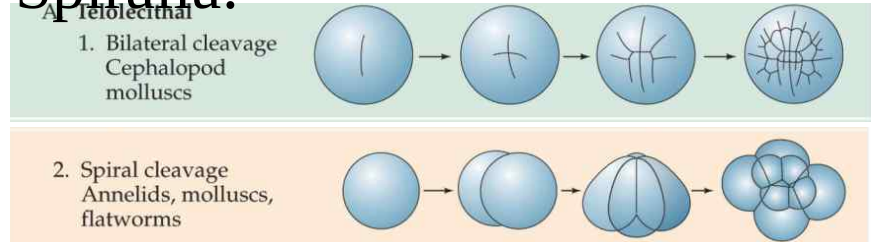


Cannon et al. 2016

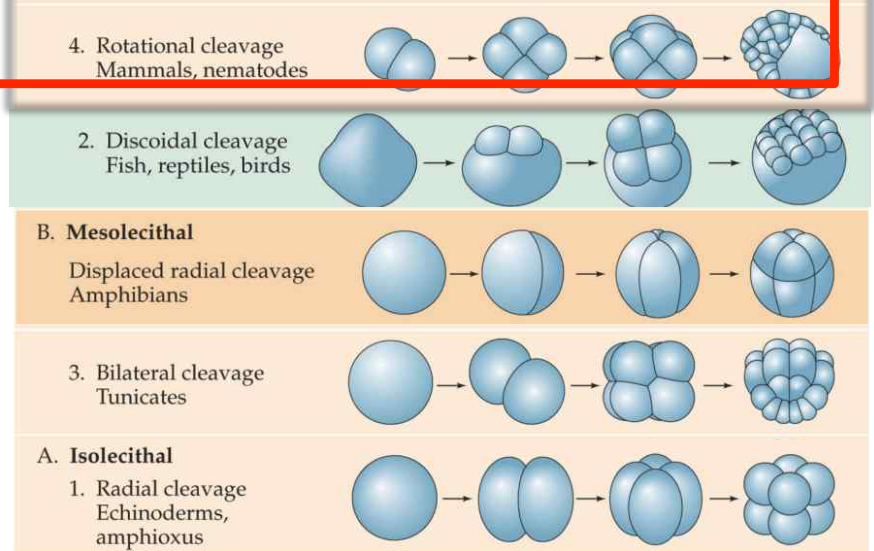
Ecdysozoa:



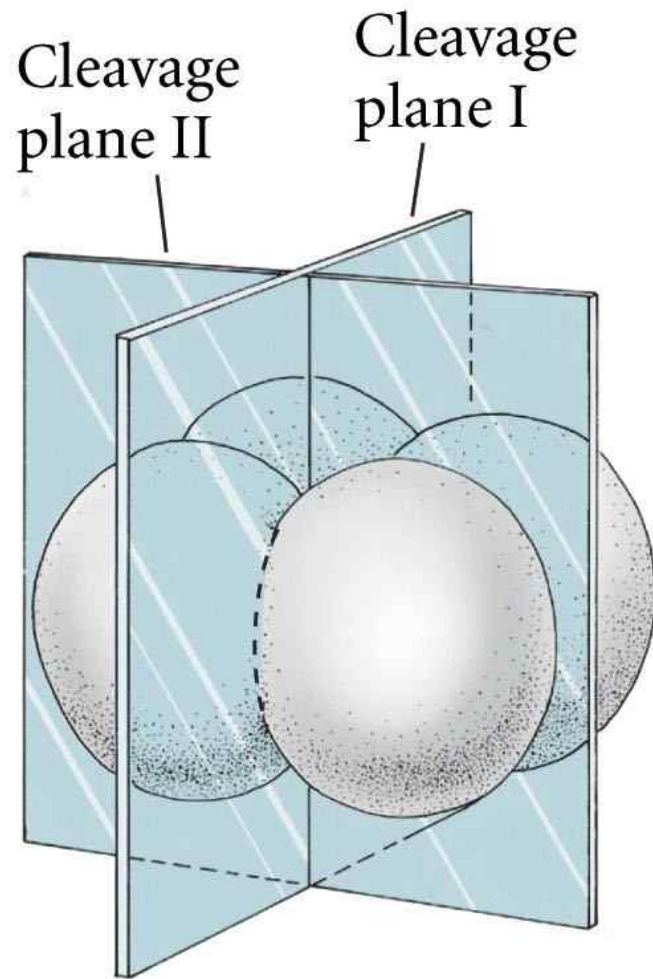
Spiralia:



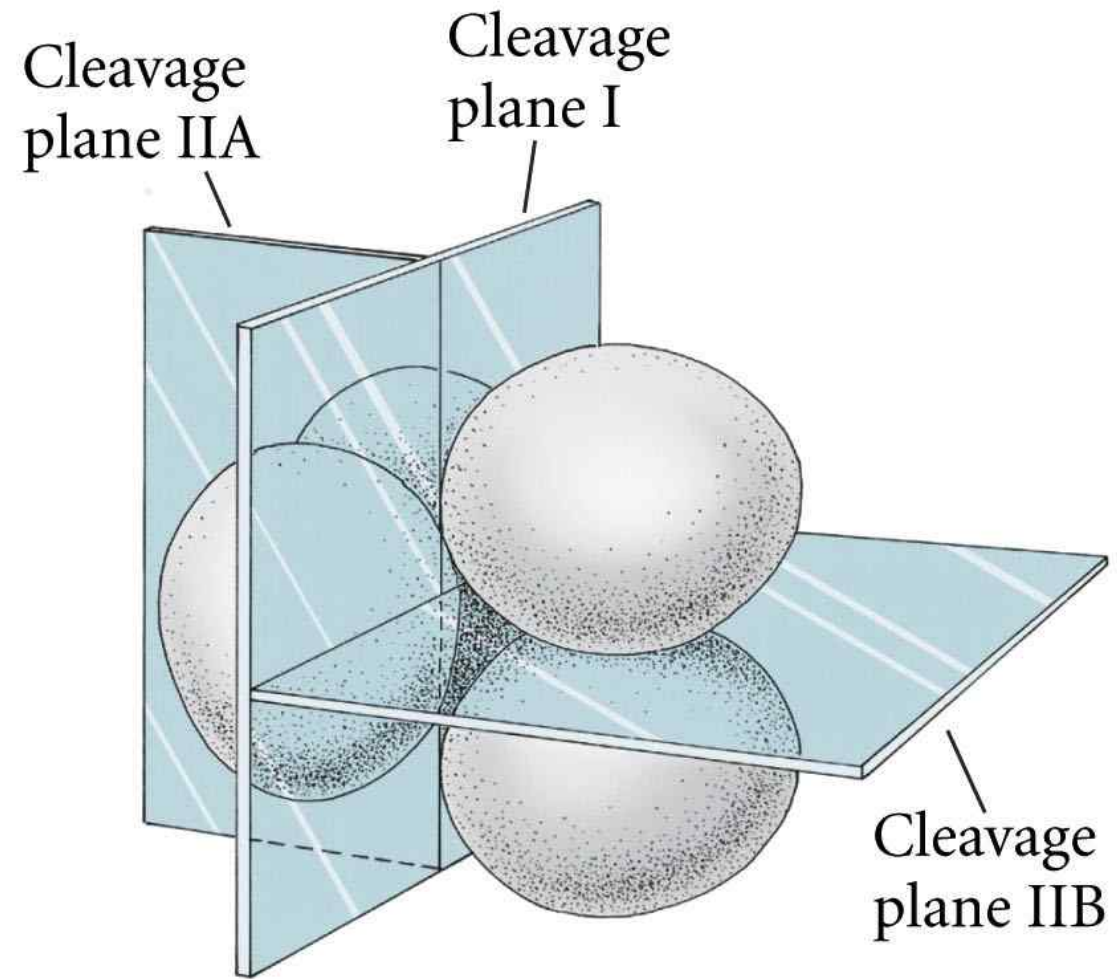
Deuterostomia:



