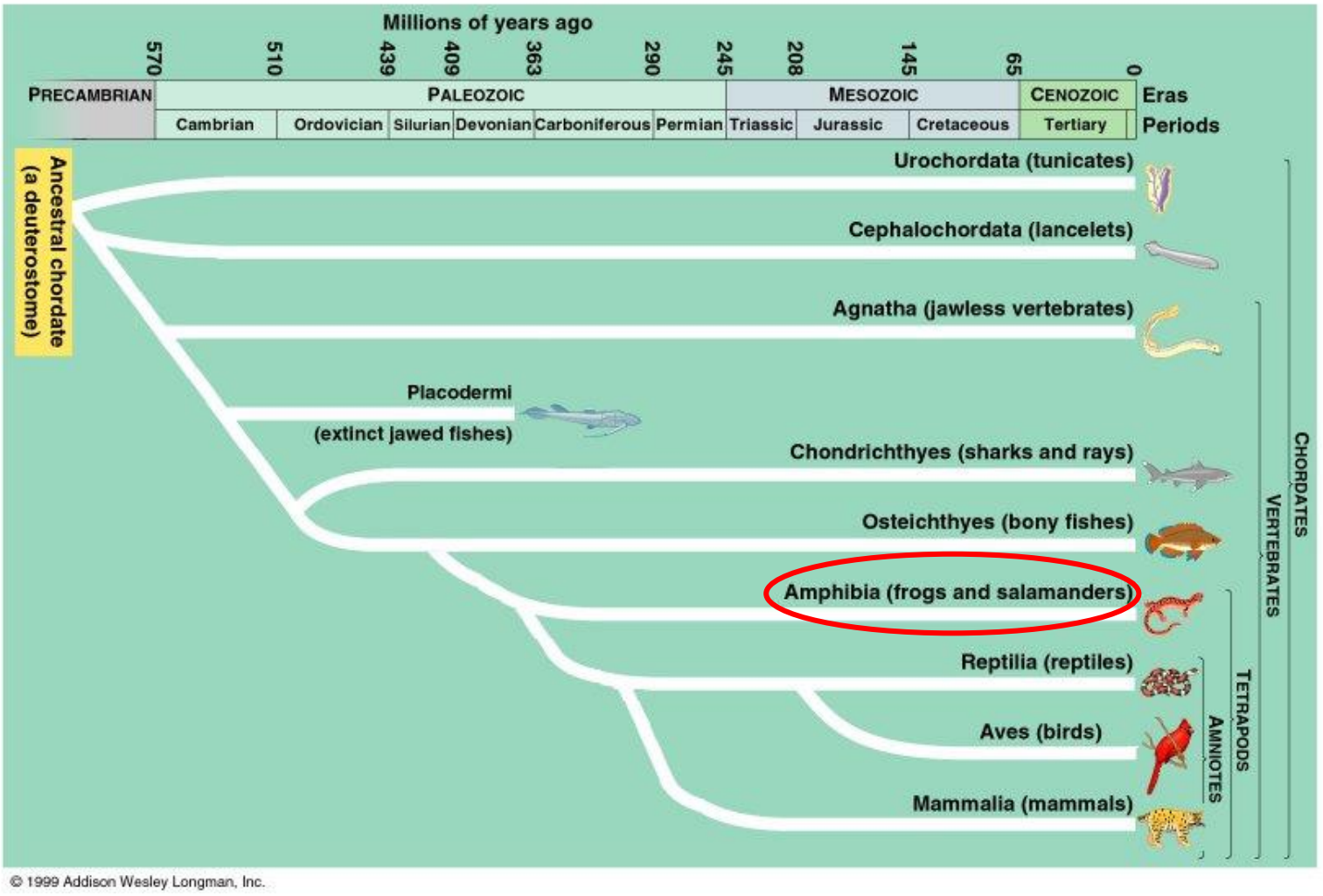
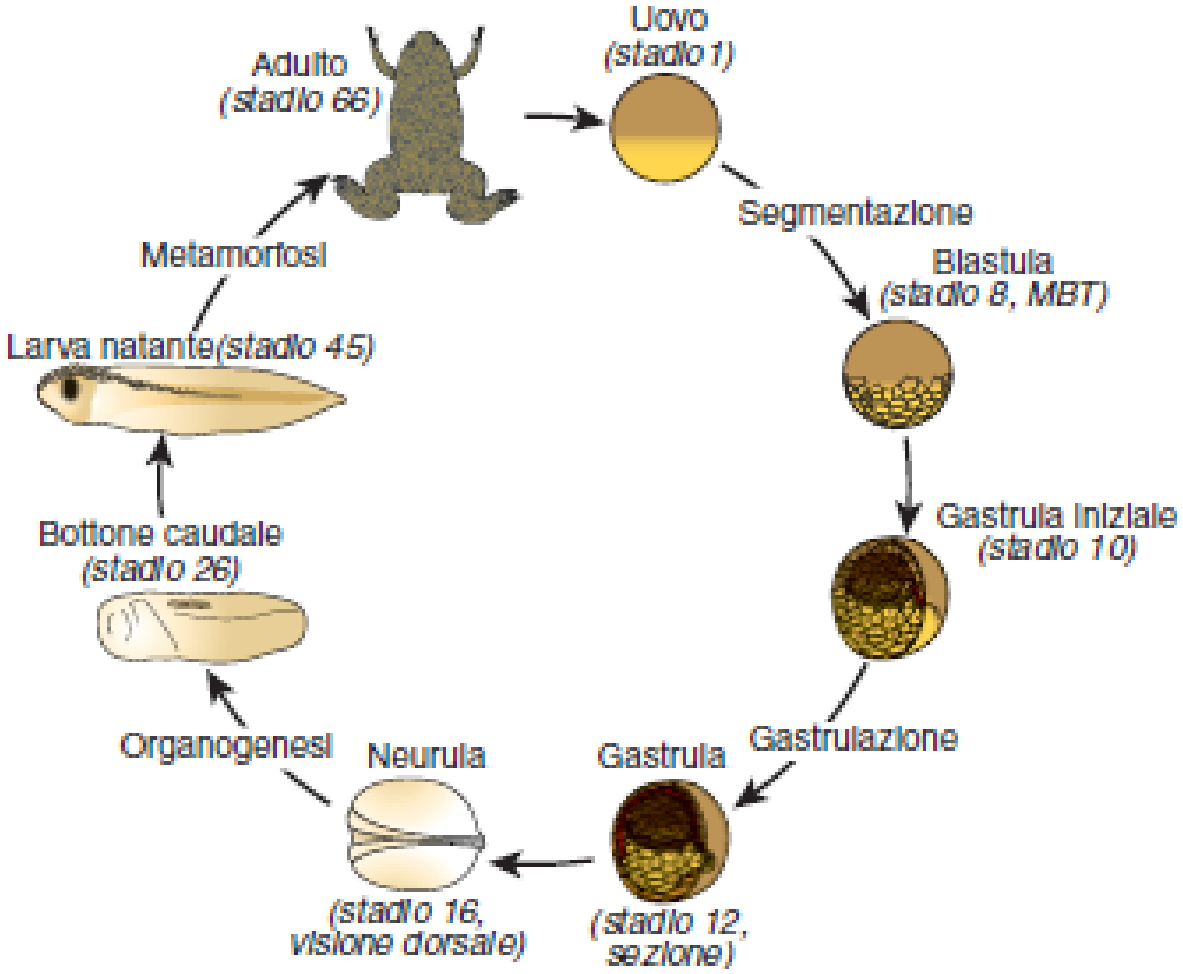
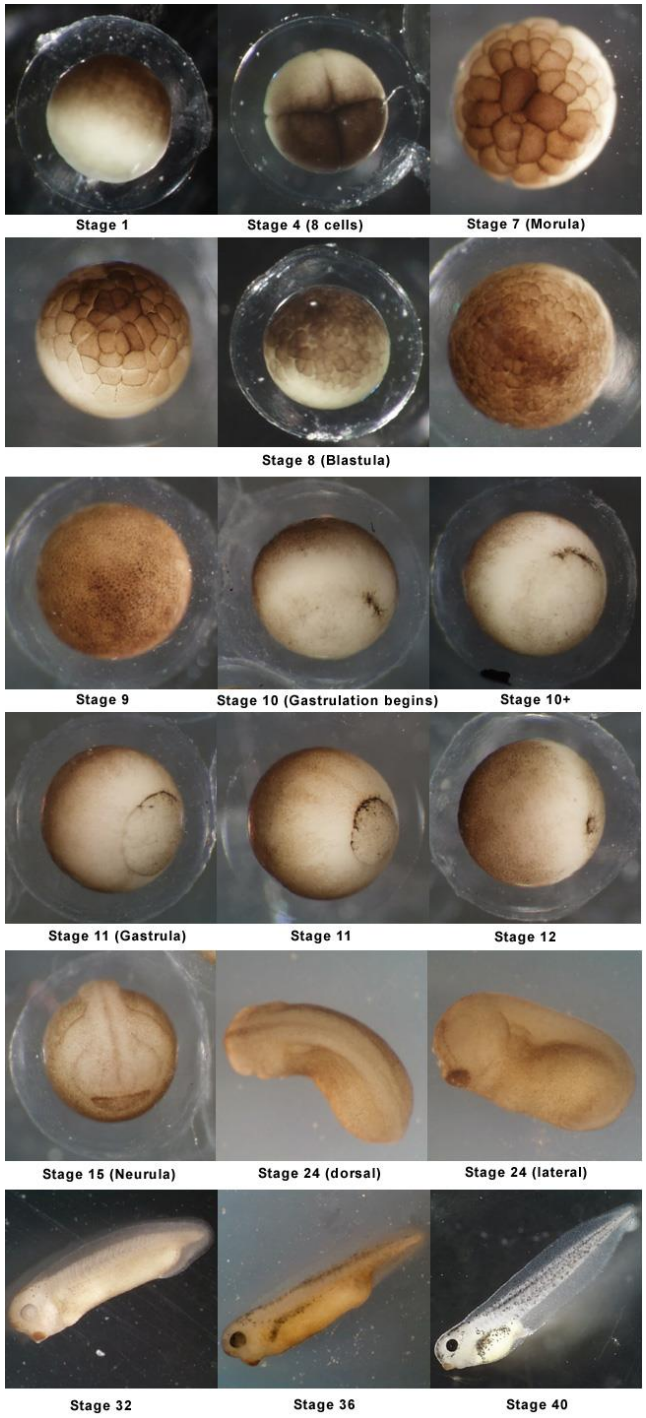
FILOGENESI DEI CORDATI

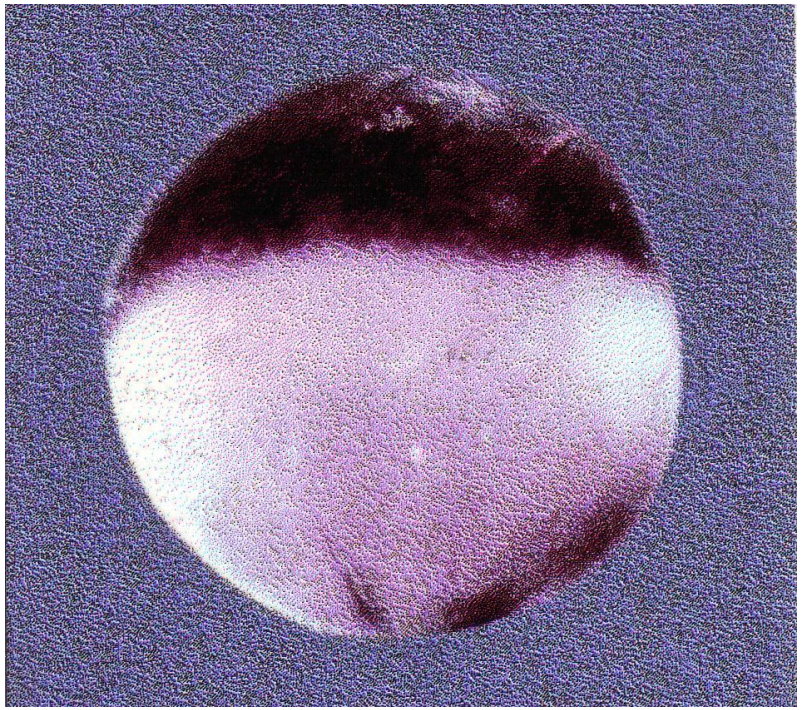


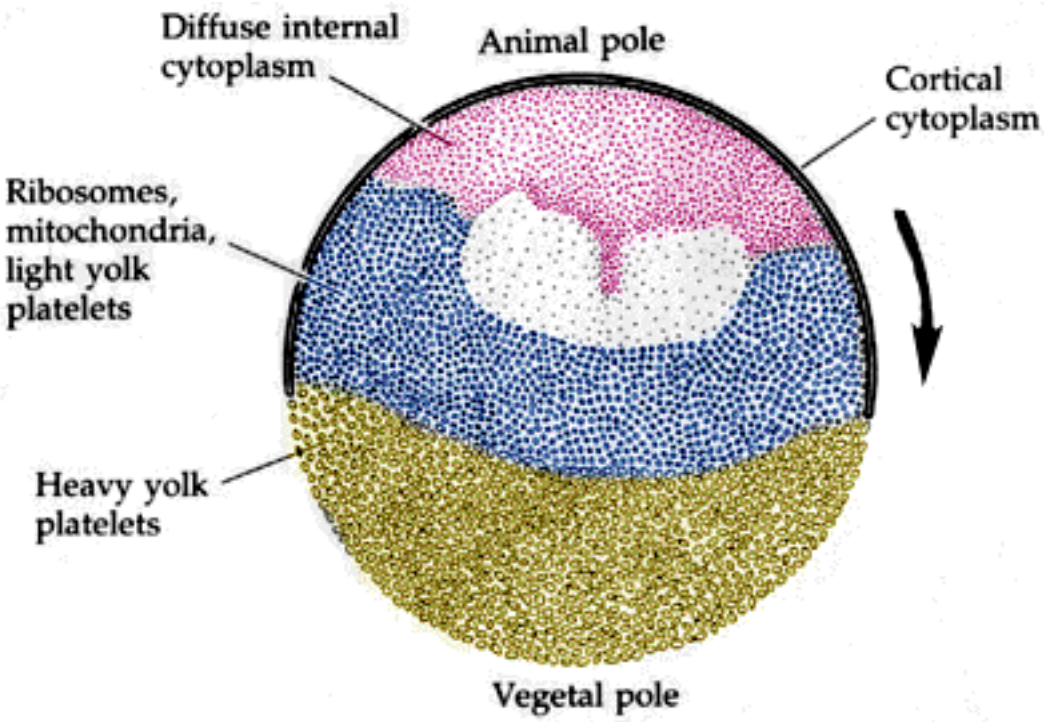
XENOPUS LAEVIS: ANFIBIO ANURO
SVILUPPO INDIRETTO



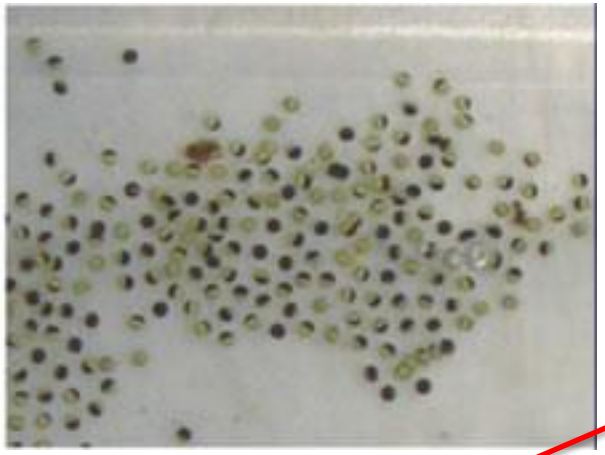


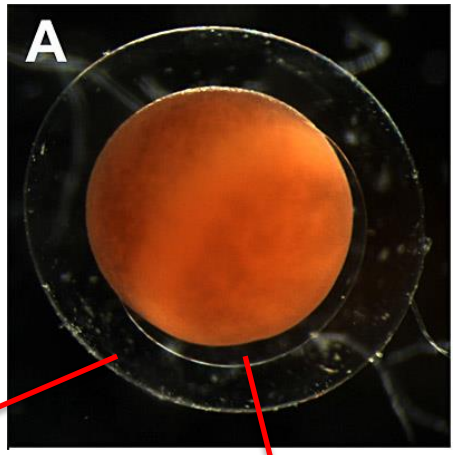
Uovo mesolecitico
Il vitello e' maggiormente concentrato al polo vegetativo
Il citoplasma corticale animale e' ricco di melanina





