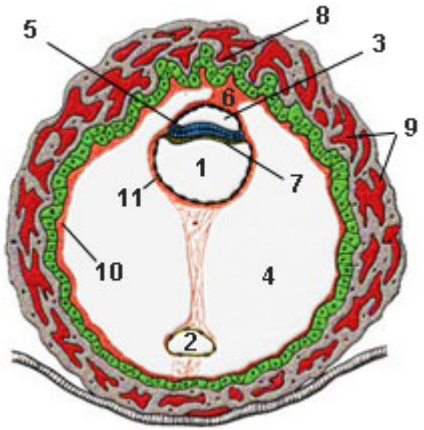
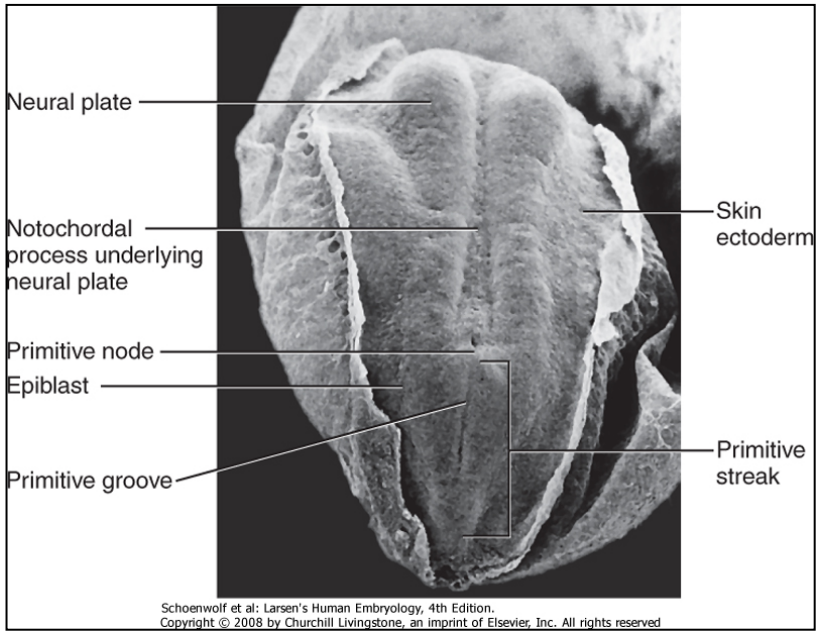
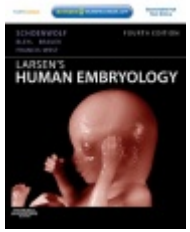
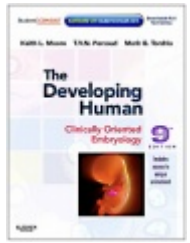
Week 3: gastrulation







Resources:
http://php.med.unsw.edu.au/embryology/
Larsen's Human Embryology
The Developing Human: Clinically Oriented Embryology



Dr Annemiek Beverdam – School of Medical Sciences, UNSW
Wallace Wurth Building Room 234 – A.Beverdam@unsw.edu.au

Week 1/2 Lecture overview

Fertilization

Cleavage stages

Morula formation

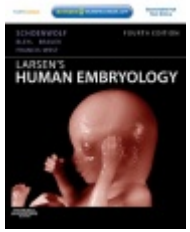
Blastocyst formation

Week 1

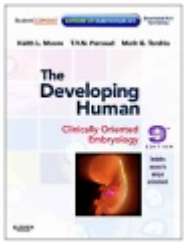
Implantation

Generation of bilaminar embryo

Week 2



Resources:
http://php.med.unsw.edu.au/embryology/
Larsen's Human Embryology
The Developing Human: Clinically Oriented Embryology



Dr Annemiek Beverdam – School of Medical Sciences, UNSW
Wallace Wurth Building Room 234 – A.Beverdam@unsw.edu.au