Comparação das primeiras divisões em (A) equinodermos e anfíbios e (B) mamíferos

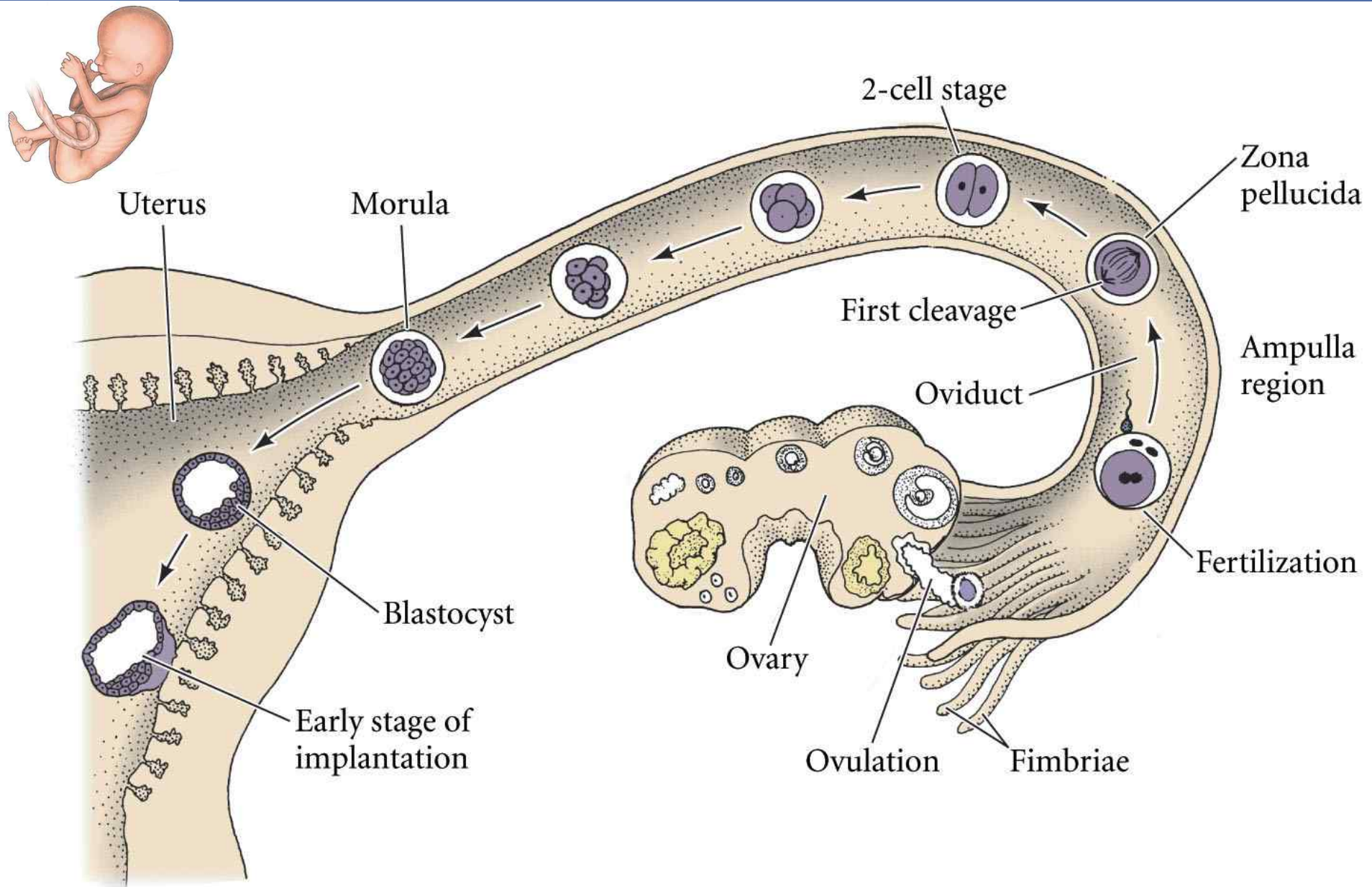


(A) ECHINODERM
AND AMPHIBIAN