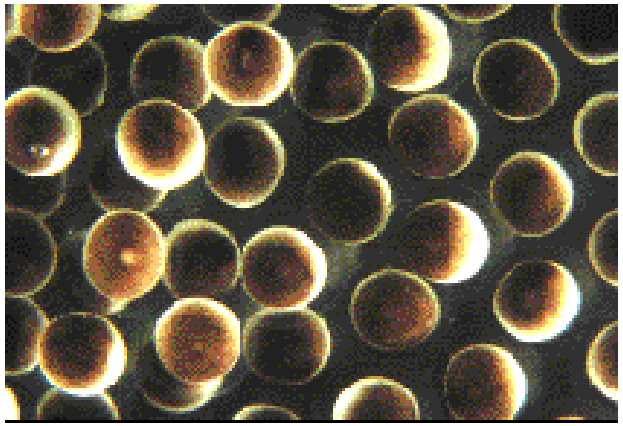
FECONDAZIONE E SVILUPPO AVVENGONO ESTERNAMENTE

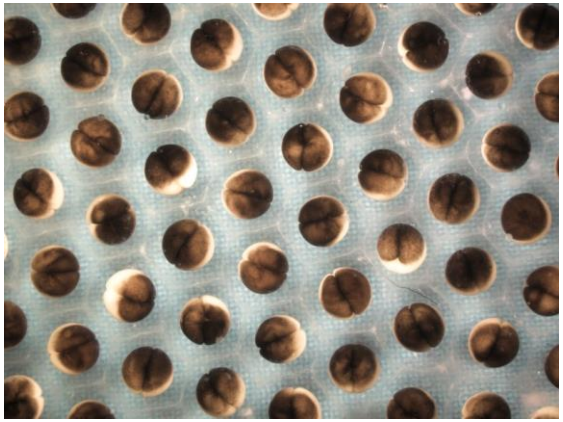




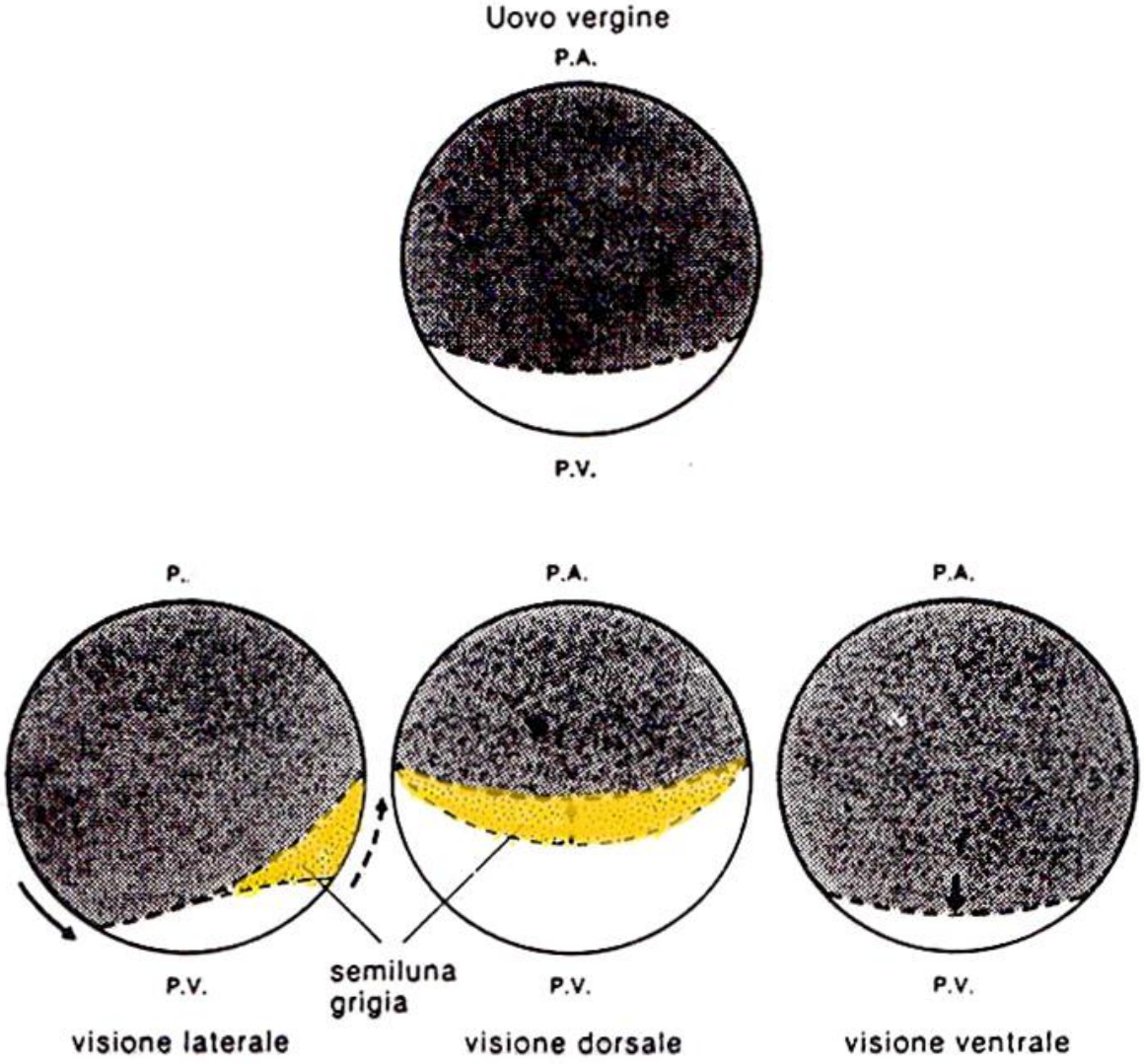
INVOLUCRO GELATINOSO

INVOLUCRO VITELLINO





ROTAZIONE CORTICALE



LA FECONDAZIONE ATTIVA LA ROTAZIONE CORTICALE

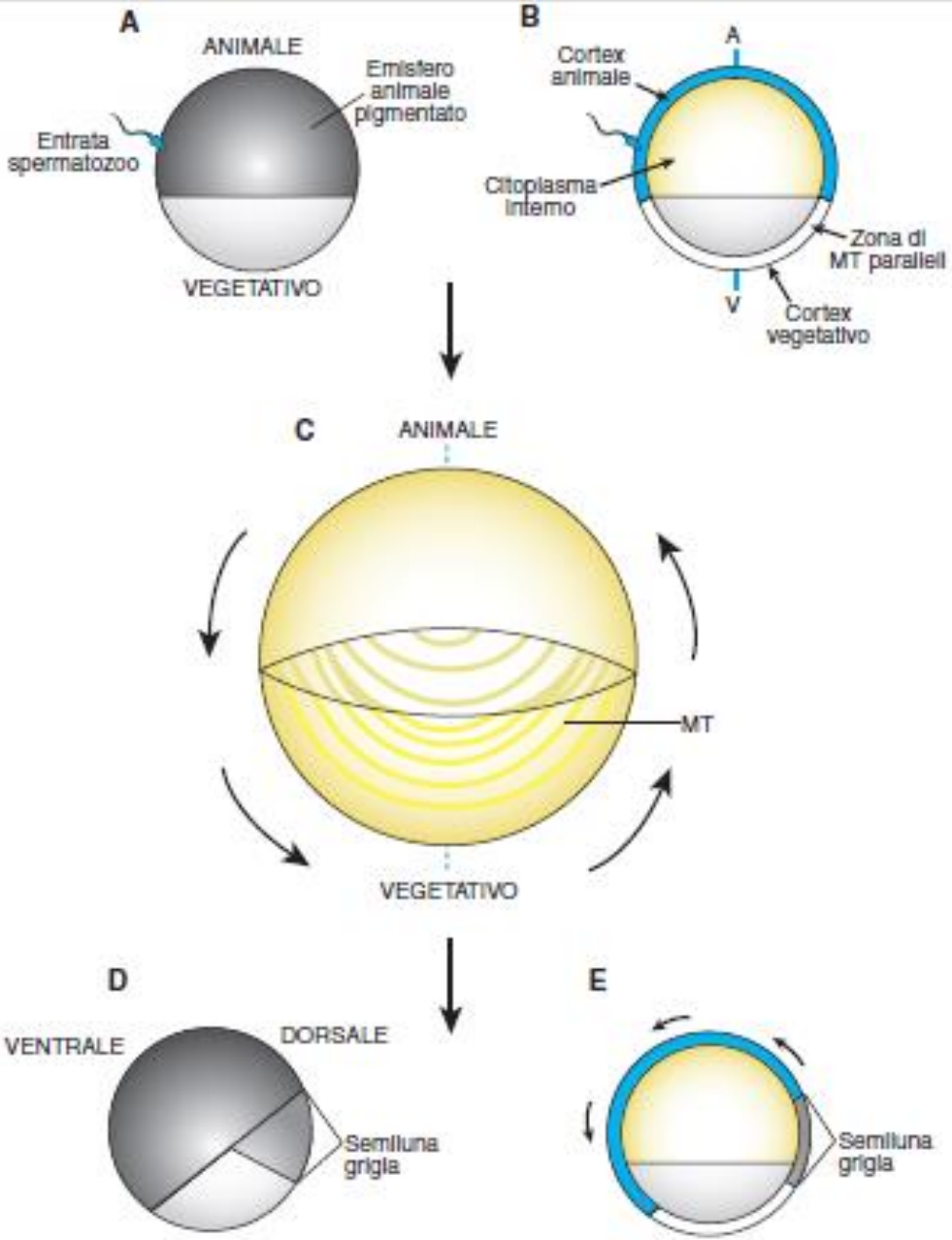
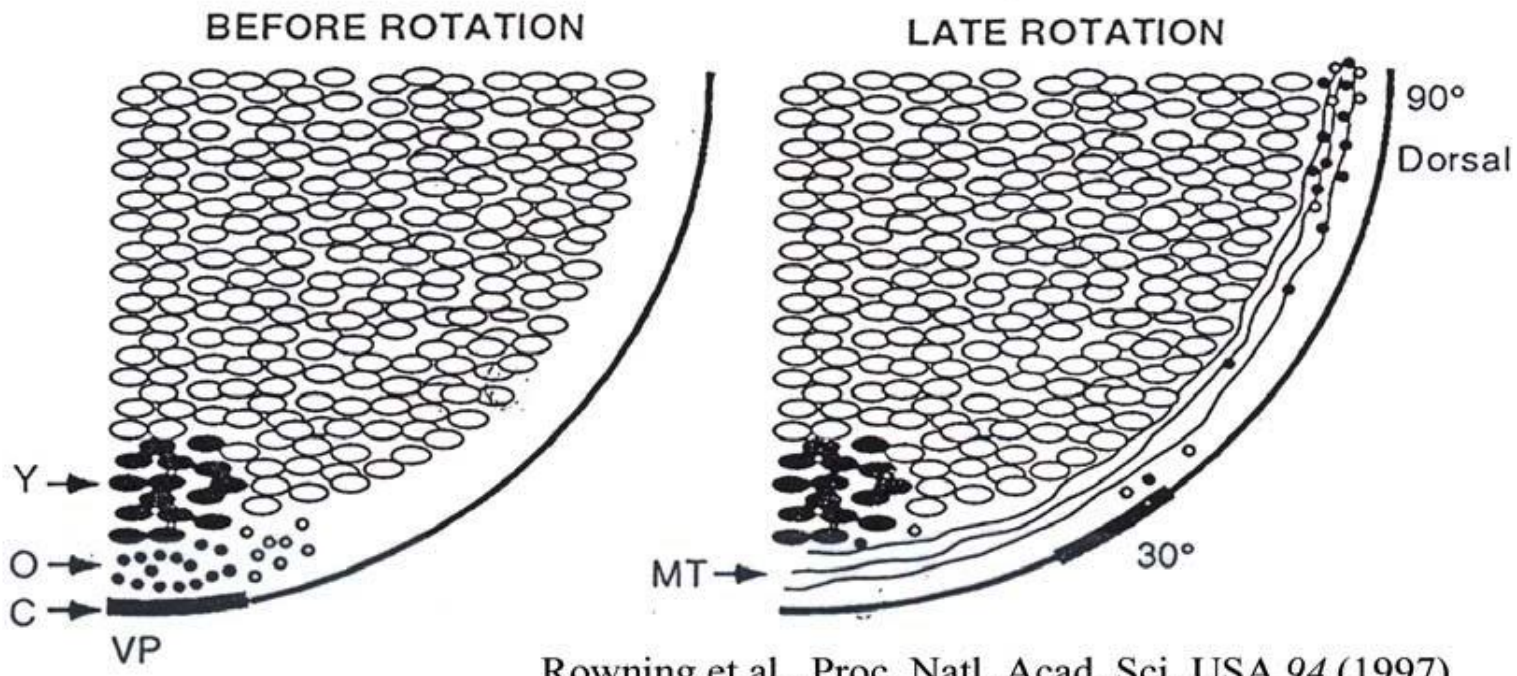


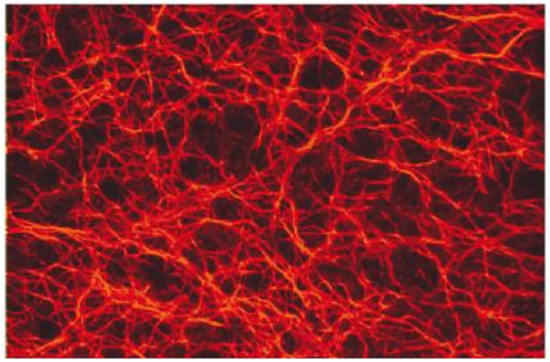
Figura 1

LA ROTAZIONE CORTICALE AVVIENE MEDIANTE UNA RIORGANIZZAZIONE DEI MICROTUBULI

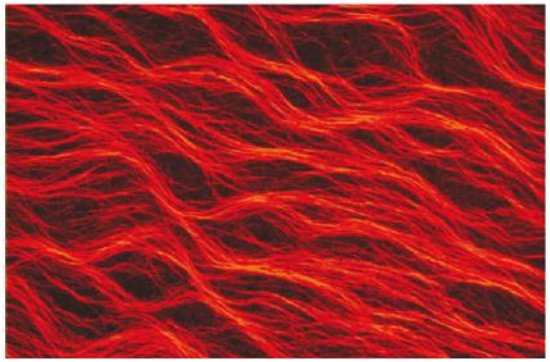


Rowning et al., Proc. Natl. Acad. Sci. USA *94* (1997)

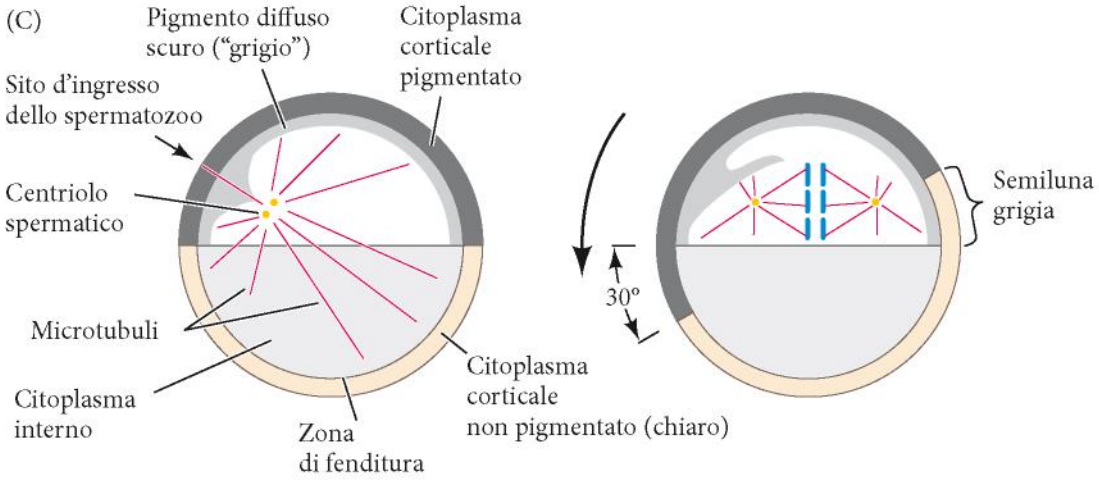
(A) 0,50



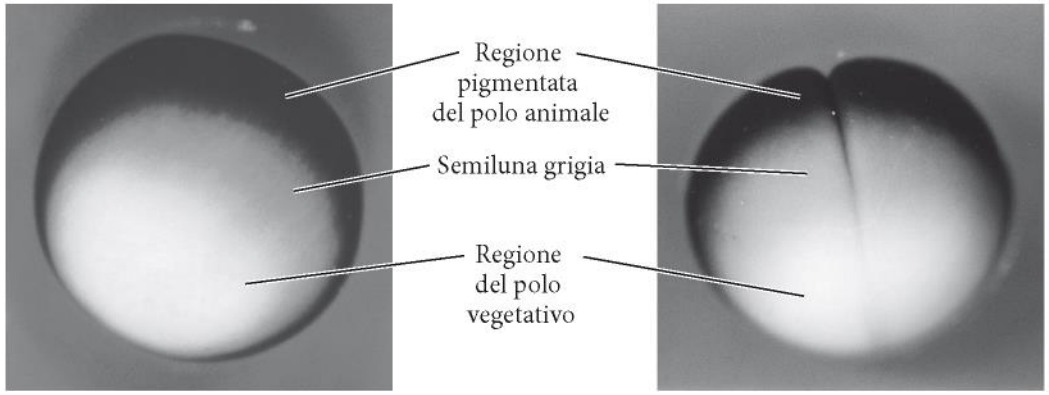
(B) 0,70



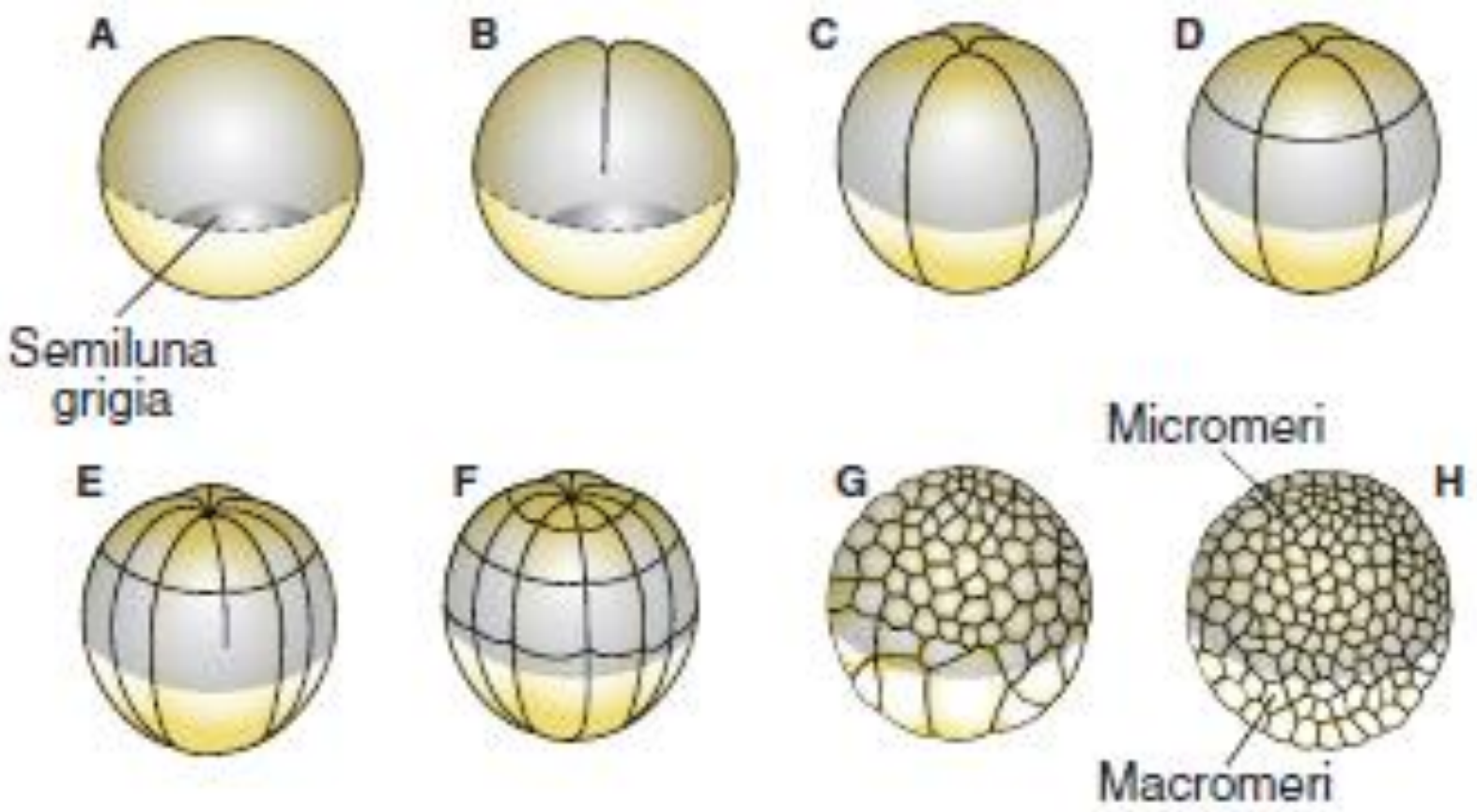
(C)