Week 3 Lecture overview

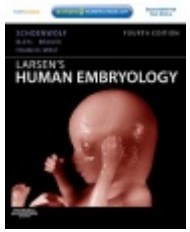
Placentation

Body axes

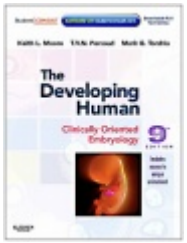
Gastrulation

Notochord formation

Embryo folding



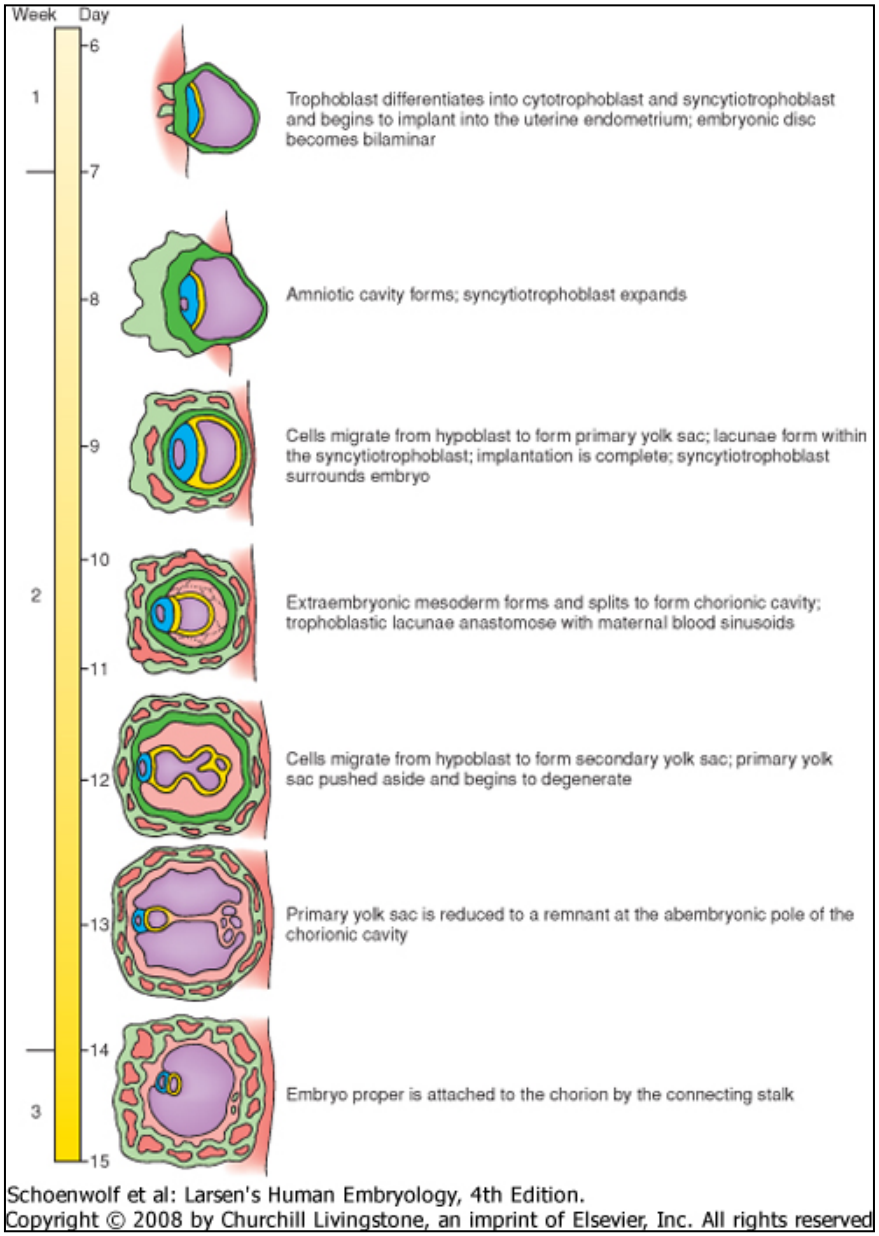
Resources:
http://php.med.unsw.edu.au/embryology/
Larsen's Human Embryology
The Developing Human: Clinically Oriented Embryology