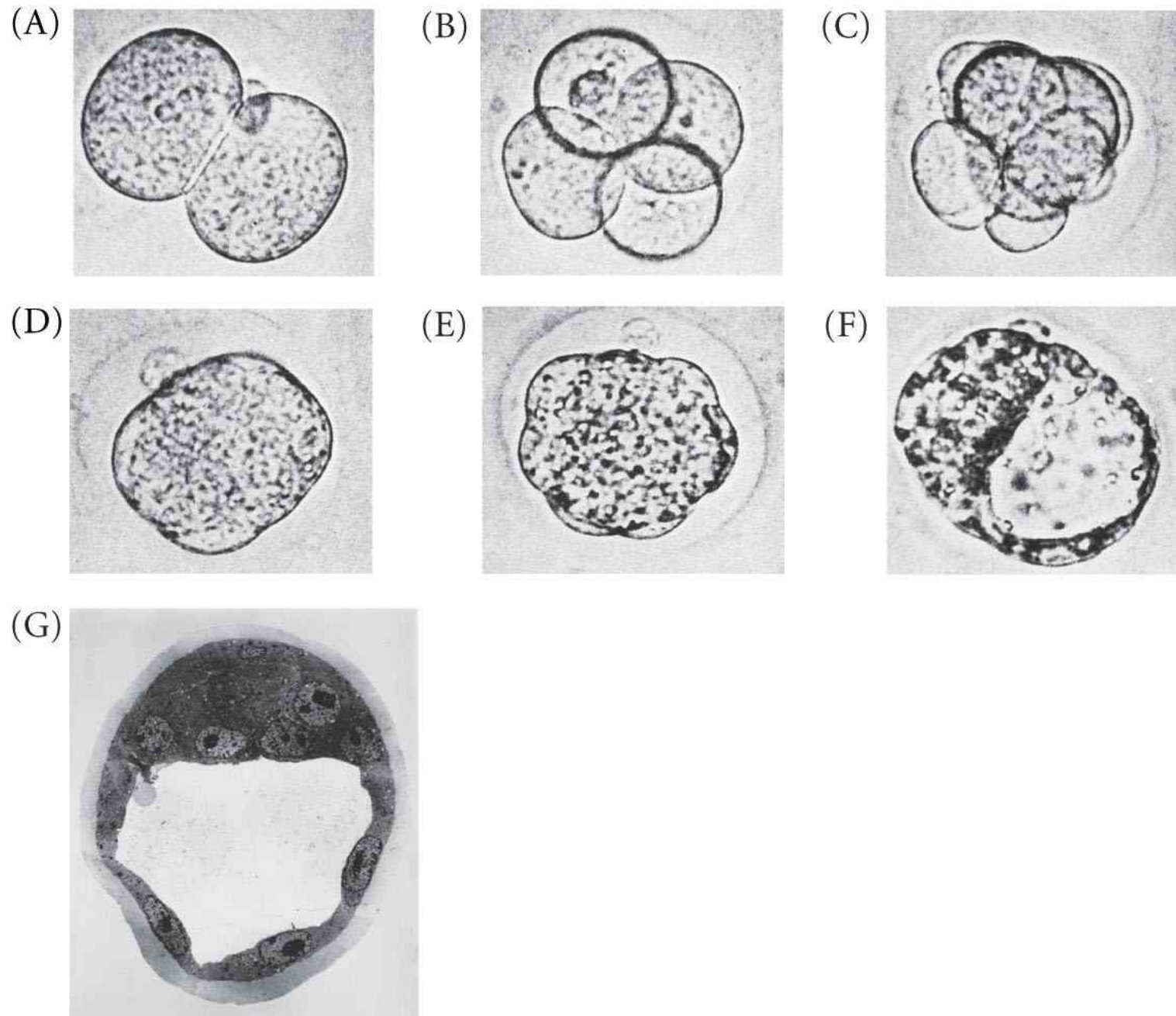


(B) MAMMAL

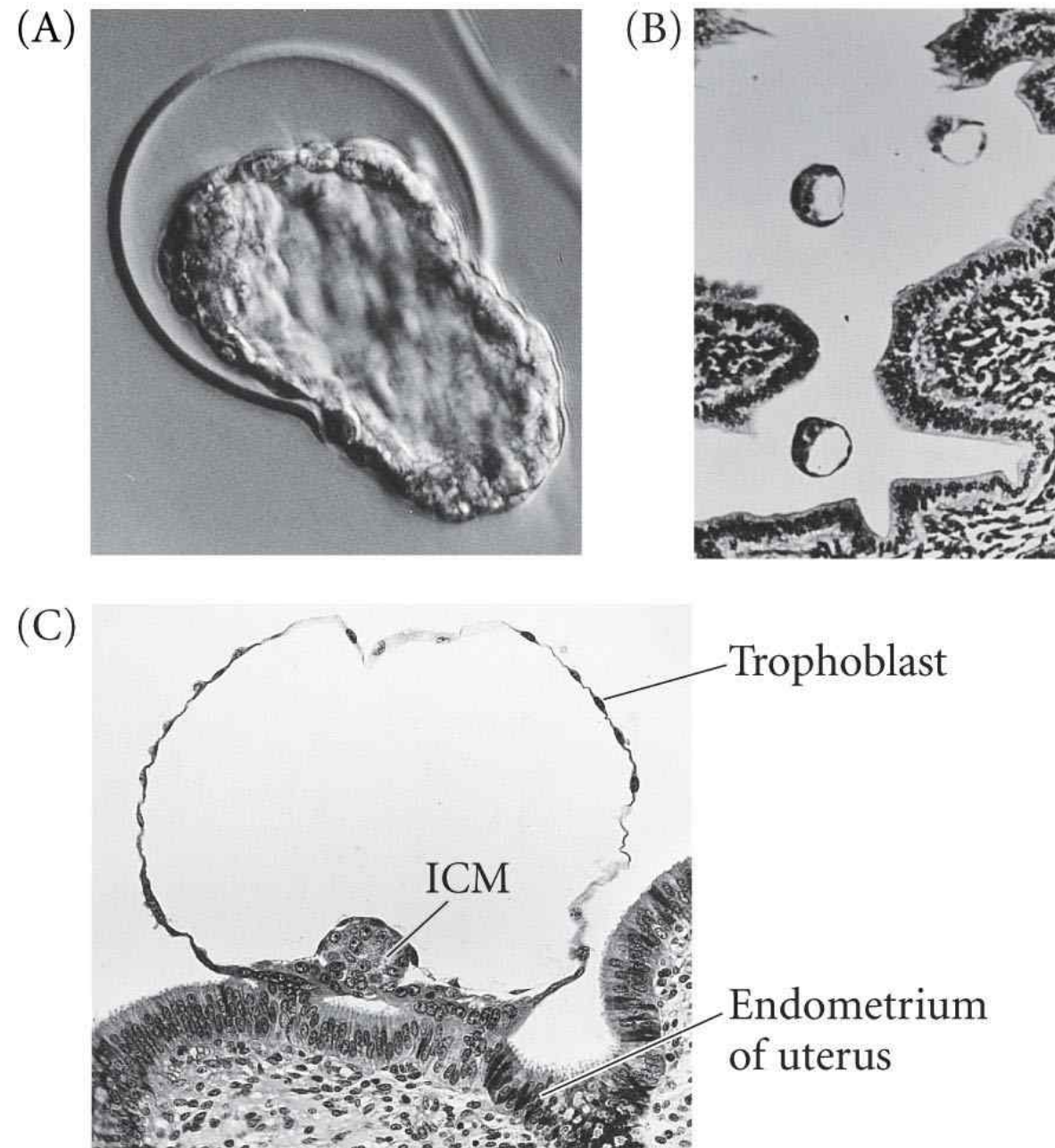
11.27 Development of a human embryo from fertilization to implantation