Pigmento diffuso scuro ("grigio")
Citoplasma corticale pigmentato
Sito d'ingresso dello spermatozoo
Centriolo spermatico
Microtubuli
Citoplasma interno
Zona di fenditura
Citoplasma corticale non pigmentato (chiaro)
30°
Semiluna grigia

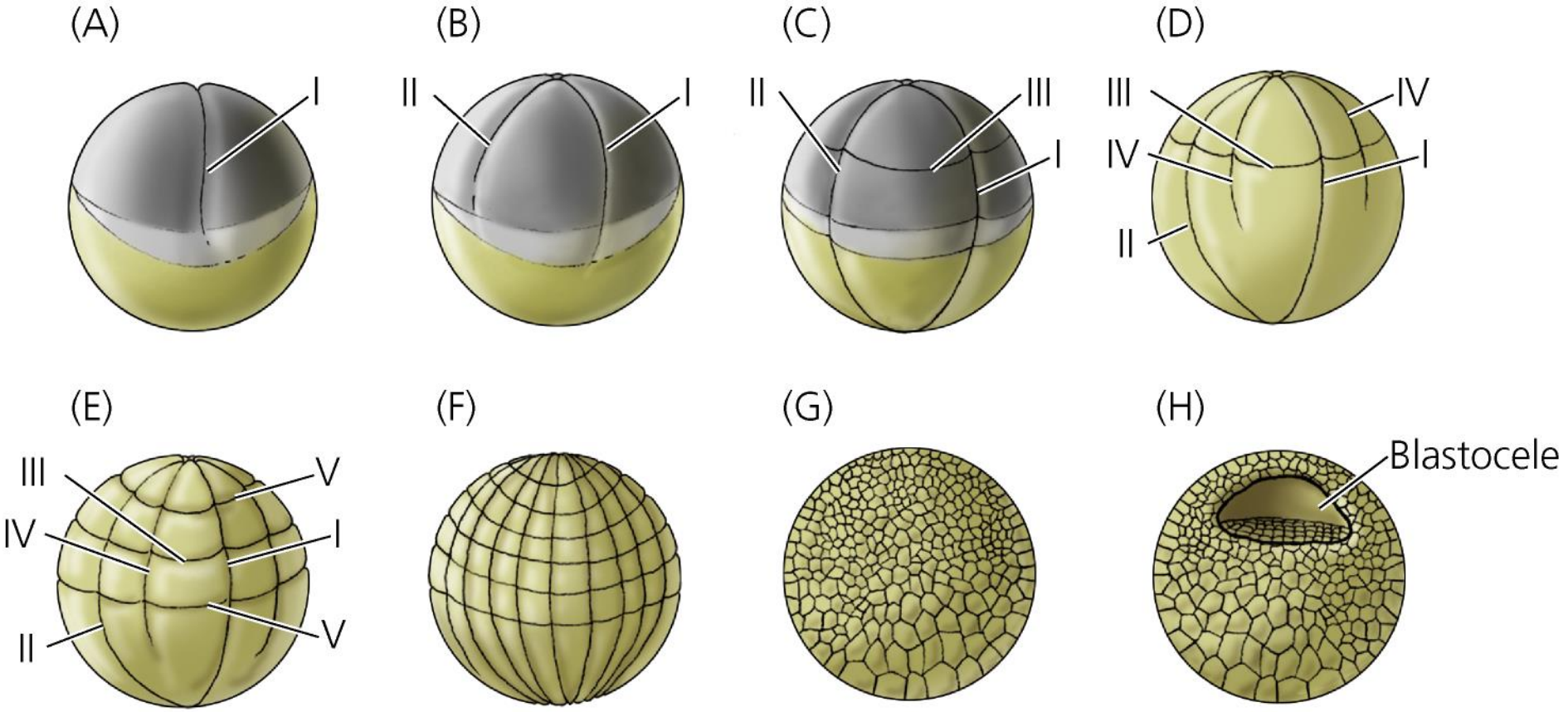
(D)


Regione pigmentata del polo animale
Semiluna grigia
Regione del polo vegetativo

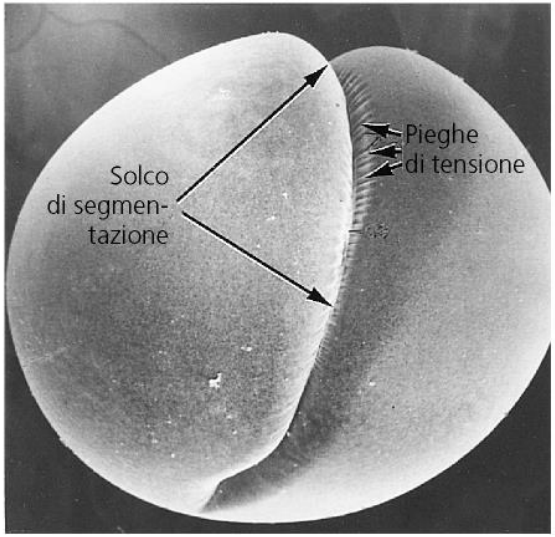
SEGMENTAZIONE OLOBLASTICA RADIALE INEGUALE



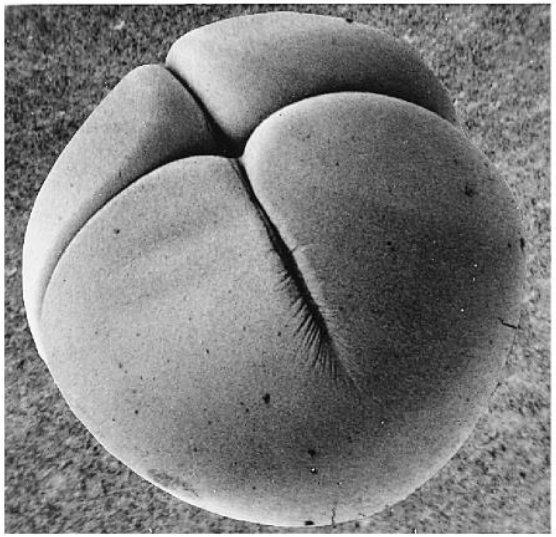
SEGMENTAZIONE OLOBLASTICA RADIALE INEGUALE



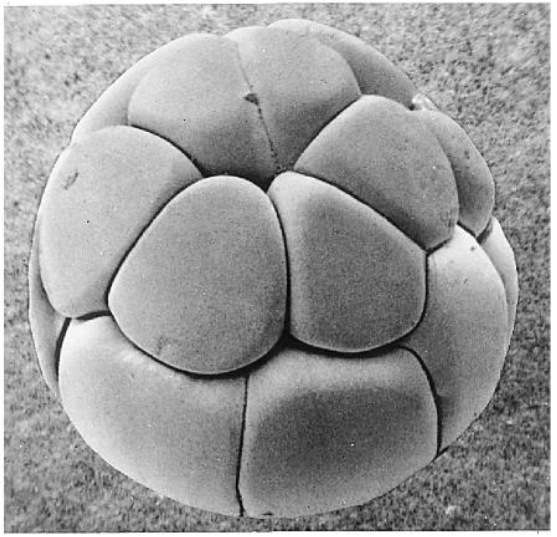
(A)



(B)

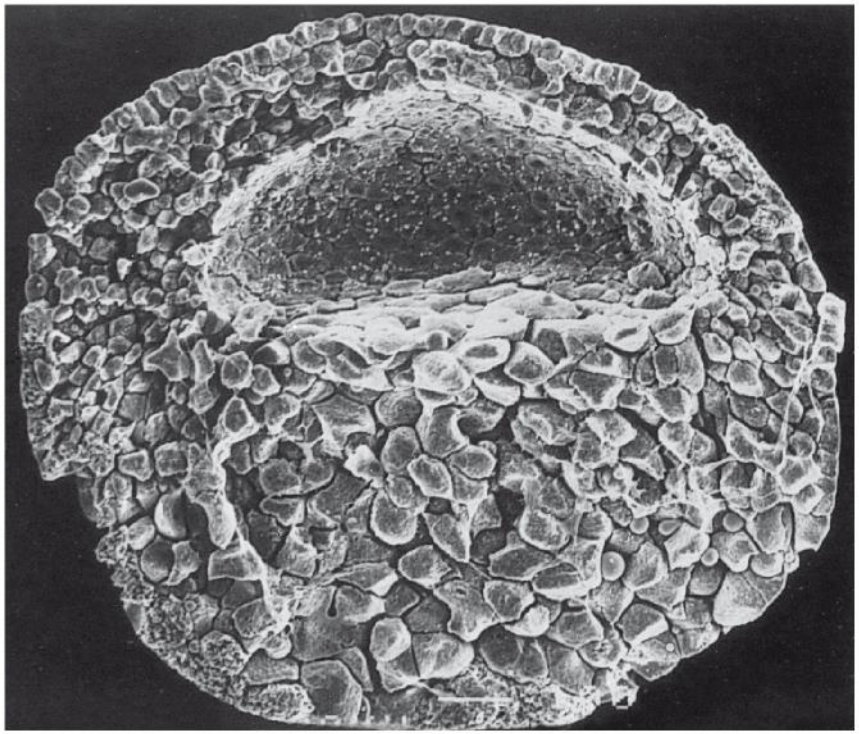


(C)

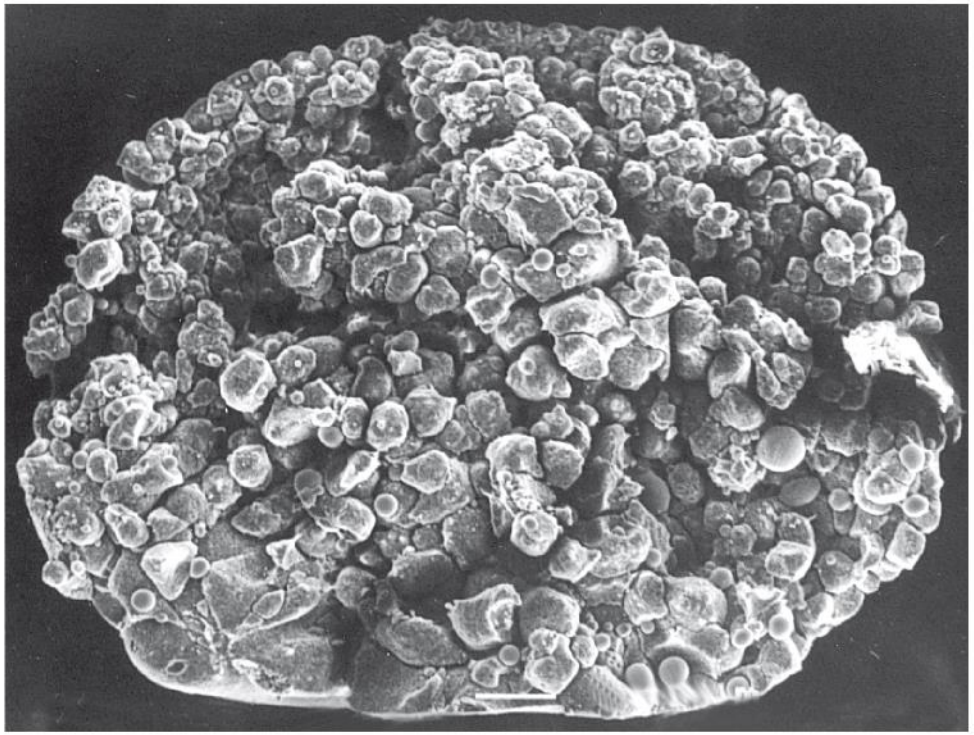


L’interazione fra i blastomeri e’ promossa da molecole di adesione (Caderine)

(A)



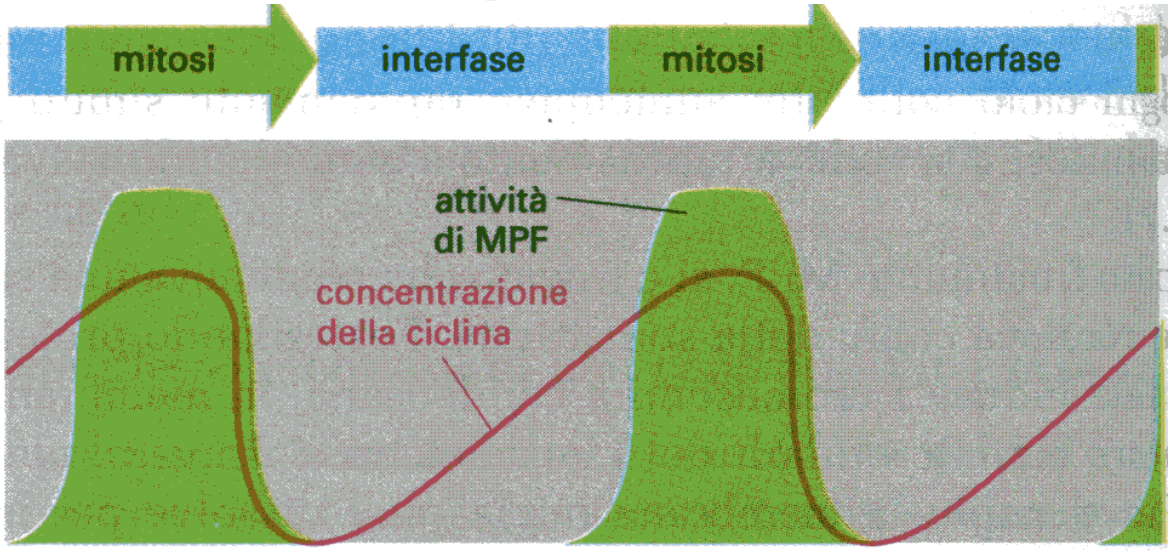
(B)

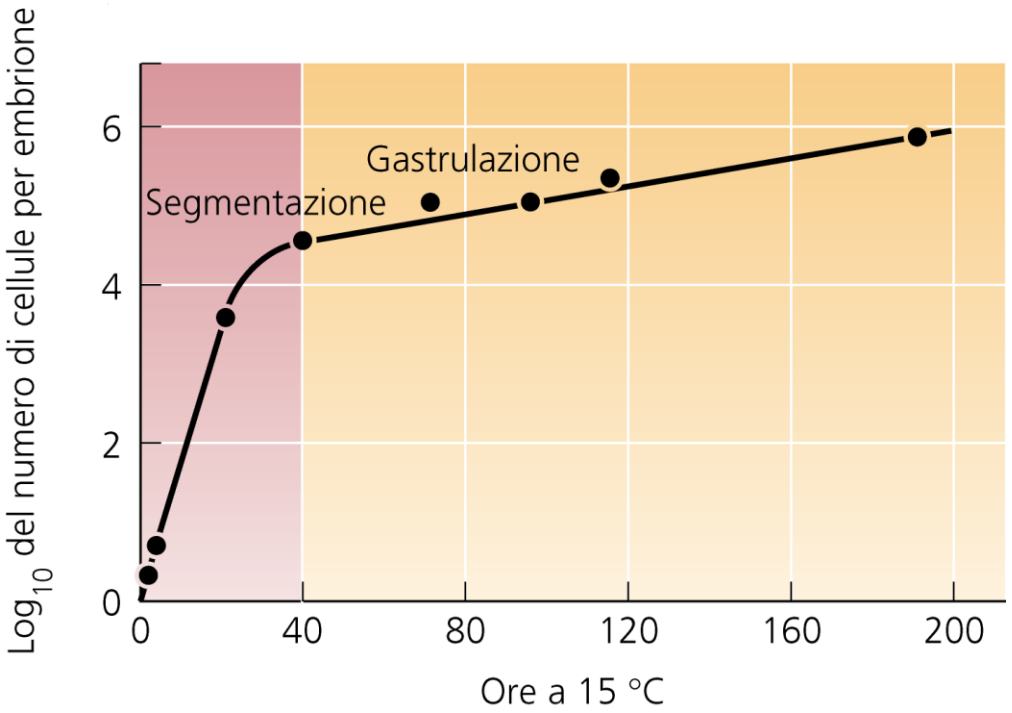


La segmentazione degli anfibi è caratterizzata da divisioni veloci e sincrone; il ciclo è bifasico M → S

I cicli bifasici durante la segmentazione sono regolati dal fattore MPF. E' costituito dalla ciclina B e una chinasi attivata dalla ciclina B. E' attivo in fase M, ma non in fase S in quanto la ciclina viene degradata.

Le divisioni rallentano poco prima della gastrulazione.