Dr Annemiek Beverdam – School of Medical Sciences, UNSW
Wallace Wurth Building Room 234 – A.Beverdam@unsw.edu.au

Implantation

Week 2



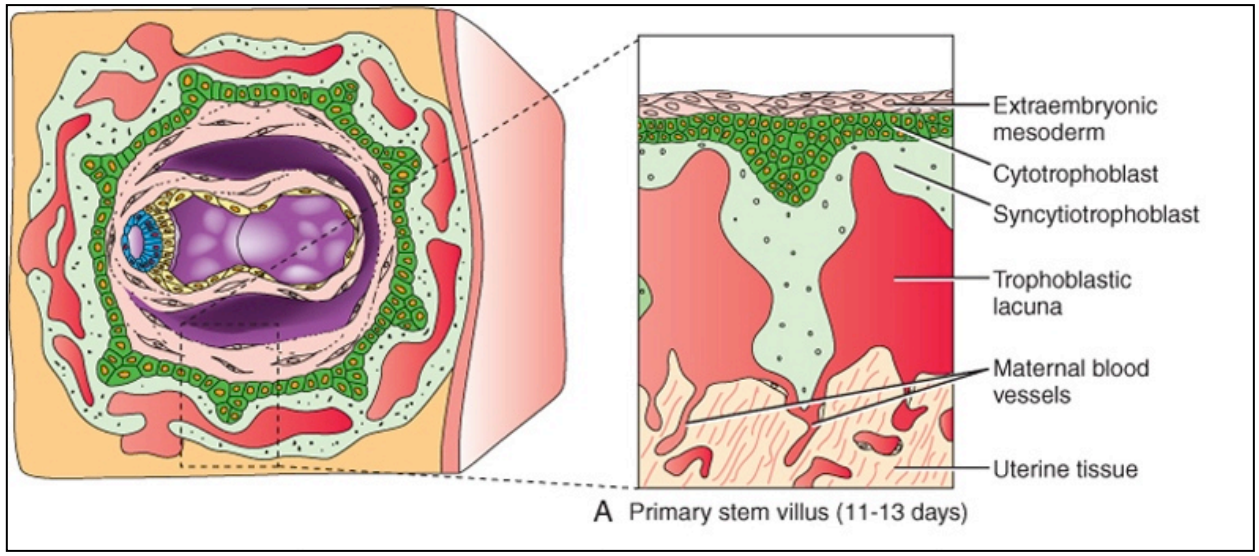
Extra-embryonic mesoderm
is probably generated
by hypoblast cells