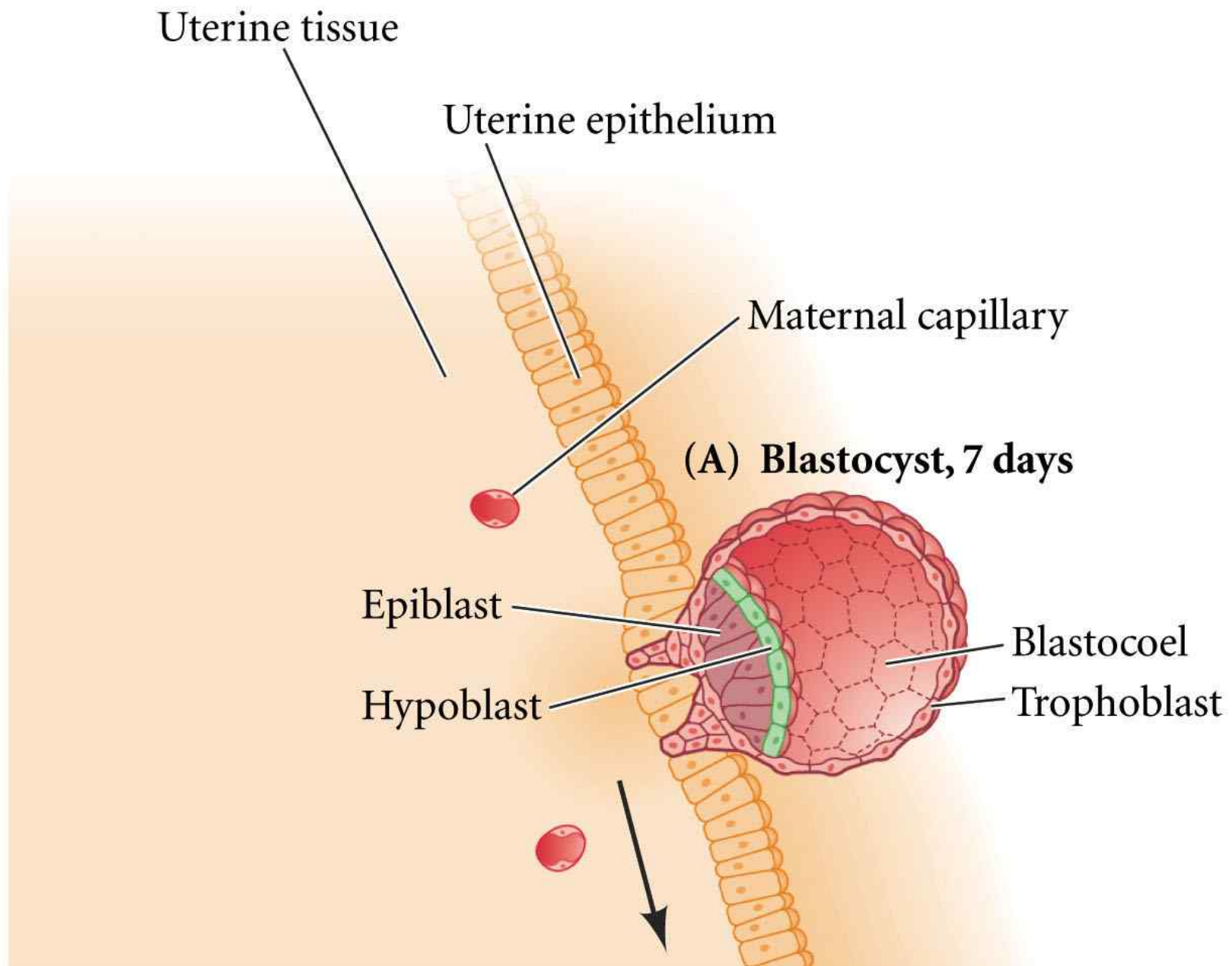
11.29 Cleavage of a single mouse embryo in vitro



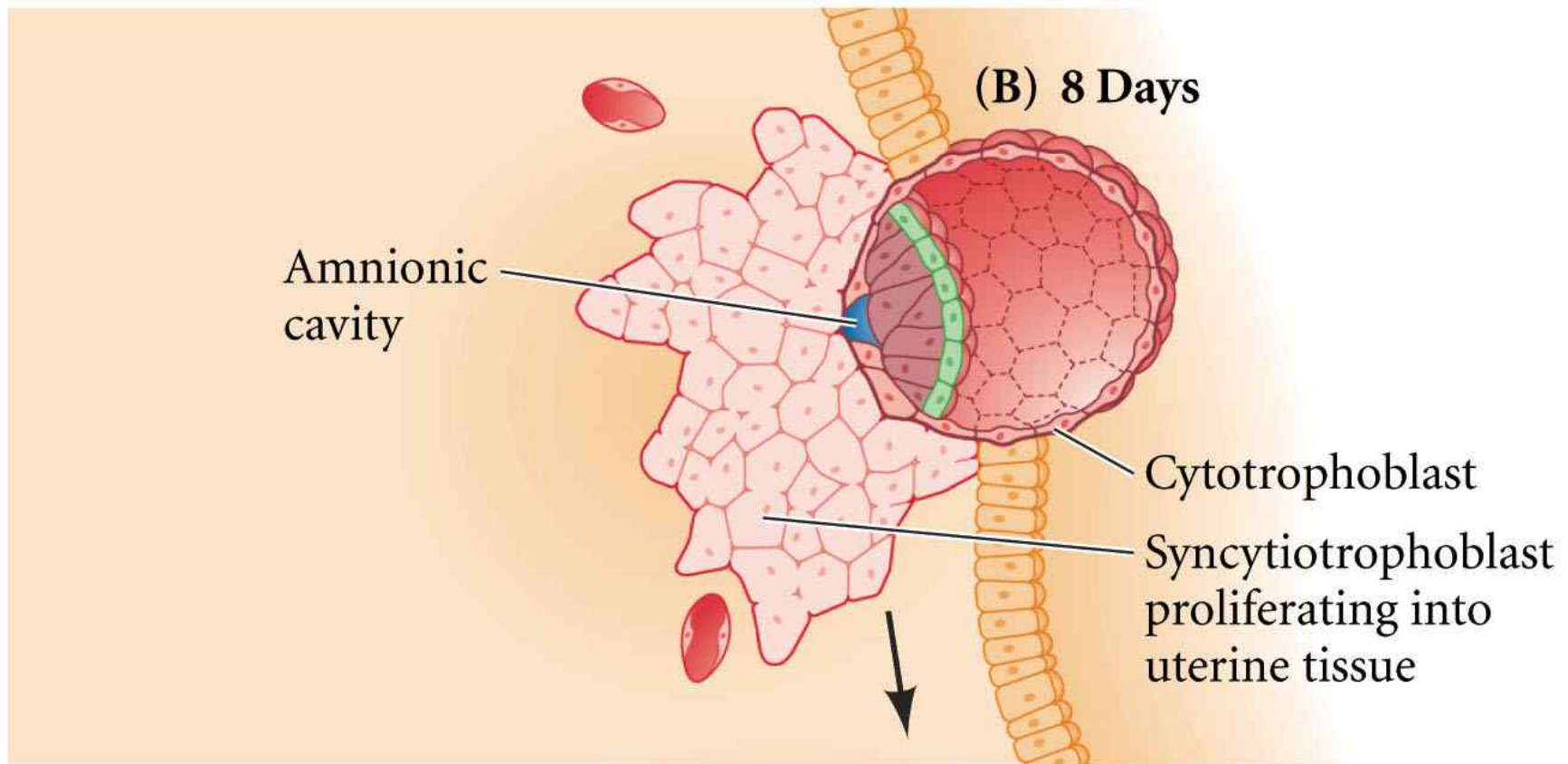
11.31 Hatching from the zona and implantation of the mammalian blastocyst in the uterus