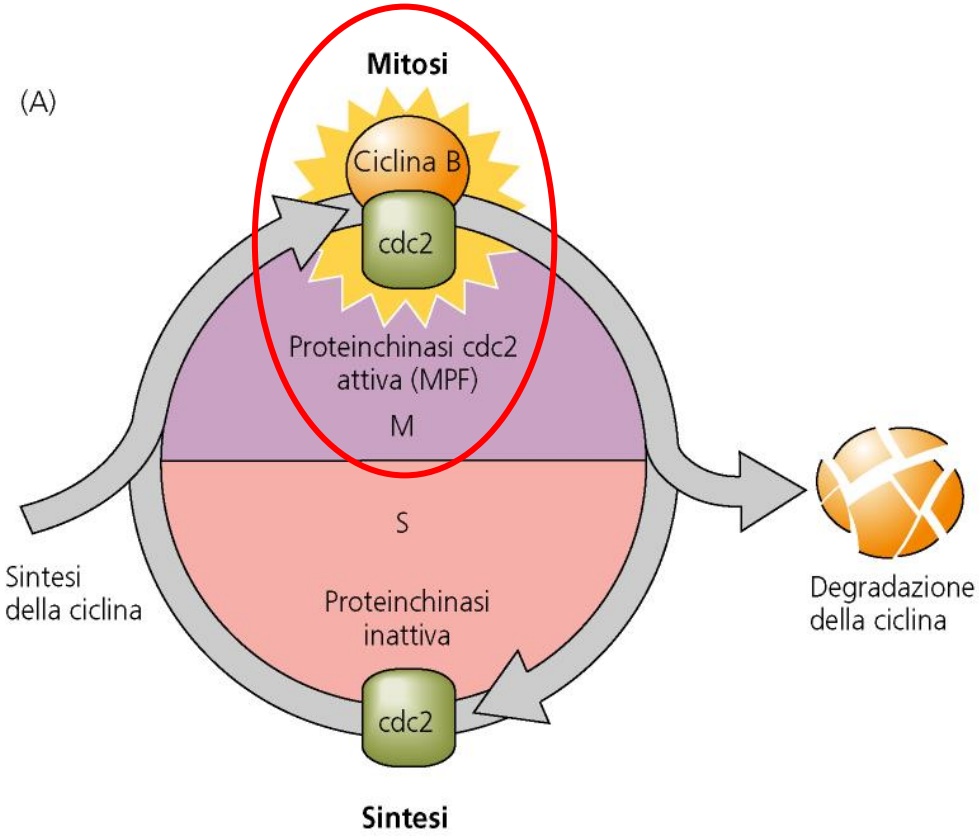


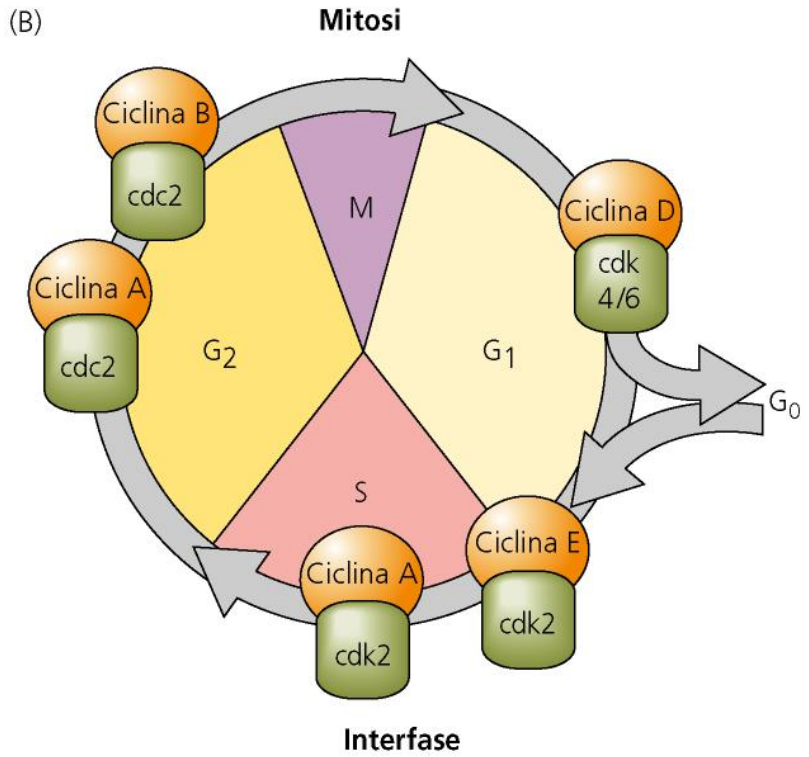
1) La ciclina B si accumula in fase S e si degrada dopo l'entrata in M

2) Il ciclo bifasico utilizza ciclina prodotta a partire da mRNA materni

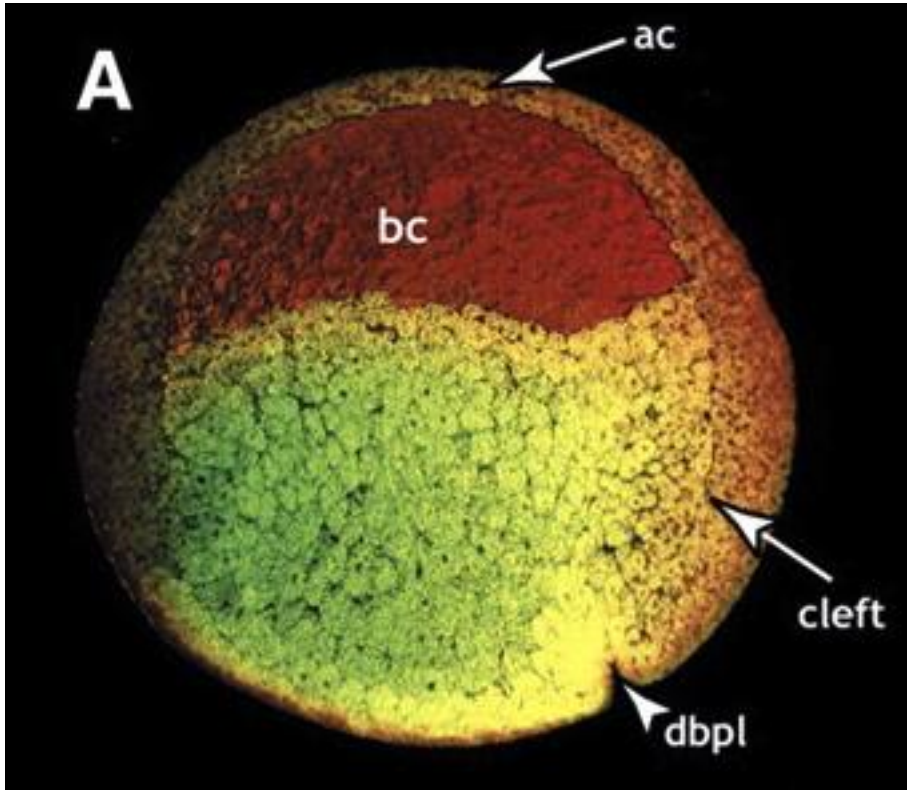
3) Quando si esauriscono le molecole materne si ha l'attivazione del genoma zigotico, il ciclo rallenta e si normalizza (G1 e G2)

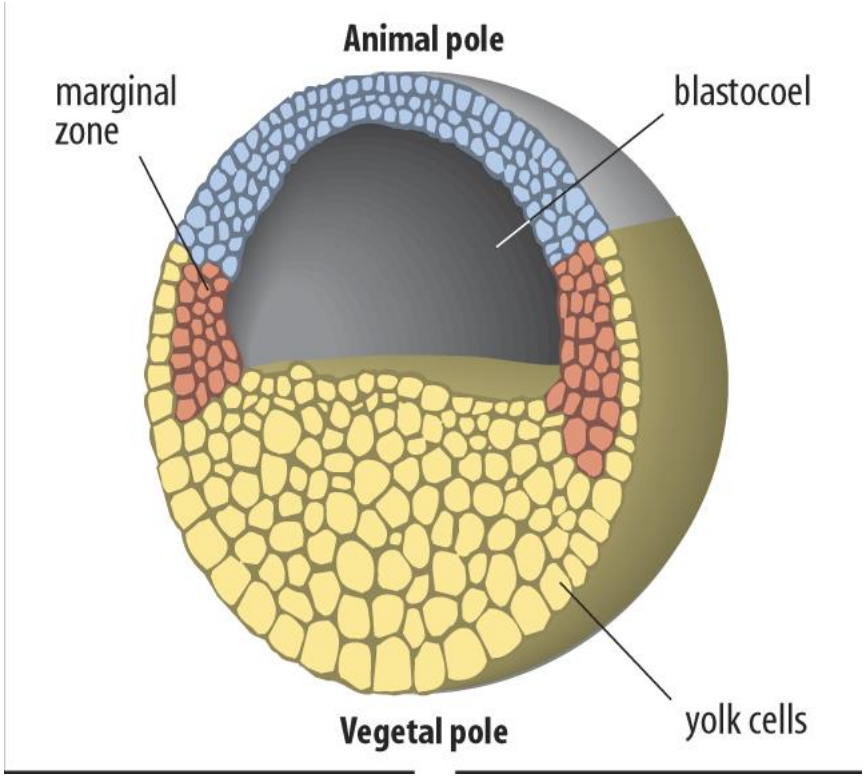
TRANSIZIONE DI MEDIOBLASTULA: Xenopus dopo la 12° divisione