Placentation

1st week: Nutrients through diffusion
Later: uteroplacental circulation

Day 11-13
Trophoblastic lacunae
Fusion with maternal circulation

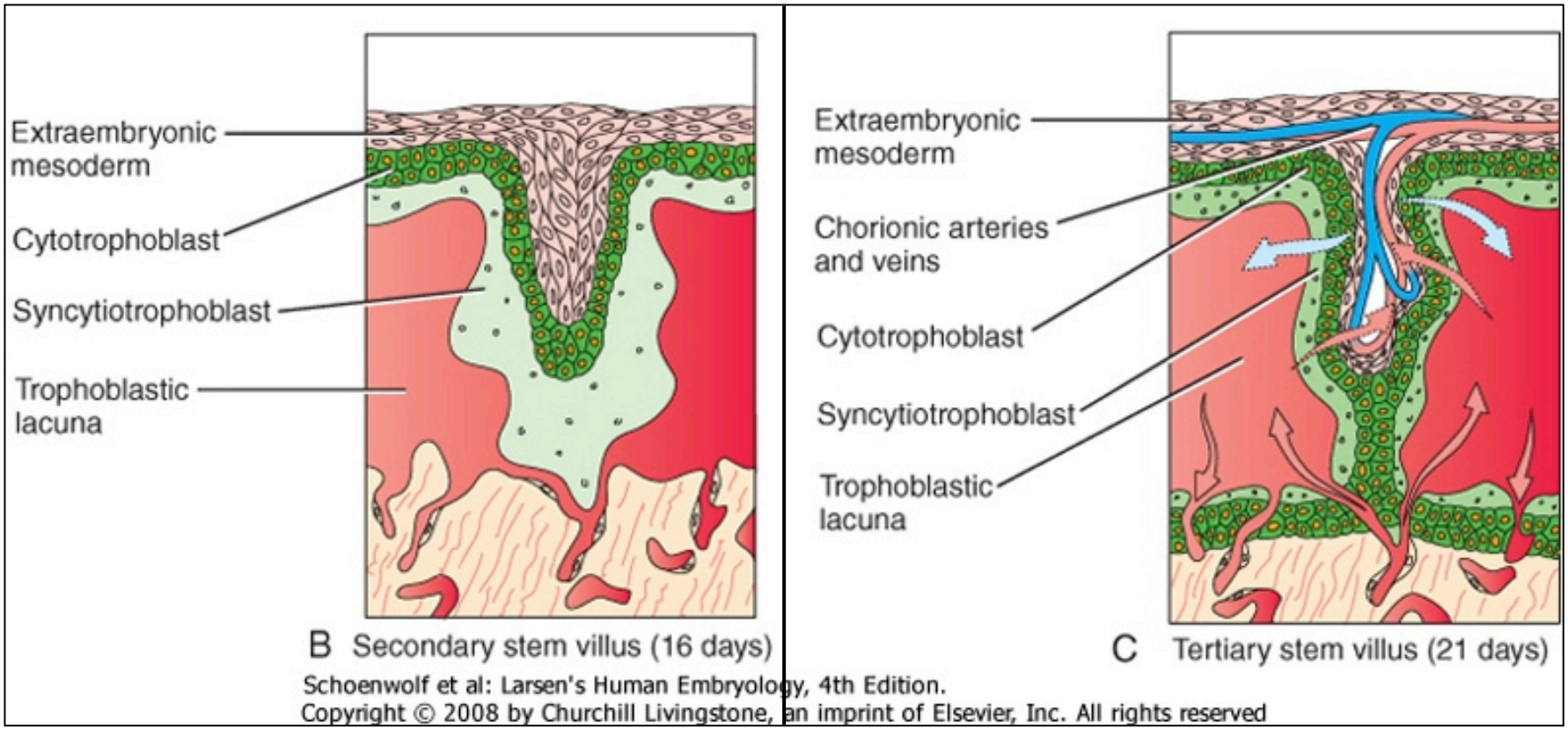
Primary chorionic stem villi formation: Cytotrophoblast projections into lacunae