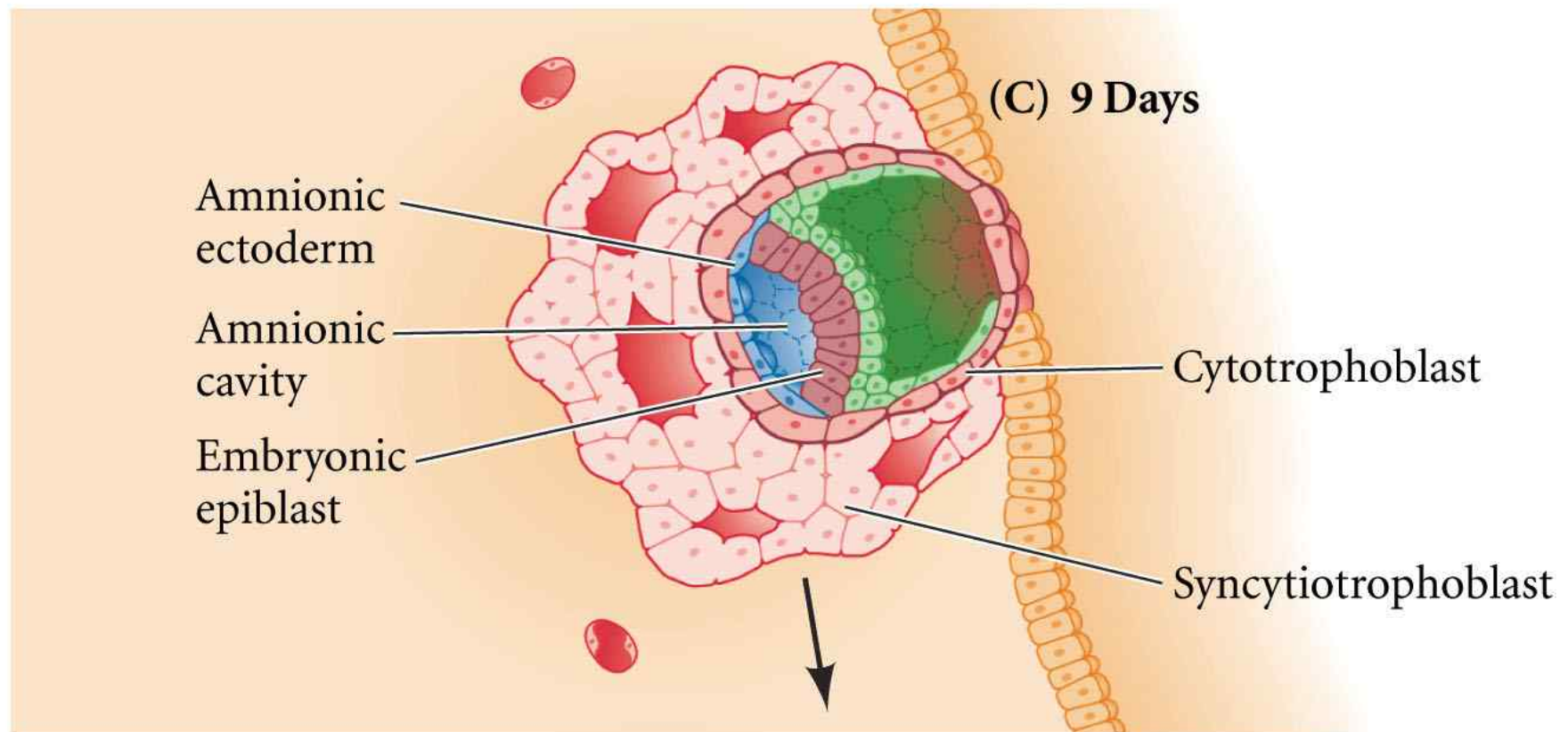
Formação do embrião humano (dia 7-11)