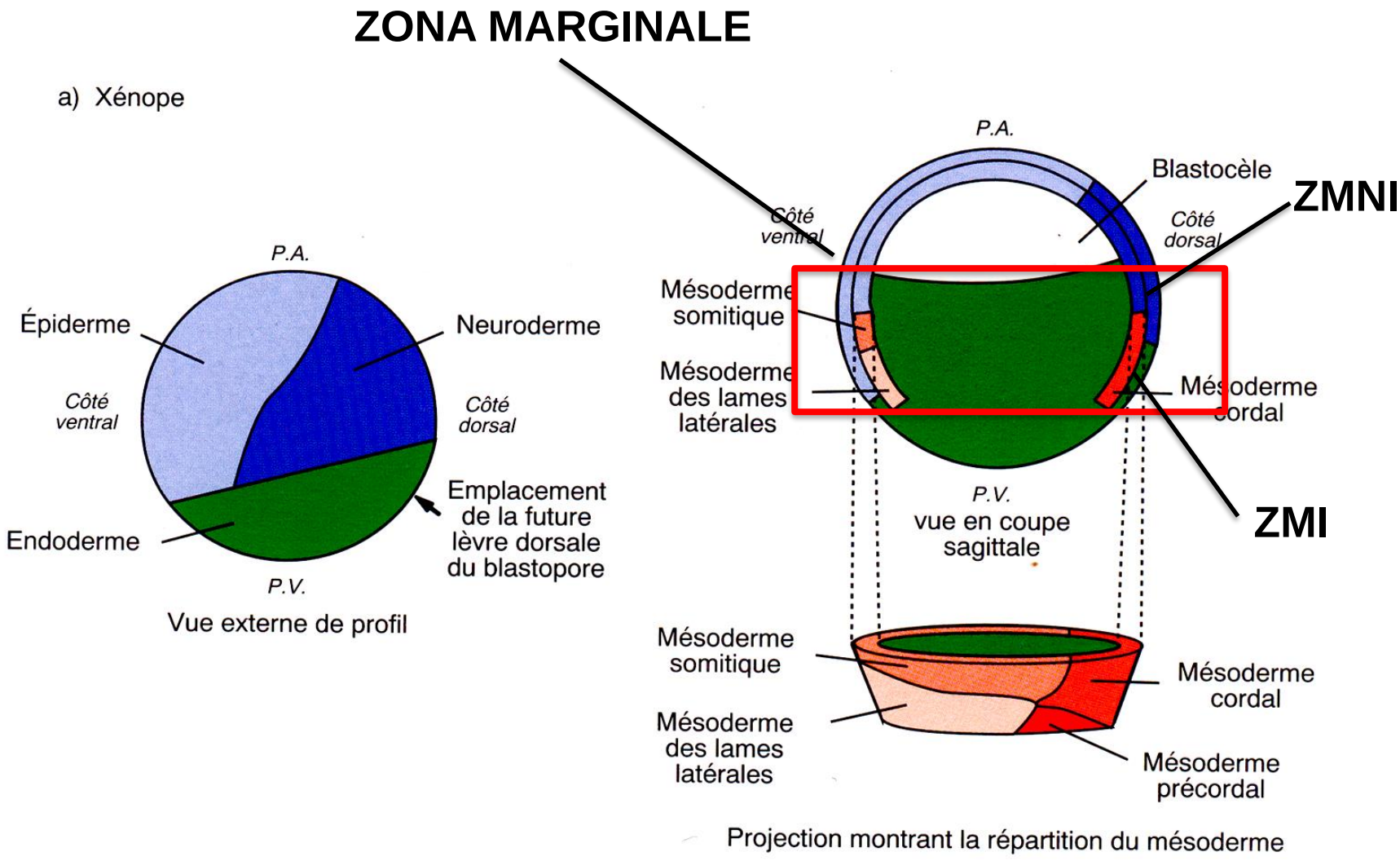


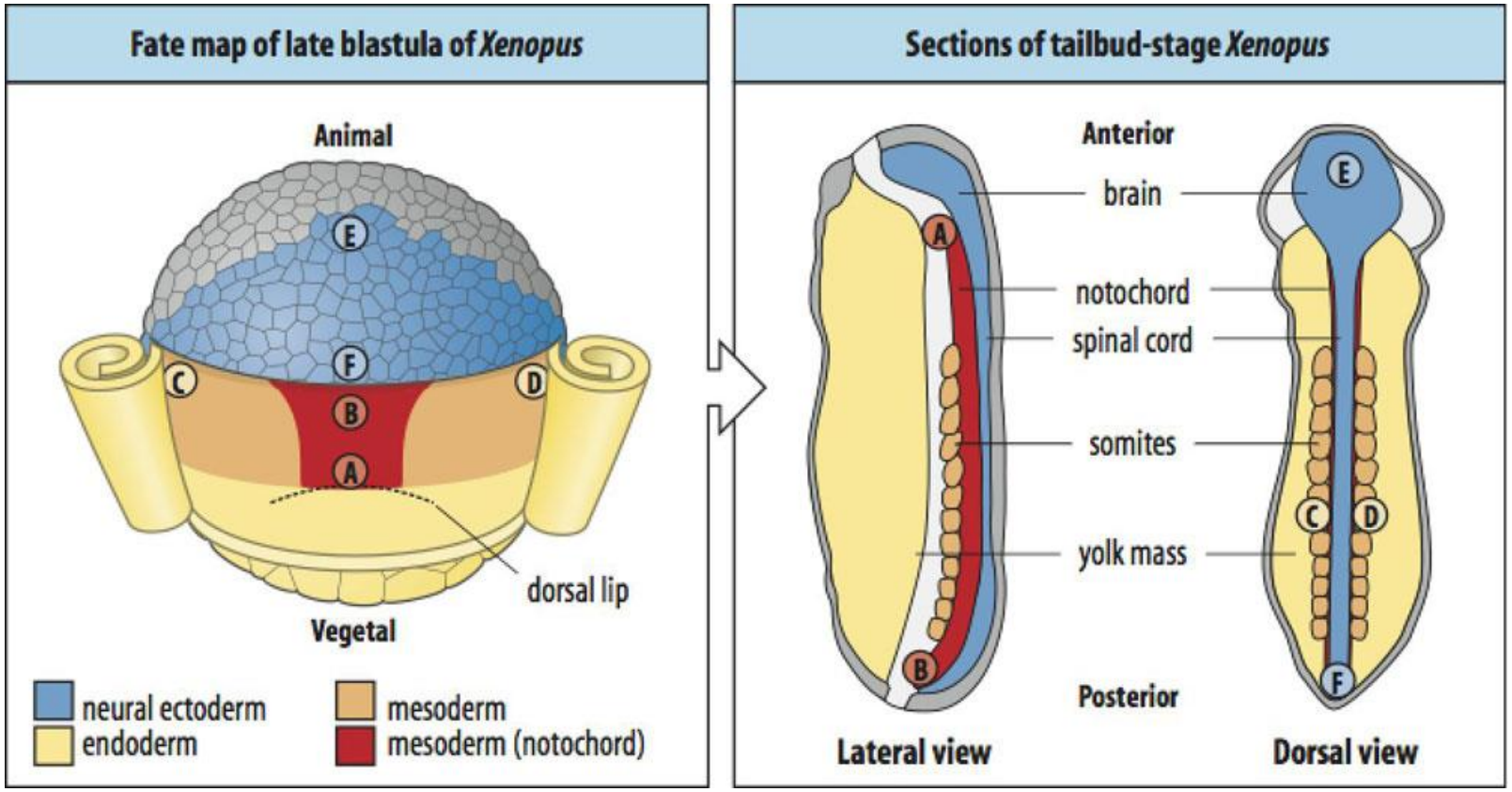
Ectoderma
Mesoderma
Endoderma



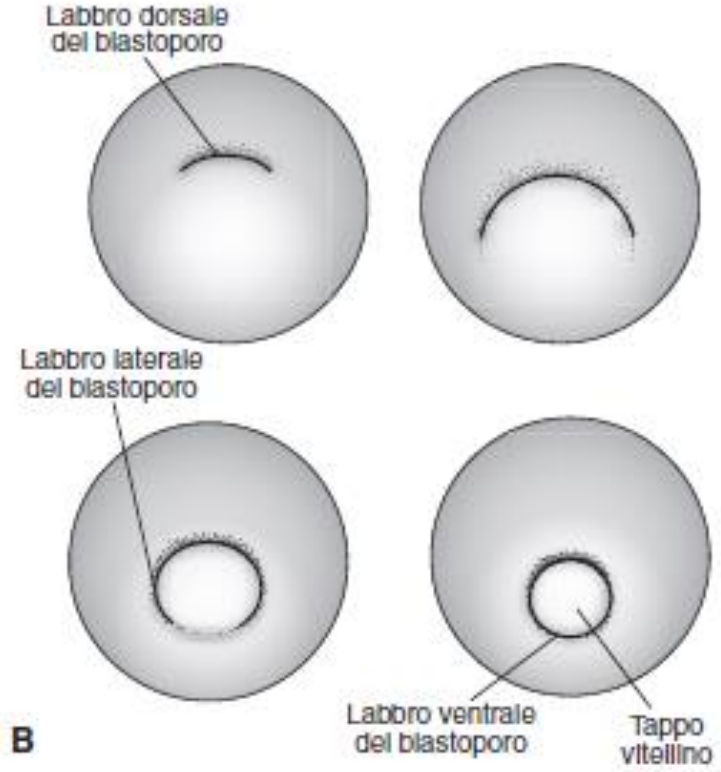


Mappa dei territori presuntivi negli *Anuri*

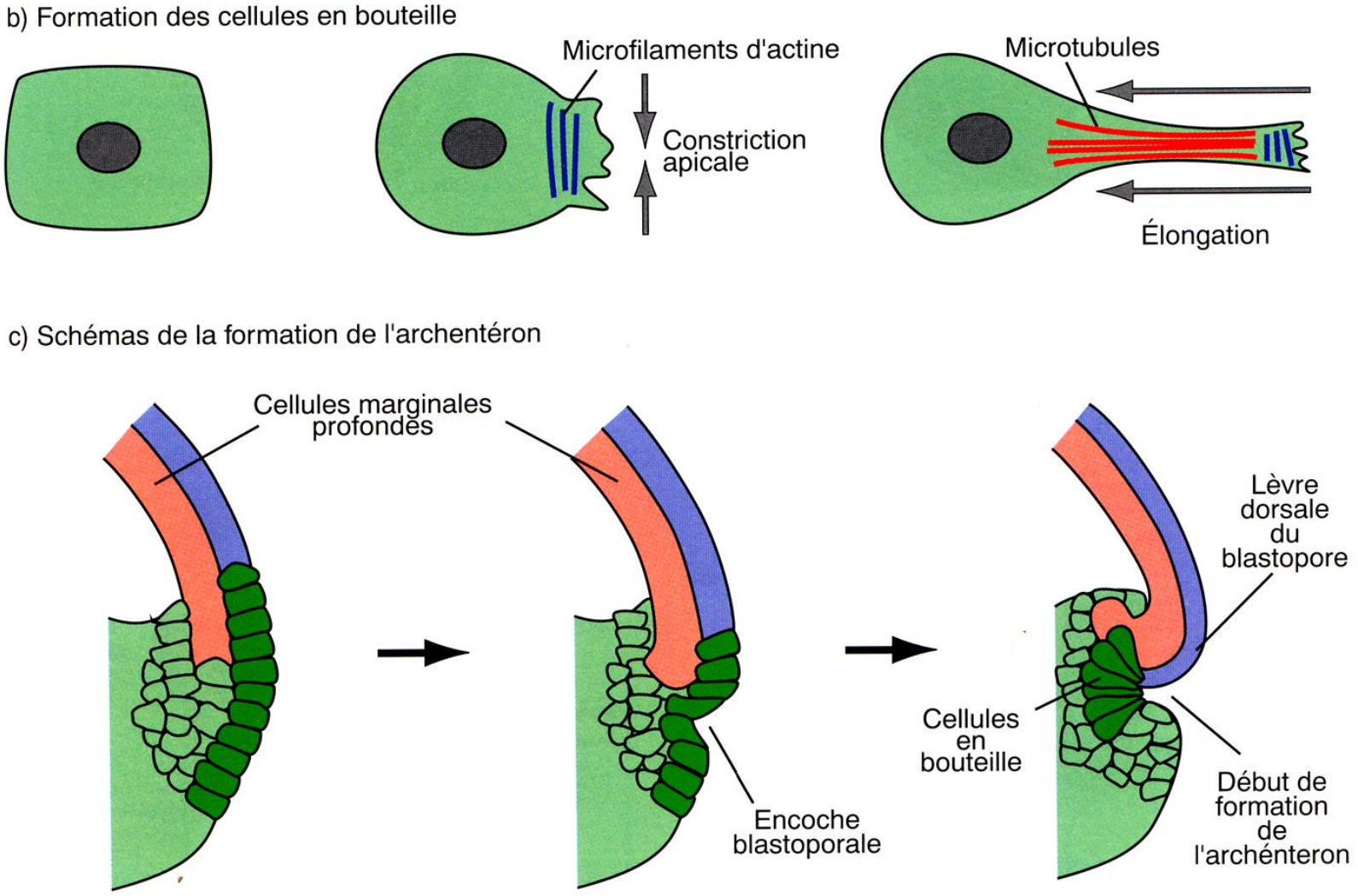



Fate map of late blastula of *Xenopus*
Animal
E
F
C
D
B
A
dorsal lip
Vegetal
neural ectoderm
endoderm
mesoderm
mesoderm (notochord)
Sections of tailbud-stage *Xenopus*
Anterior
brain
notochord
spinal cord
somites
yolk mass
Posterior
Lateral view
Dorsal view


A


Labbro dorsale del blastoporo
Labbro laterale del blastoporo
Labbro ventrale del blastoporo
Tappo vitellino
B

IL LABRO DEL BLASTOPORO SI ORIGINA CON LA FORMAZIONE DELLE CELLULE A FIASCO E L'INVAGINAZIONE DELLE CELLULE ENDODERMICHE SUPERFICIALI



LA GASTRULAZIONE HA LUOGO MEDIANTE MOVIMENTI DI INVOLUZIONE DEL MESOENDODERMA

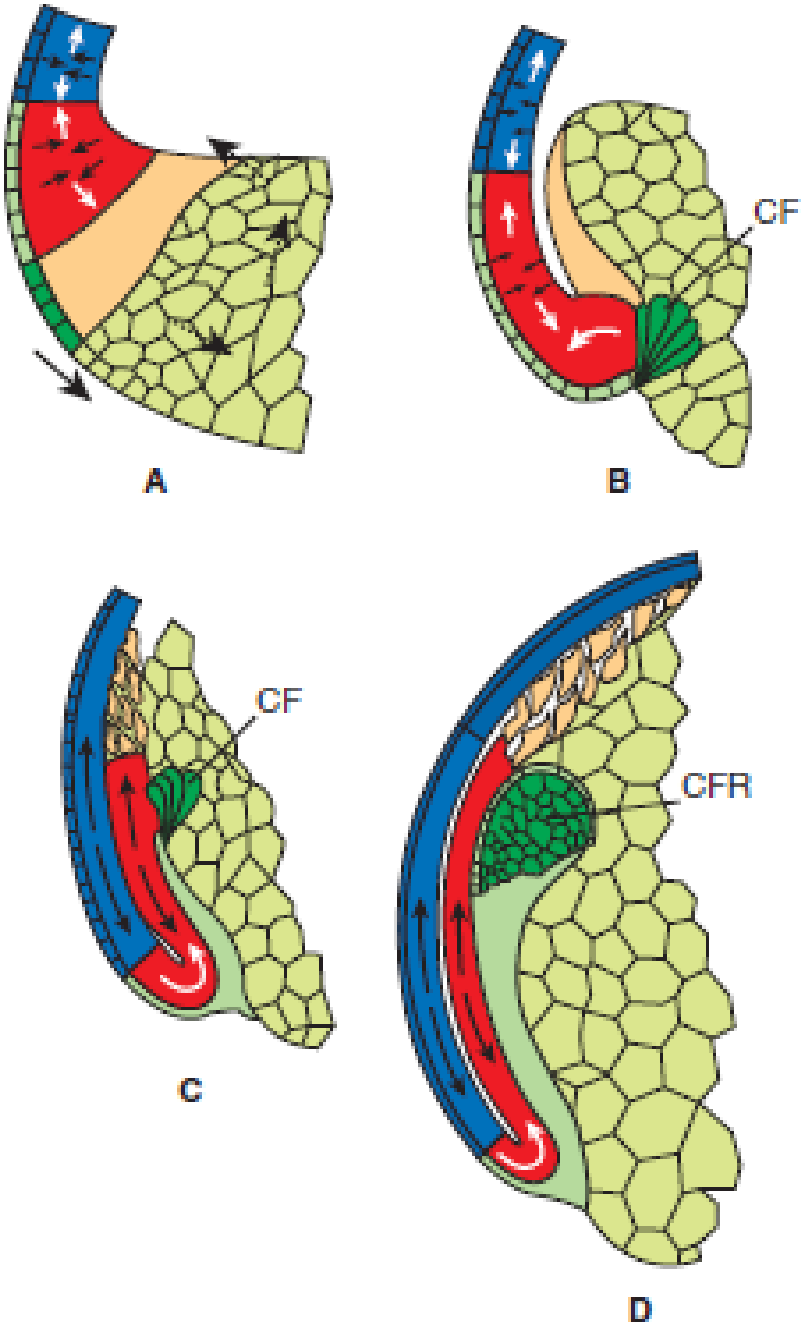
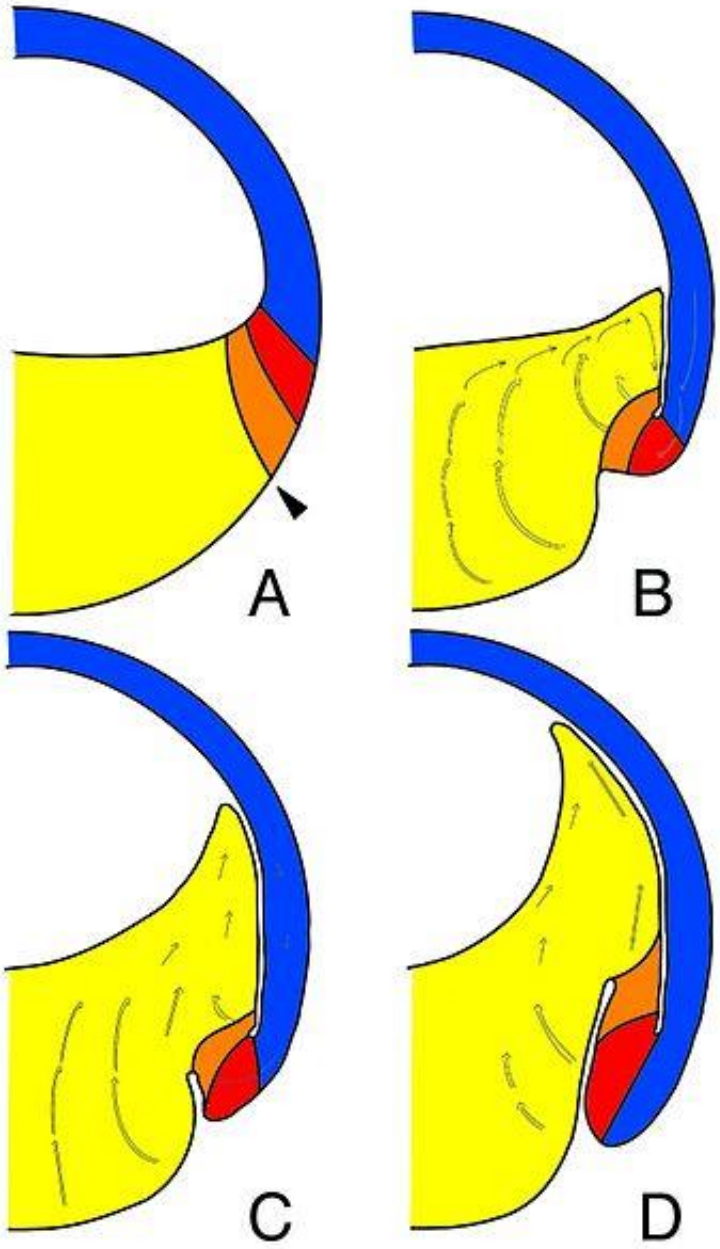
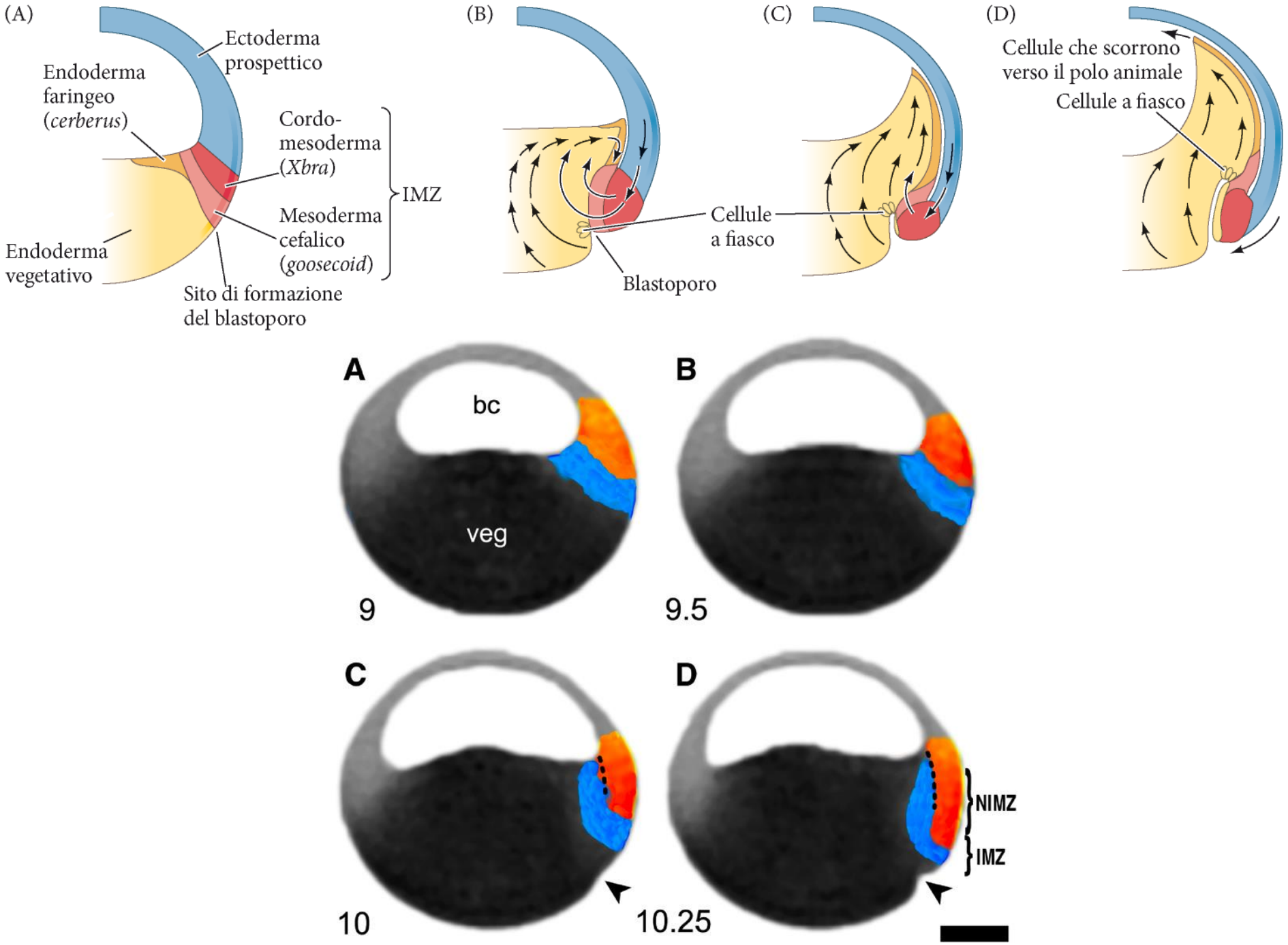


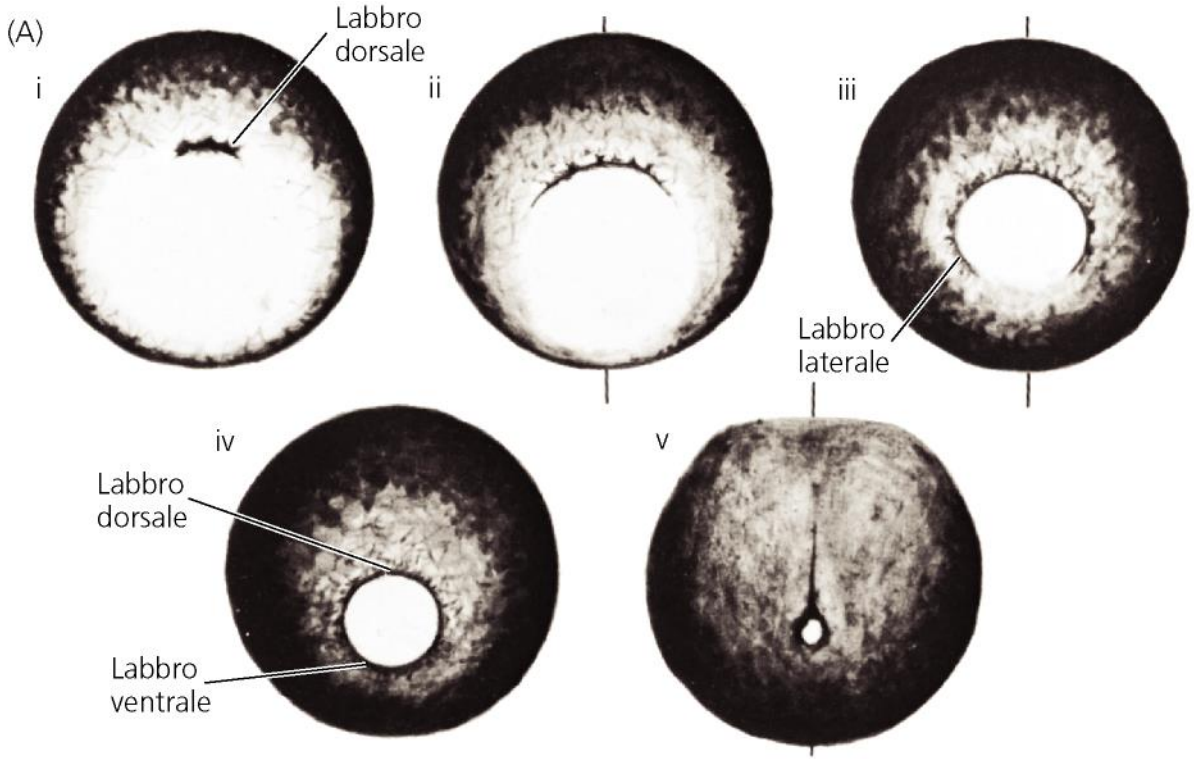
Figura 7

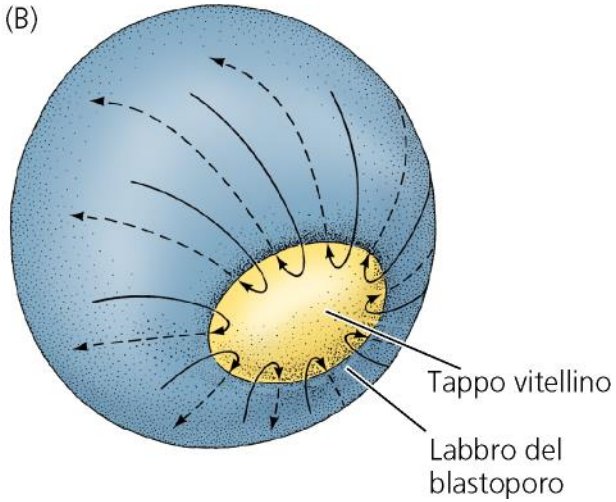
L’INVOLUZIONE DEL MESOENDODERMA E’ PROMOSSA DA MOVIMENTI DI ROTAZIONE DELLA MASSA VEGETATIVA PROFONDA ED EPIBOLIA DELLA ZONA MARGINALE SUPERFICIALE