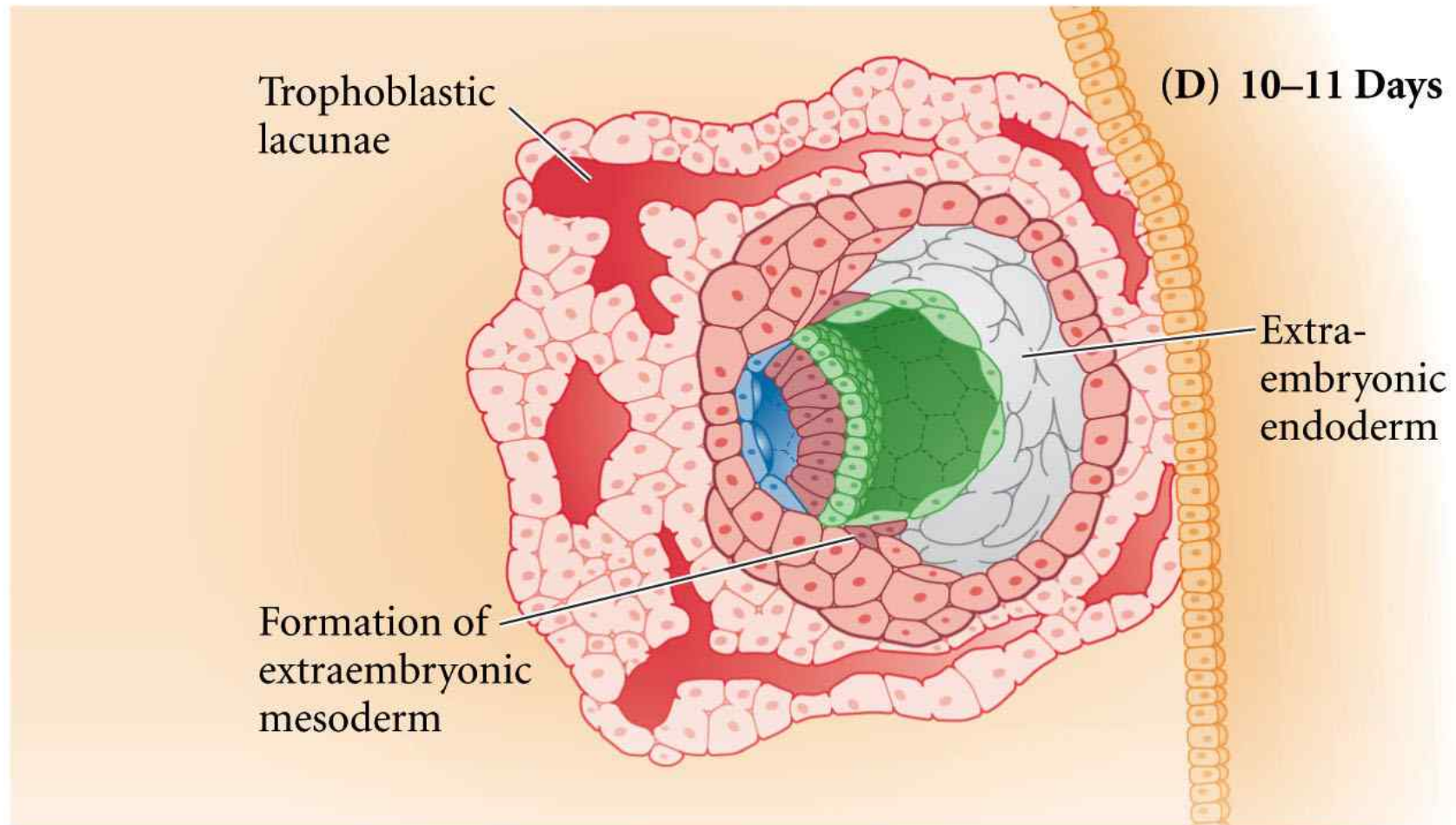
Formação do embrião humano (dia 7-11)



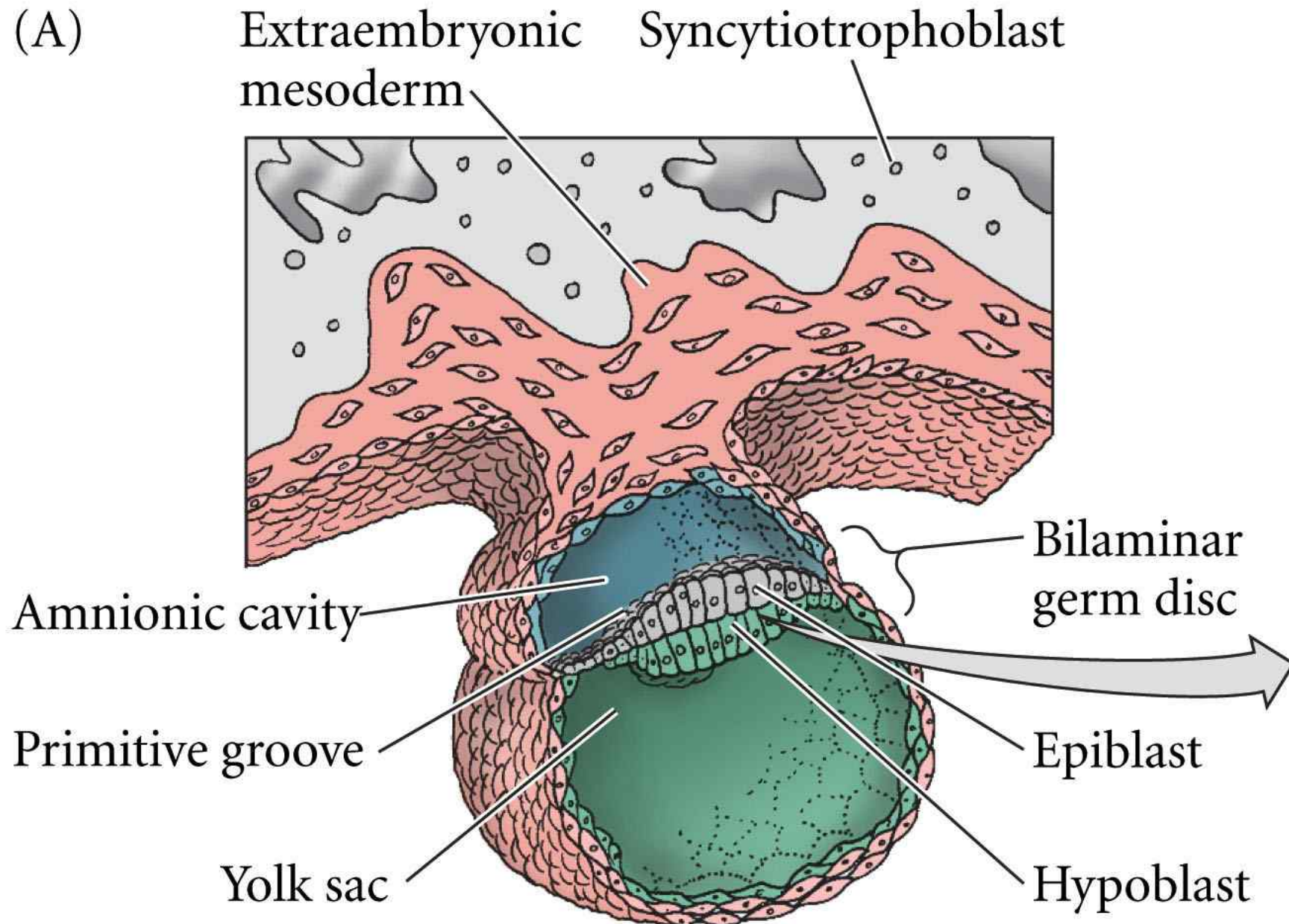
Formação do embrião humano (dia 7-11)



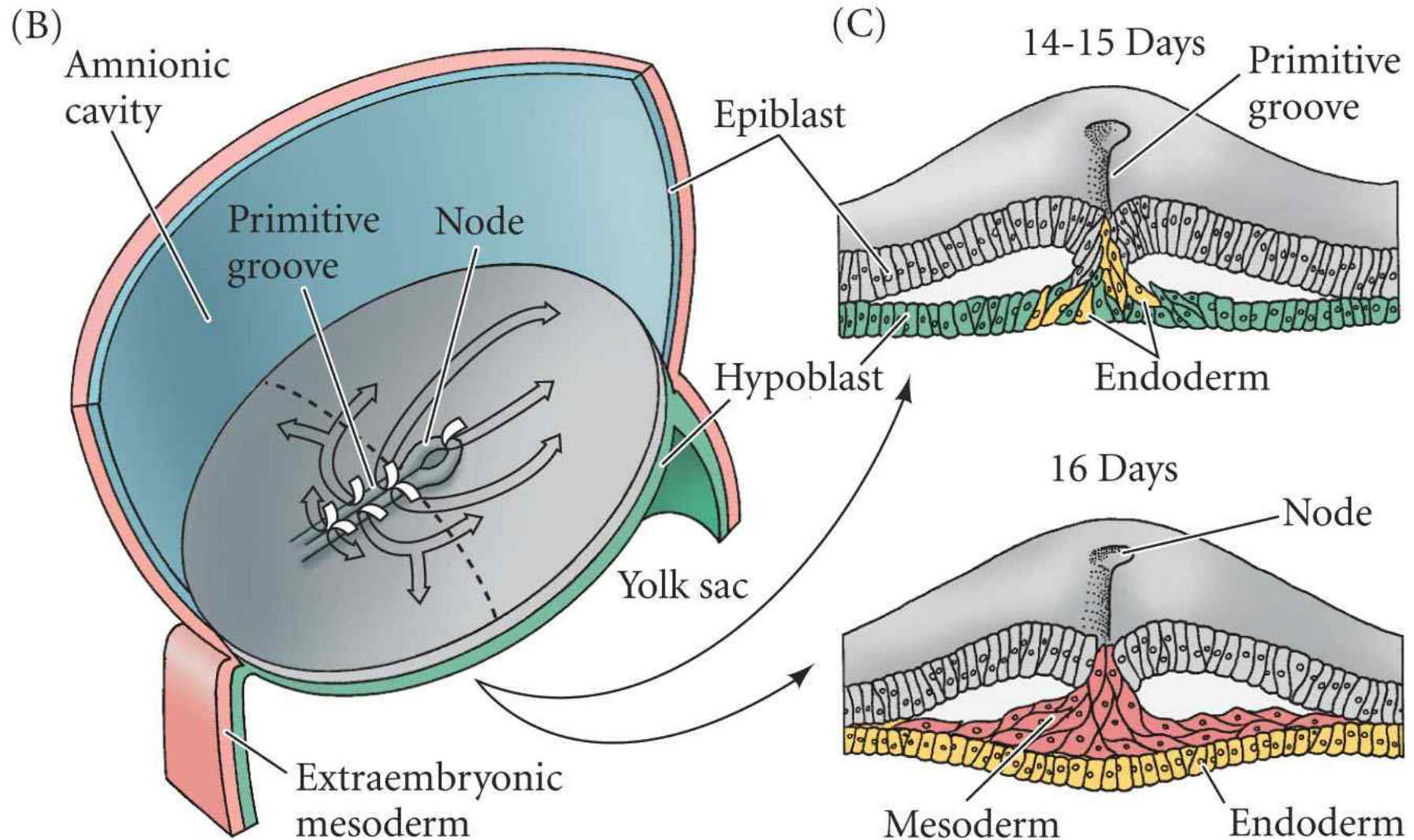
Formación del embrión humano (día 7-11)