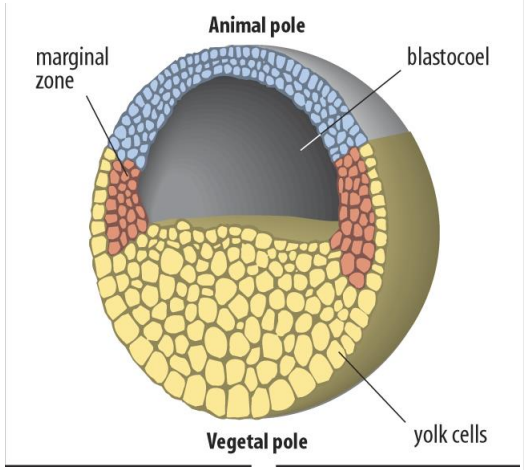


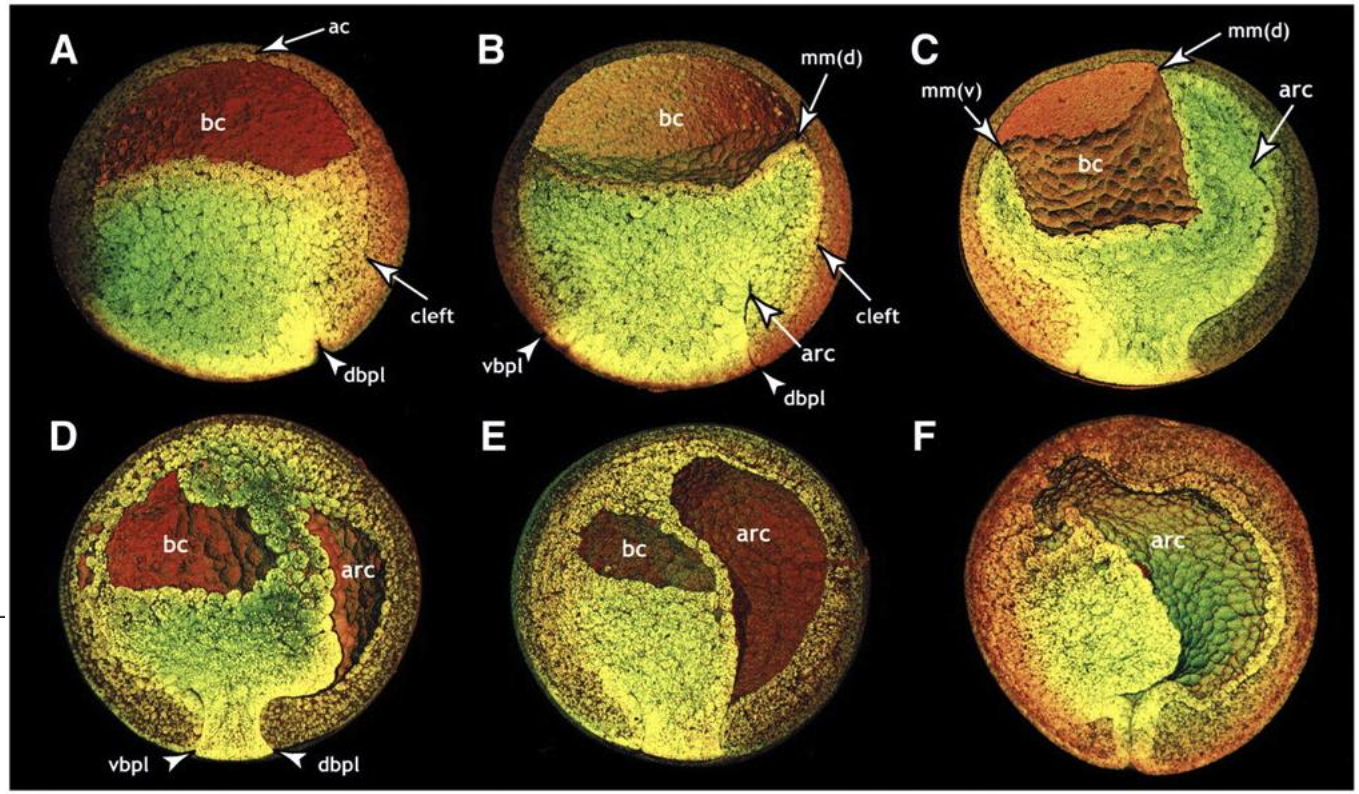

(A)
Ectoderma prospettico
Endoderma faringeo (*cerberus*)
Cordo-mesoderma (*Xbra*)
IMZ
Mesoderma cefalico (*goosecoid*)
Endoderma vegetativo
Sito di formazione del blastoporo
(B)
Cellule a fiasco
Blastoporo
(C)
(D)
Cellule che scorrono verso il polo animale
Cellule a fiasco
A
bc
veg
9
B
9.5
C
10
D
10.25
NIMZ
IMZ

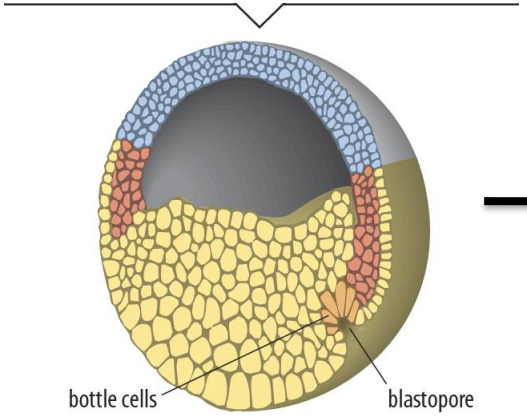
I MOVIMENTI DI GASTRULAZIONE SI ESTENDONO PROGRESSIVAMENTE IN DIREZIONE DORSO-VENTRALE

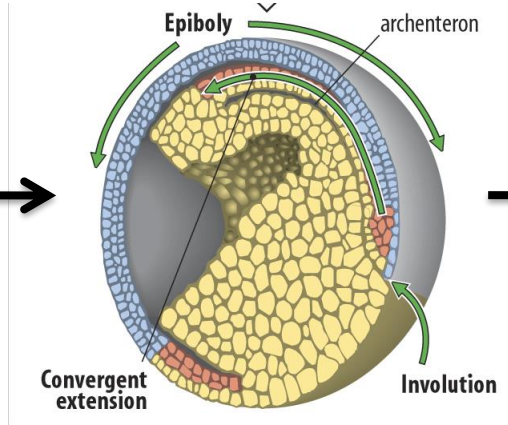


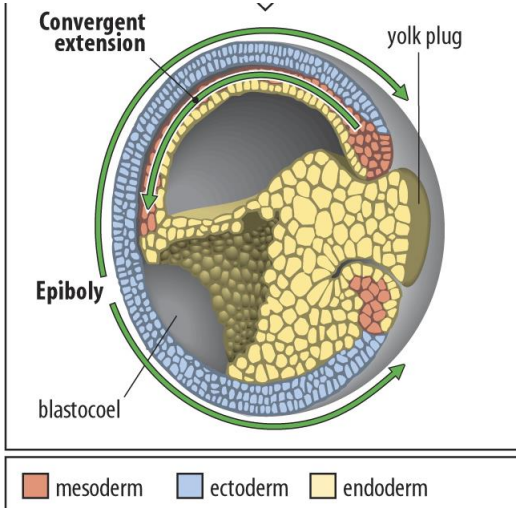



Animal pole
marginal zone
blastocoel
yolk cells
Vegetal pole

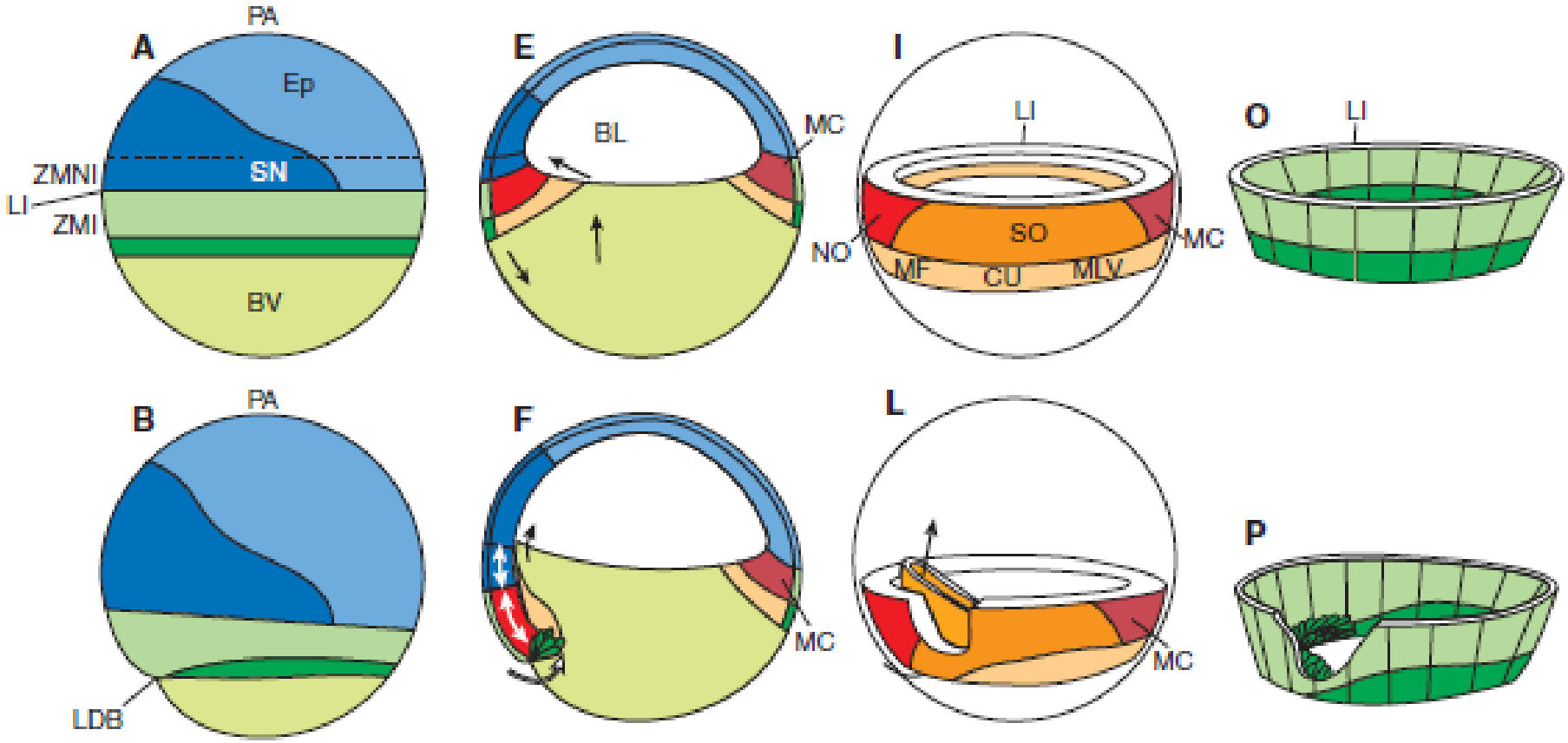

A
ac
bc
cleft
dbpl
B
mm(d)
bc
cleft
vbpl
arc
dbpl
C
mm(d)
mm(v)
arc
bc
D
bc
arc
vbpl
dbpl
E
bc
arc
F
arc