Movimentos celulares durante a gastrulação humana

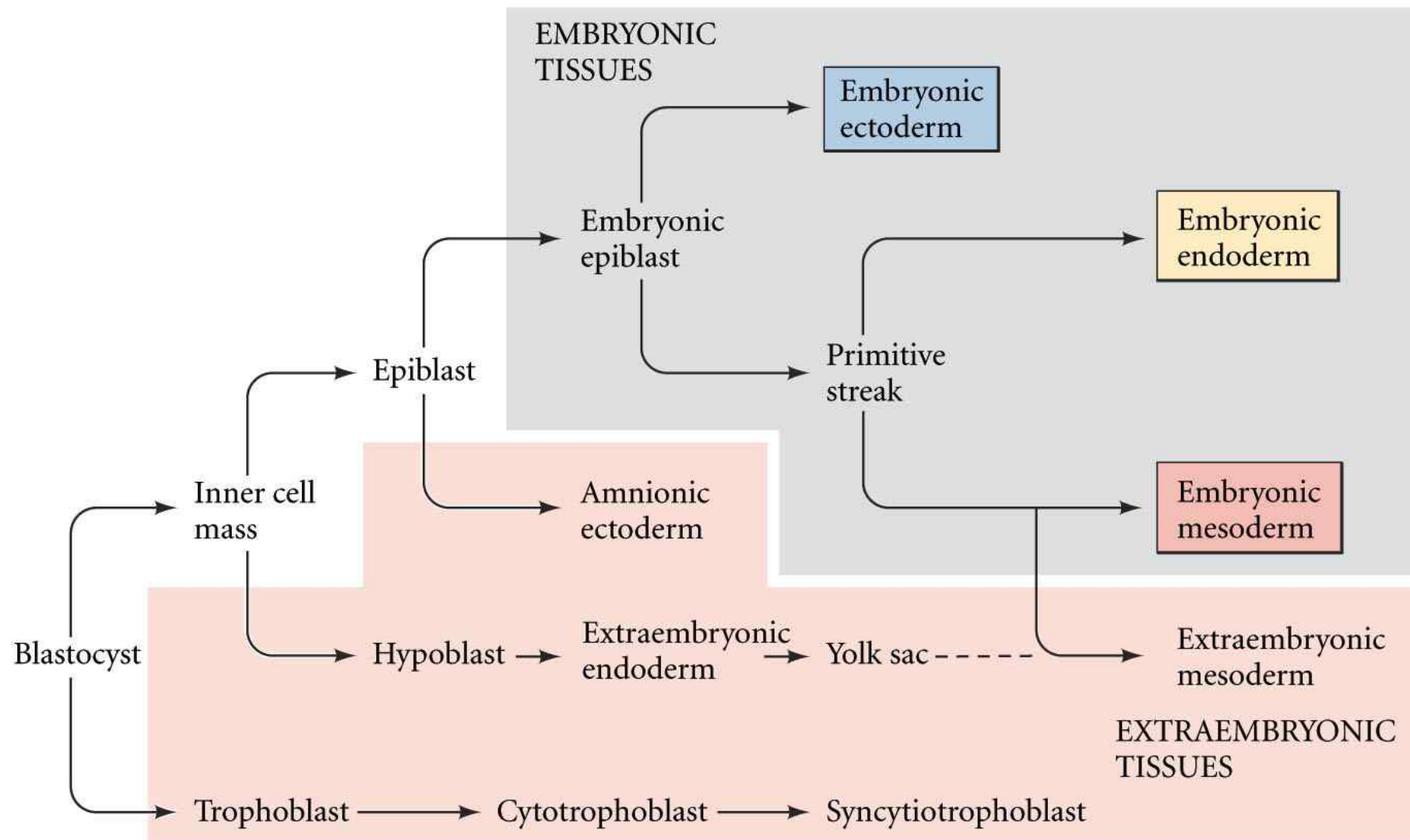


Movimentos celulares durante a gastrulação humana

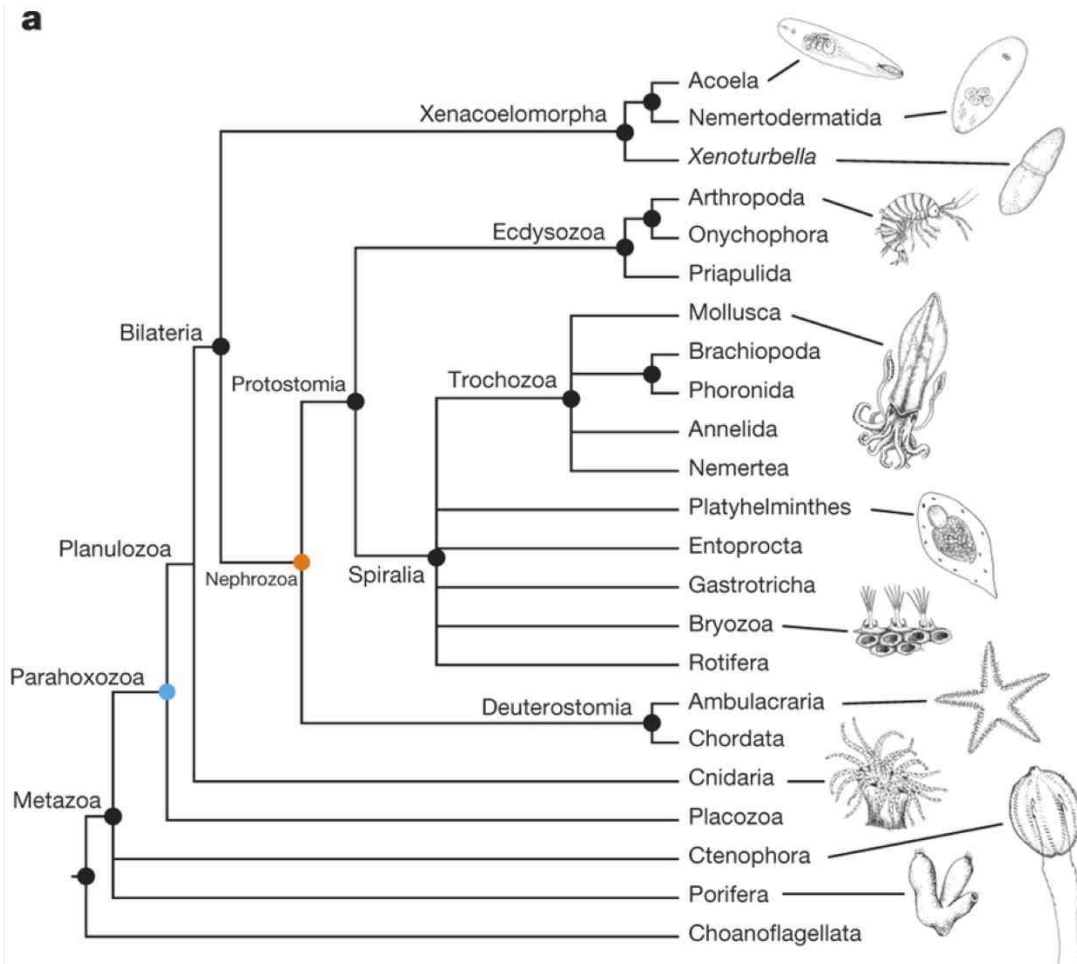


http://www.youtube.com/watch?v=x-p_ZkhqZ0M

Derivation of tissues in human and rhesus monkey embryos



Pattern of development in the Metazoans:

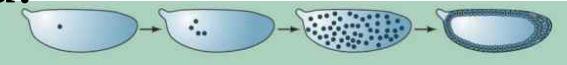


Cannon et al. 2016

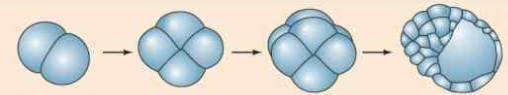
Isolecitos
Mesolecitos
Telolecitos
Centrolecitos

Ecdysozoa:

Superficial cleavage
Most insects



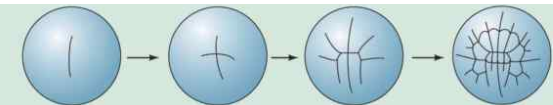
4. Rotational cleavage
Mammals, nematodes



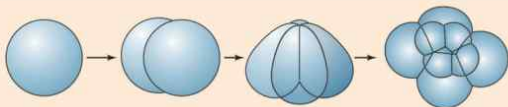
Spiralia:

A. Telolecithal

1. Bilateral cleavage
Cephalopod molluscs

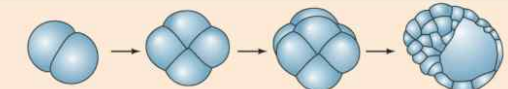


2. Spiral cleavage
Annelids, molluscs, flatworms

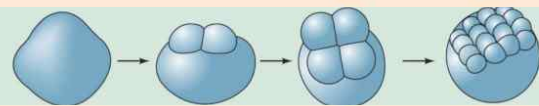


Deuterostomia:

4. Rotational cleavage
Mammals, nematodes

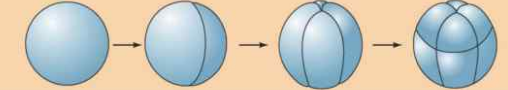


2. Discoidal cleavage
Fish, reptiles, birds

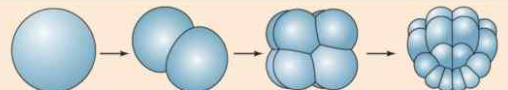


B. Mesolecithal

Displaced radial cleavage
Amphibians



3. Bilateral cleavage
Tunicates



A. Isolecithal

1. Radial cleavage
Echinoderms, amphioxus