bottle cells
blastopore

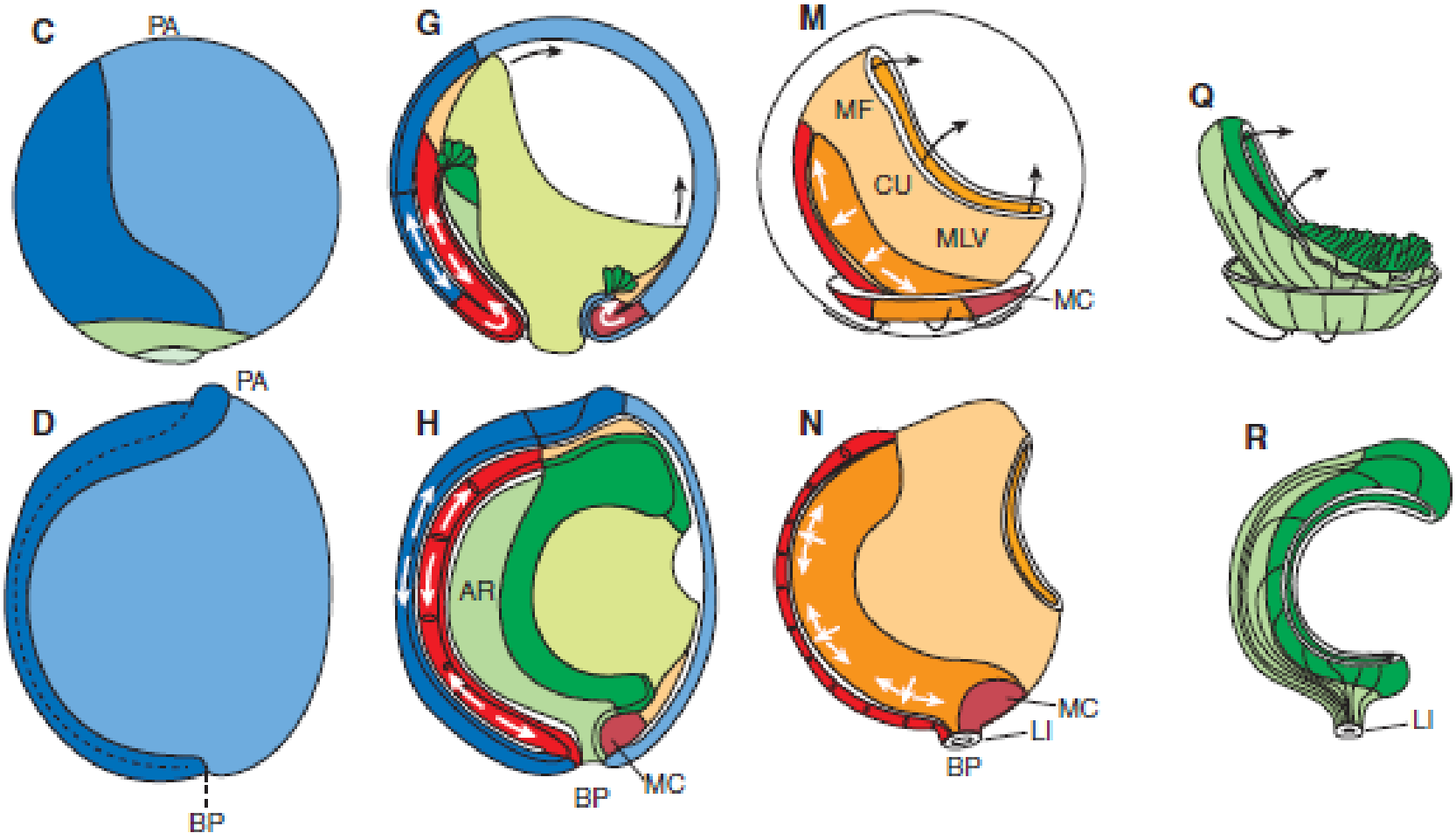

Epiboly
archenteron
Convergent extension
Involution

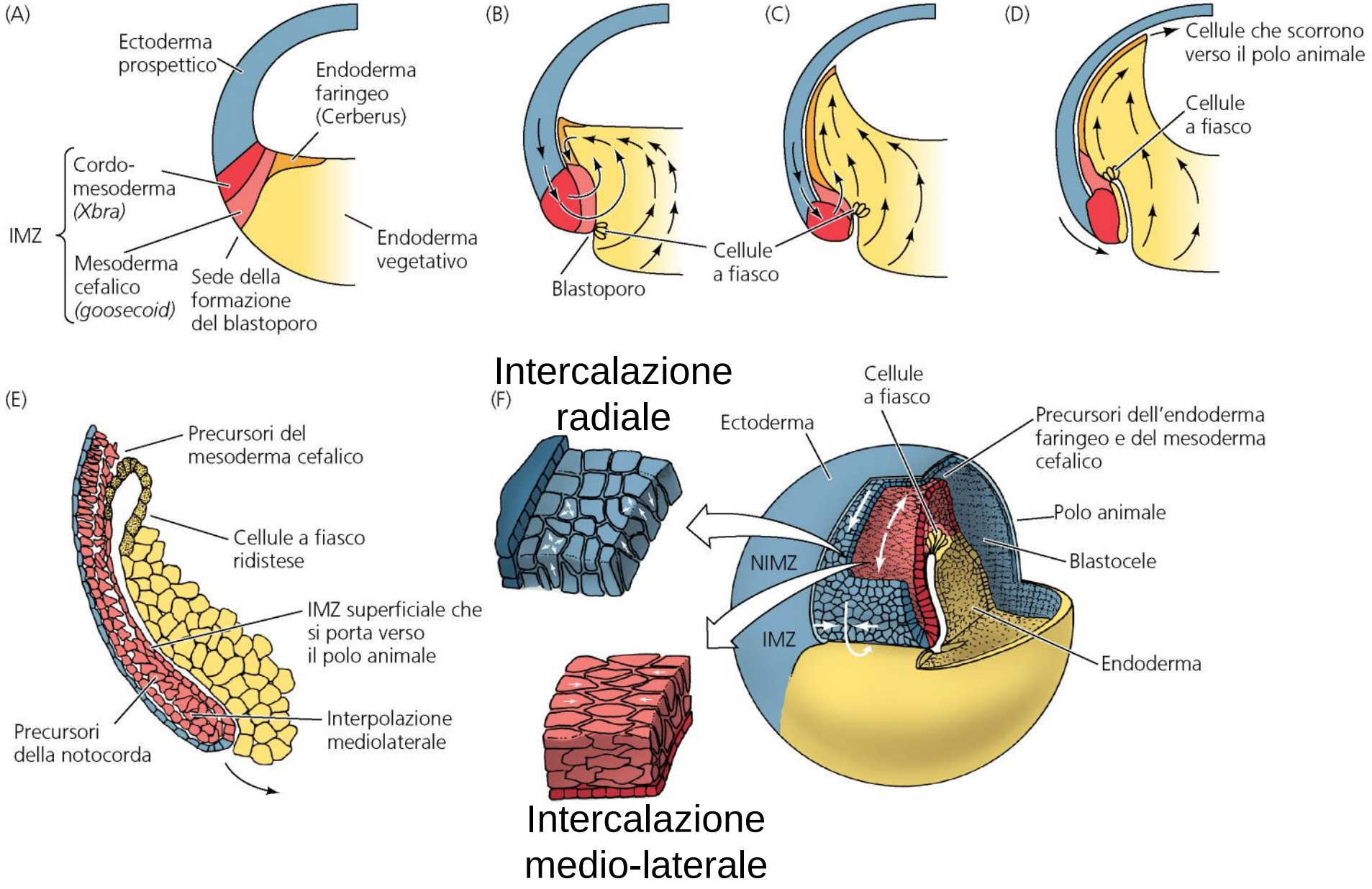

Convergent extension
yolk plug
Epiboly
blastocoel
mesoderm
ectoderm
endoderm

GASTRULA PRECOCE

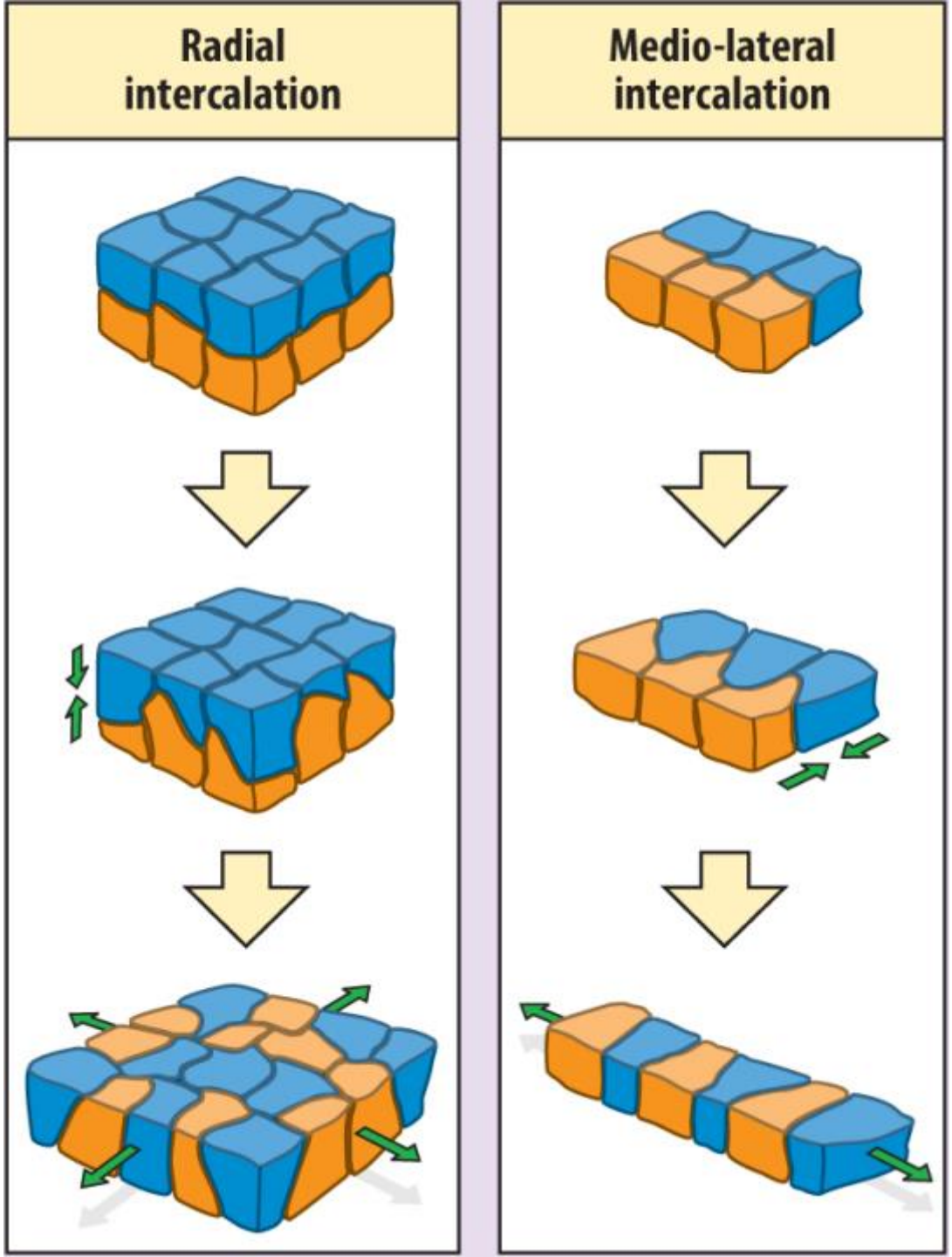


GASTRULA TARDIVA

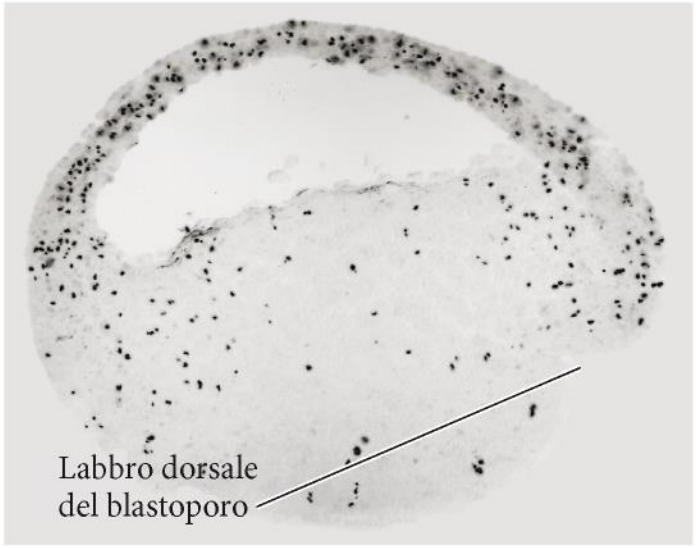




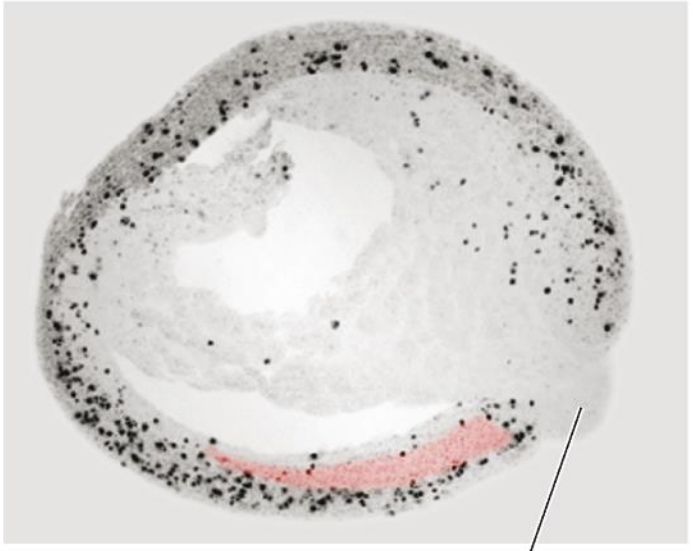
Invaginazione **Involuzione** **Epibolia**


Radial intercalation
Medio-lateral intercalation

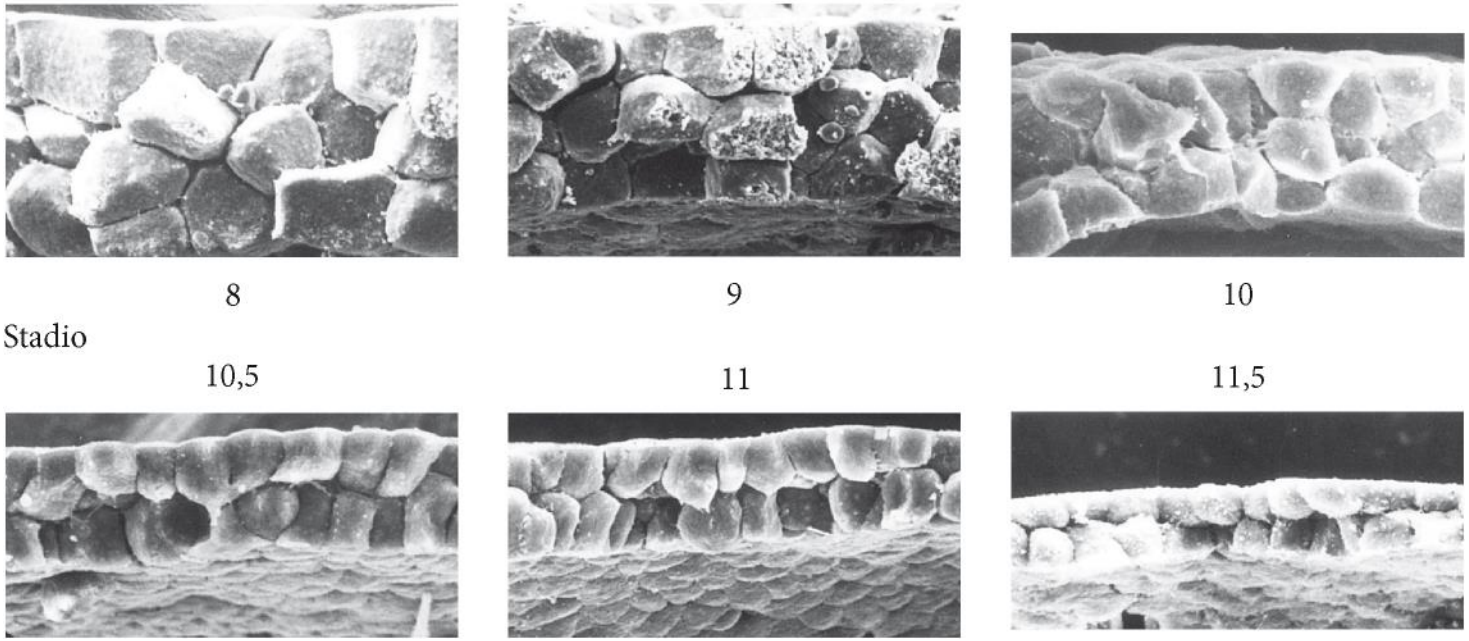
(A)


Labbro dorsale
del blastoporo

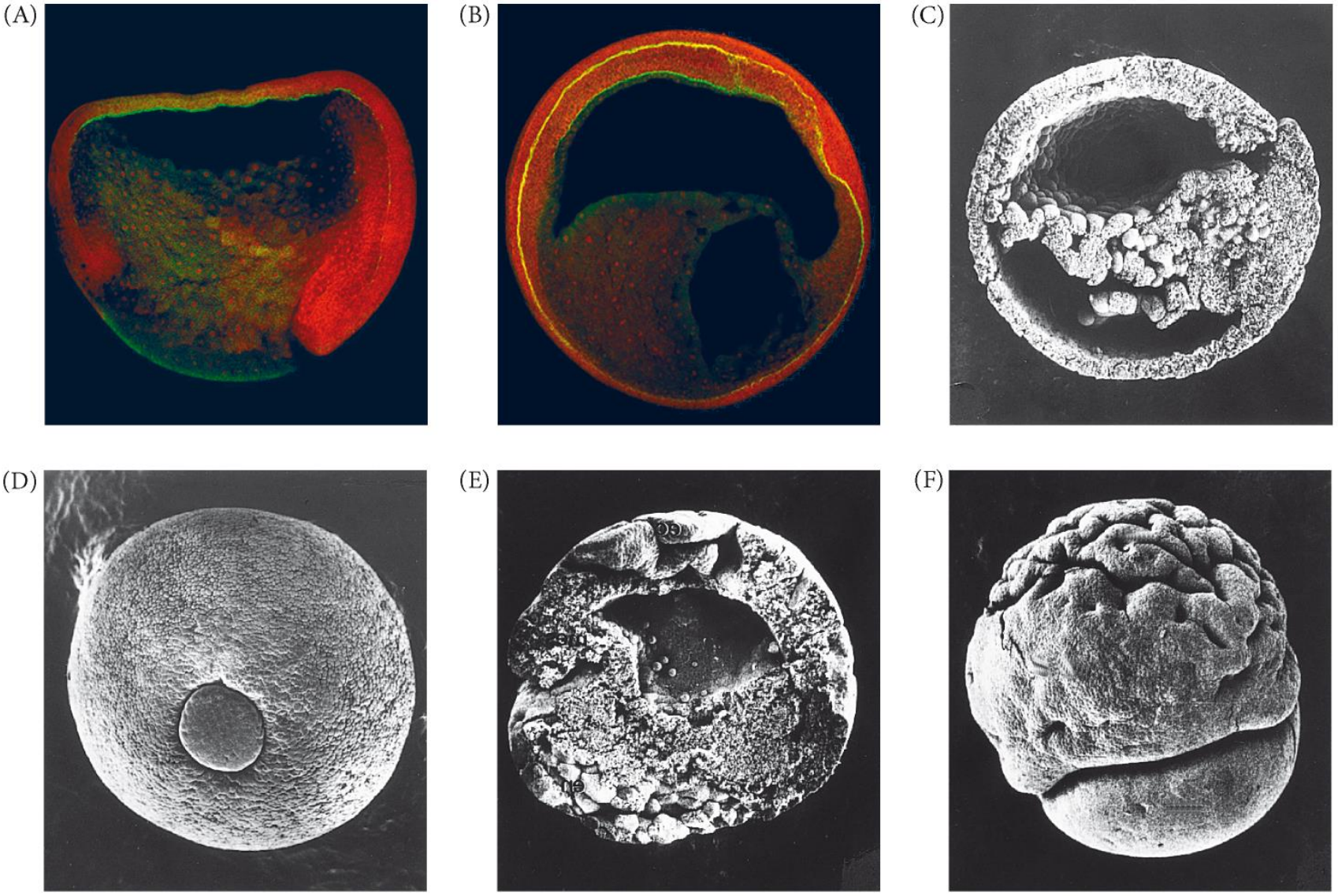
(B)


Tappo vitellino

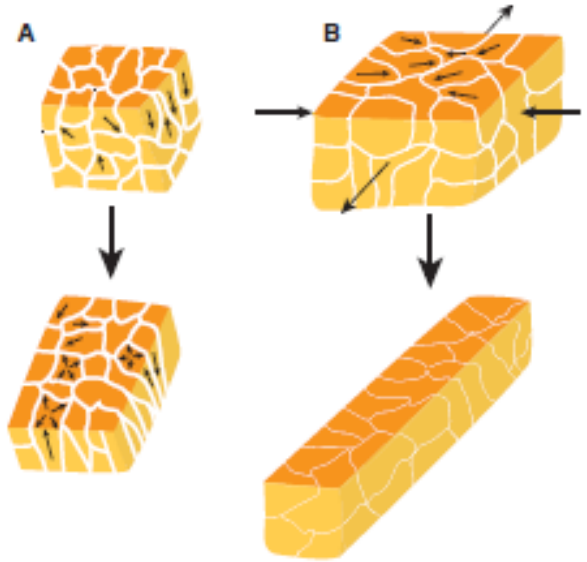
(C)

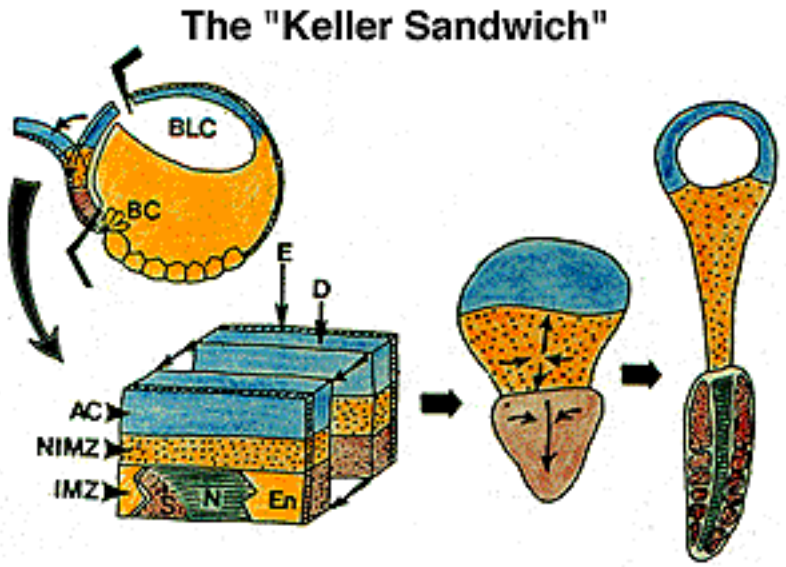

8
9
10
Stadio
10,5
11
11,5

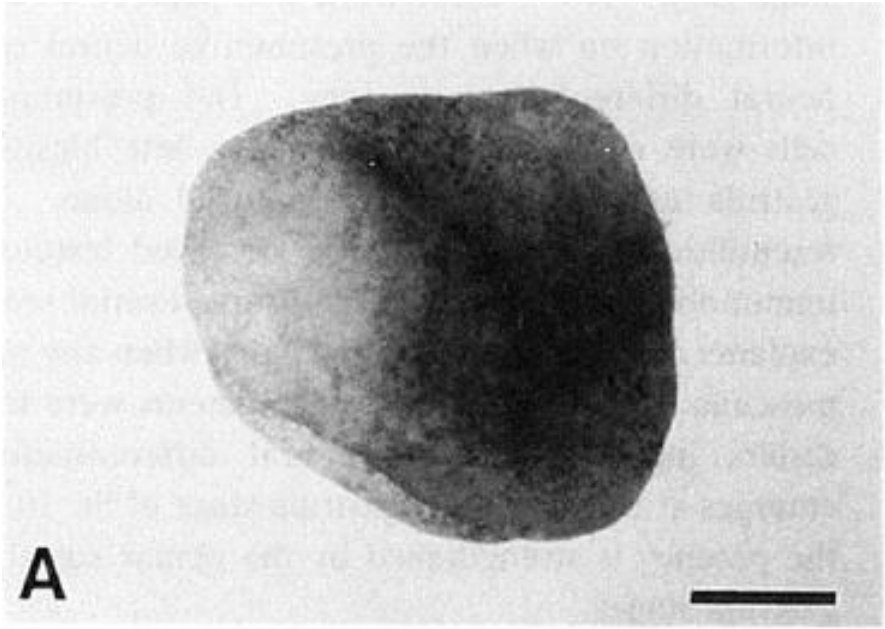
I MOVIMENTI DI INVOLUZIONE SONO MEDIATI DA INTERAZIONI DELLE CELLULE MESENDODERMICHE CON LA MATRICE EXTRA-CELLULARE PRODOTTA DALLE CELLULE DEL TETTO DEL BLASTOCELE

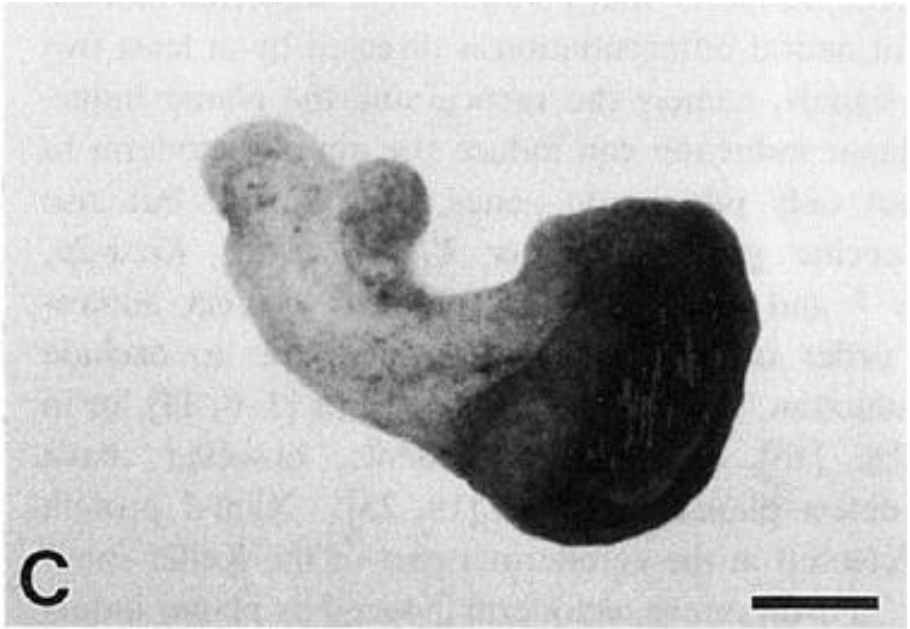


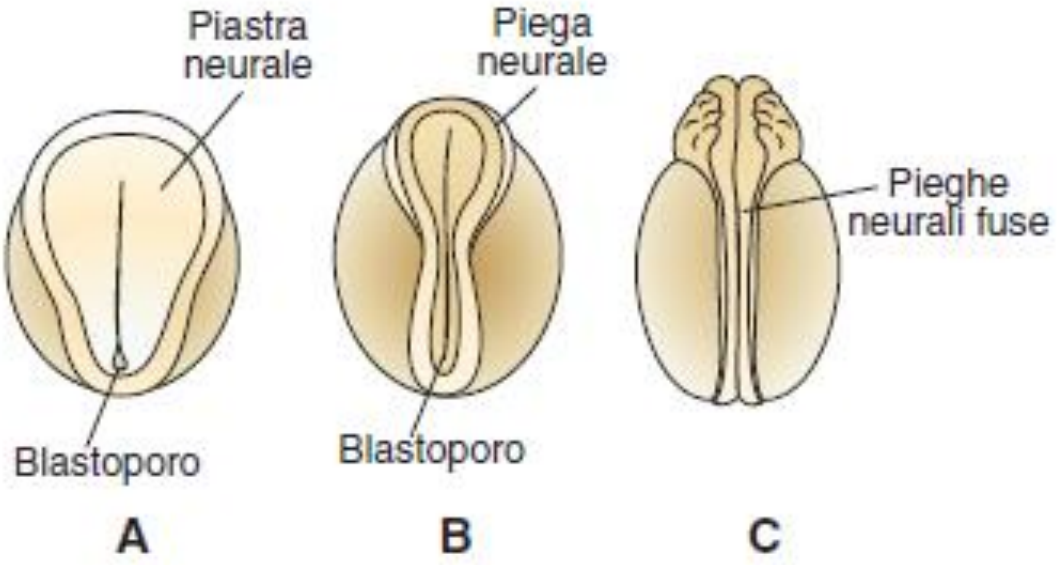
I MOVIMENTI DI ESTENSIONE CONVERGENTE GIOCANO UN RUOLO CHIAVE NELLA GASTRULAZIONE



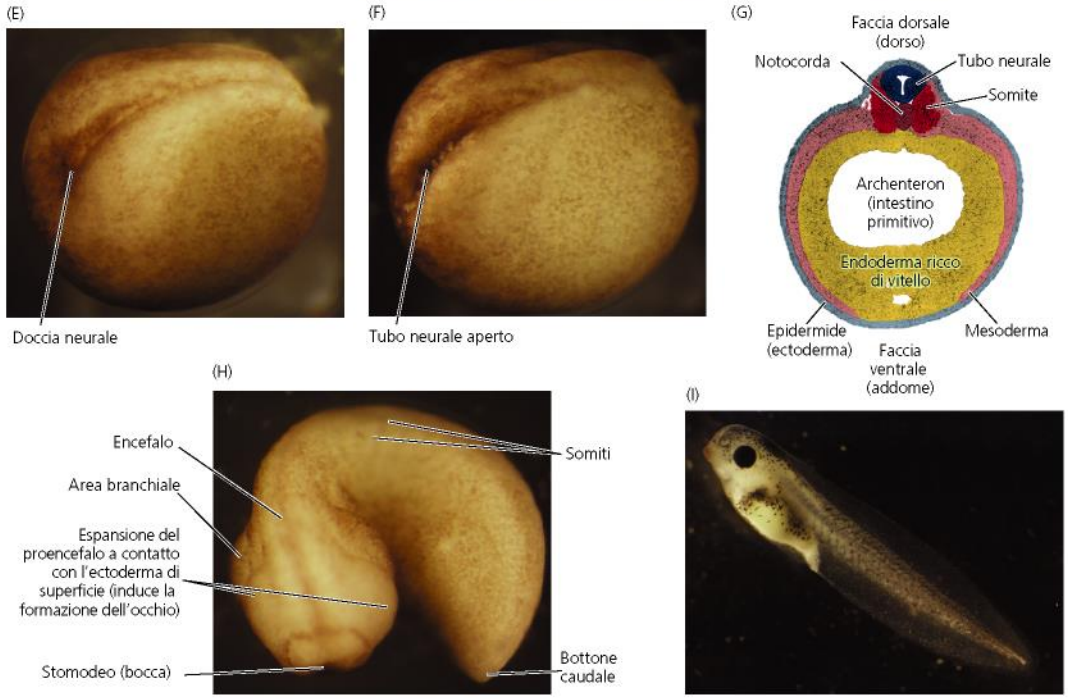


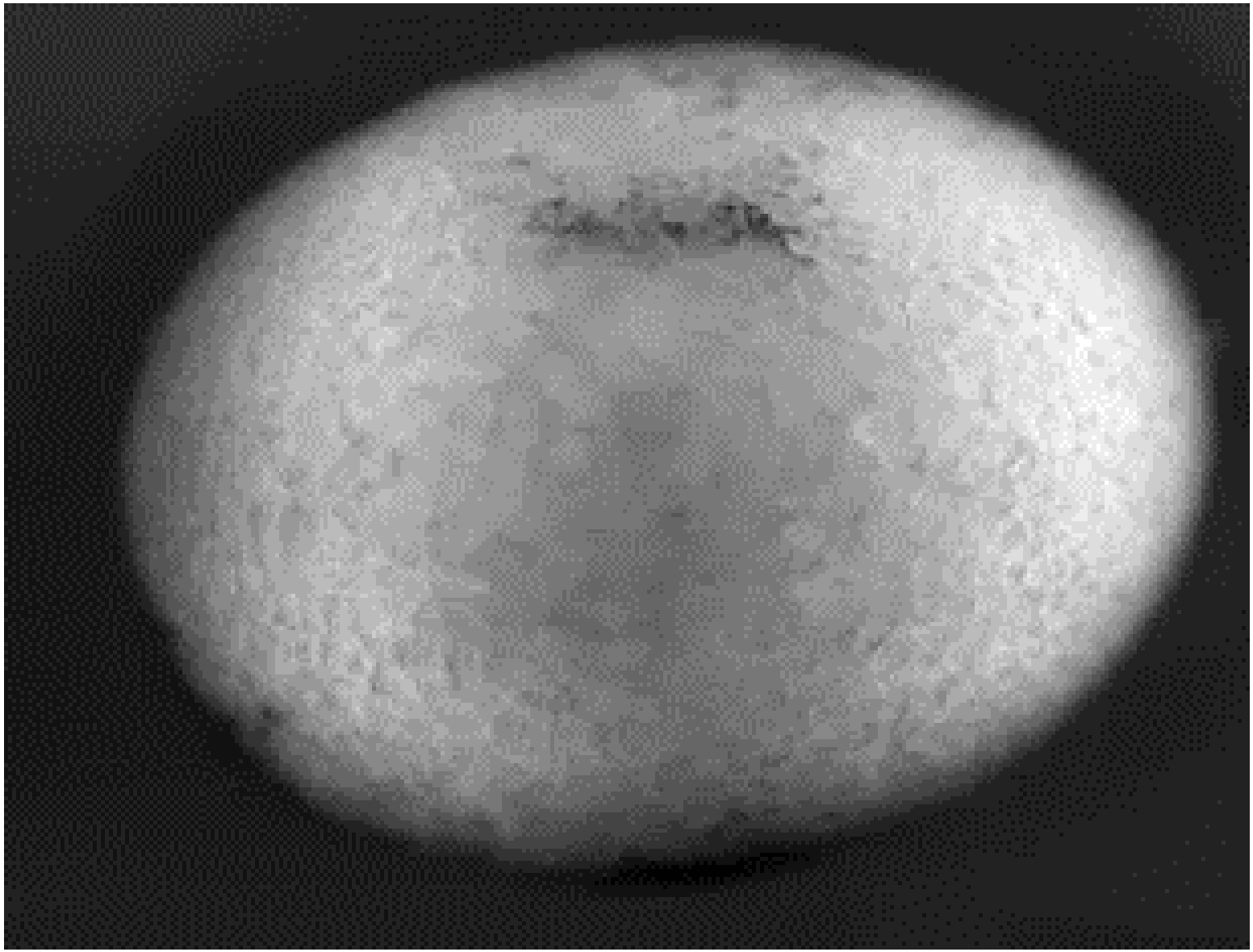






I MOVIMENTI DI NEURULAZIONE CONDUCONO ALLA FORMAZIONE DEL TUBO NEURALE





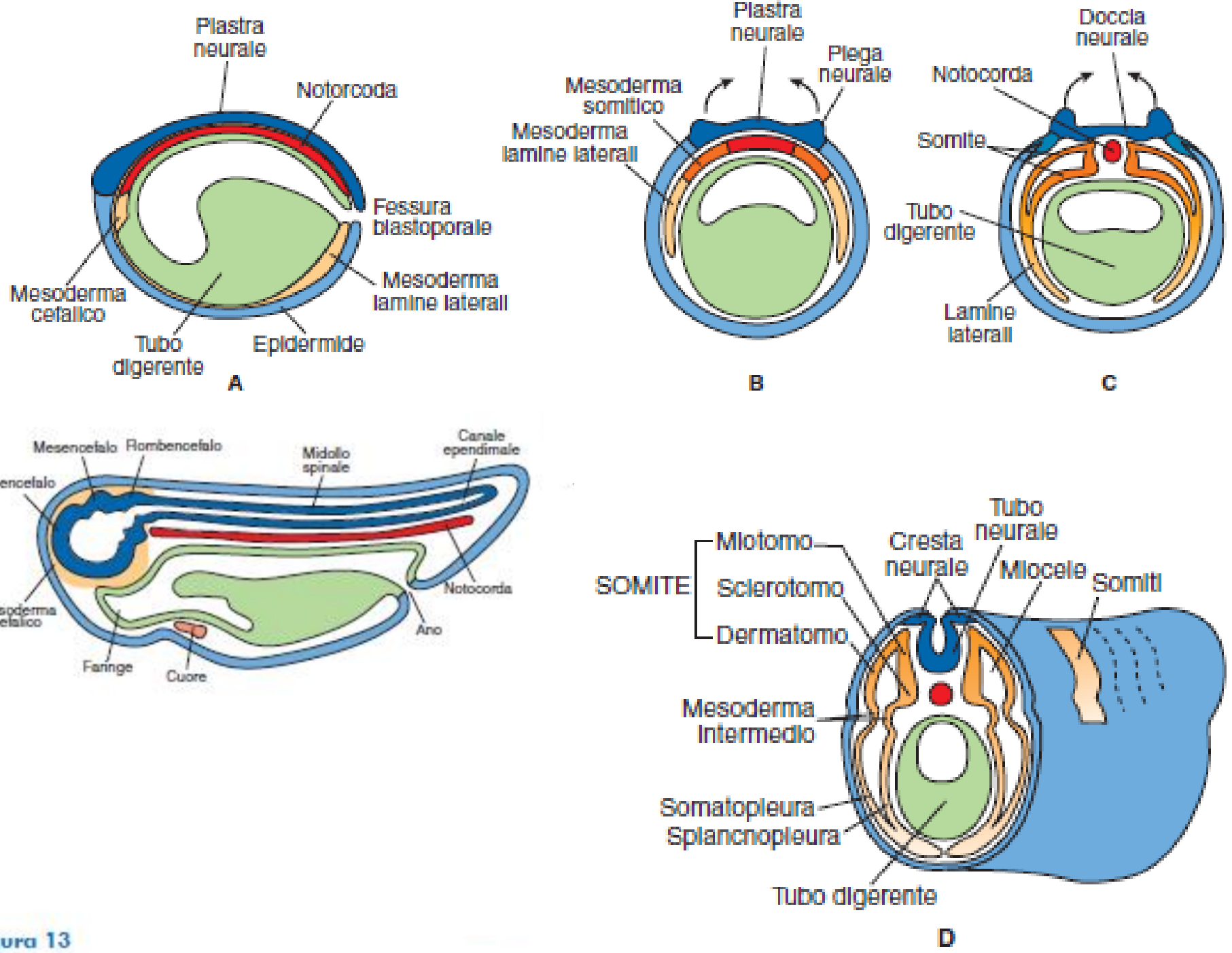
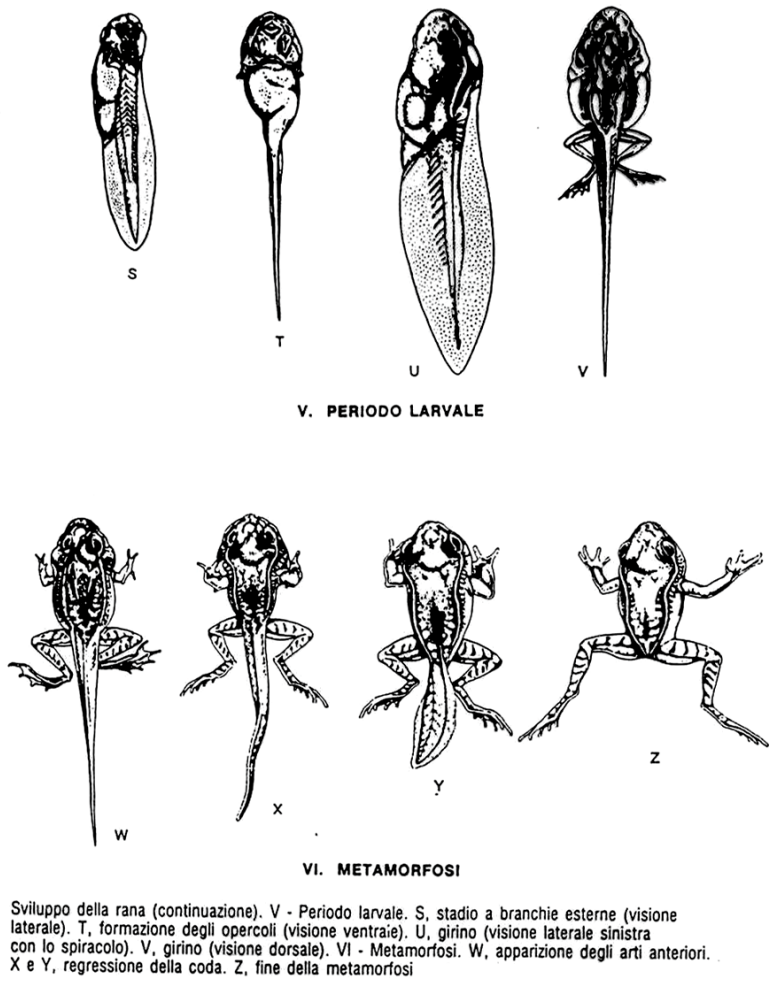

Plastra neurale
Notocorda
Fessura blastoporale
Mesoderma lamine laterali
Mesoderma cefalico
Tubo digerente
Epidermide
A
Plastra neurale
Piega neurale
Mesoderma somitico
Mesoderma lamine laterali
B
Doccia neurale
Notocorda
Somite
Tubo digerente
Lamine laterali
C
Mesencefalo
Rombencefalo
Midollo spinale
Canale ependimale
Prosencefalo
Notocorda
Mesoderma cefalico
Ano
Faringe
Cuore
A
Tubo neurale
Miotomo
Cresta neurale
Miocele
Somiti
SOMITE
Sclerotomo
Dermatomo
Mesoderma intermedio
Somatopleura
Splancnopleura
Tubo digerente
D

Figura 13

Metamorfosi



Sviluppo della rana (continuazione). V - Periodo larvale. S, stadio a branchie esterne (visione laterale). T, formazione degli opercoli (visione ventrale). U, girino (visione laterale sinistra con lo spiracolo). V, girino (visione dorsale). VI - Metamorfosi. W, apparizione degli arti anteriori. X e Y, regressione della coda. Z, fine della metamorfosi

Pre-metamorfosi: accrescimento girino, Presenza di branchie, progressivo sviluppo arti posteriori.

Metamorfosi: arti anteriori, regressione pinna caudale e coda, modificazione tubo digerente, sviluppo polmoni.

Controllo ormonale:

ipofisi- ormone tireotropo

Tiroide- ormone tiroxina