Placentation

Day 16
Secondary stem villus
Cytotrophoblast projections

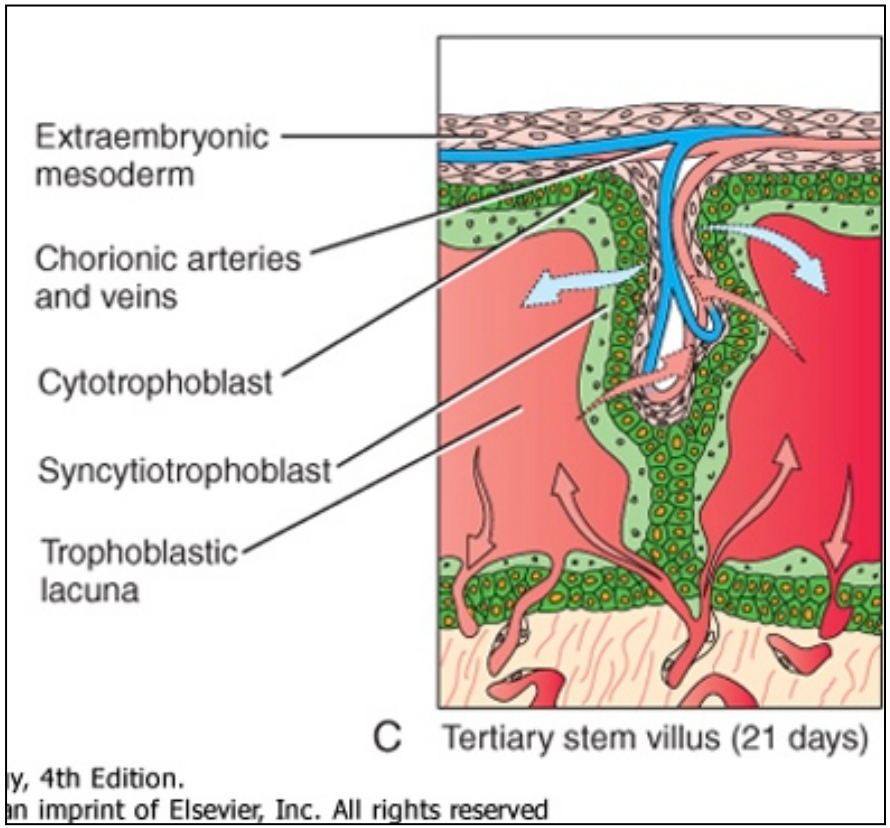
Day 21
Tertiary stem villus
Blood vessel development



Placentation

Placental barrier

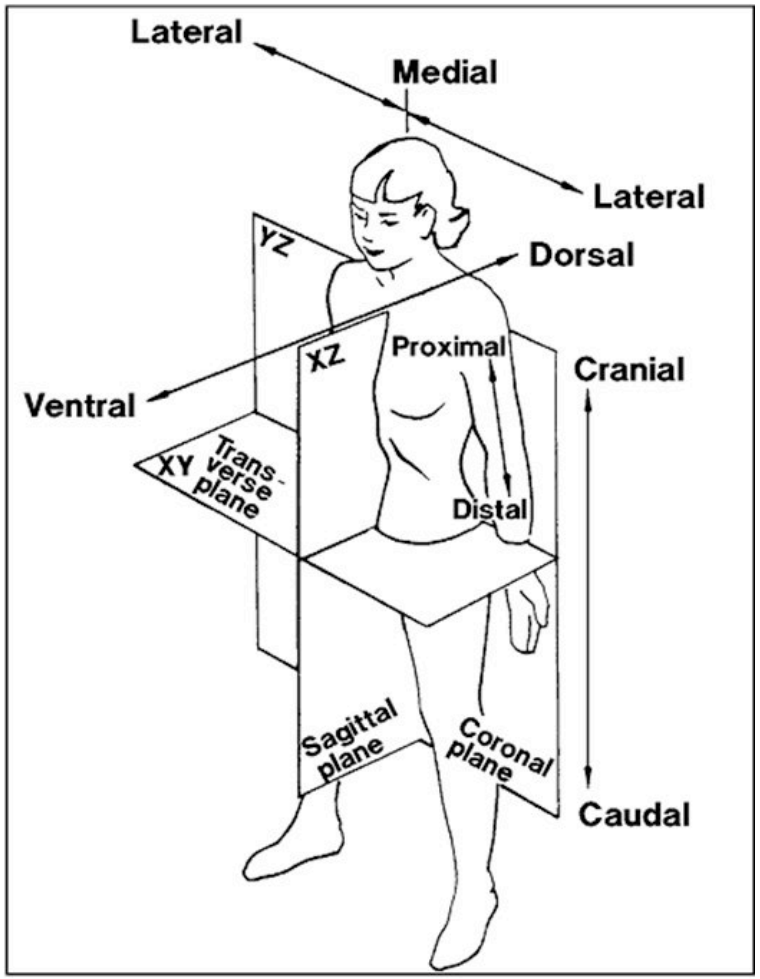
No mixing of embryonic and maternal blood

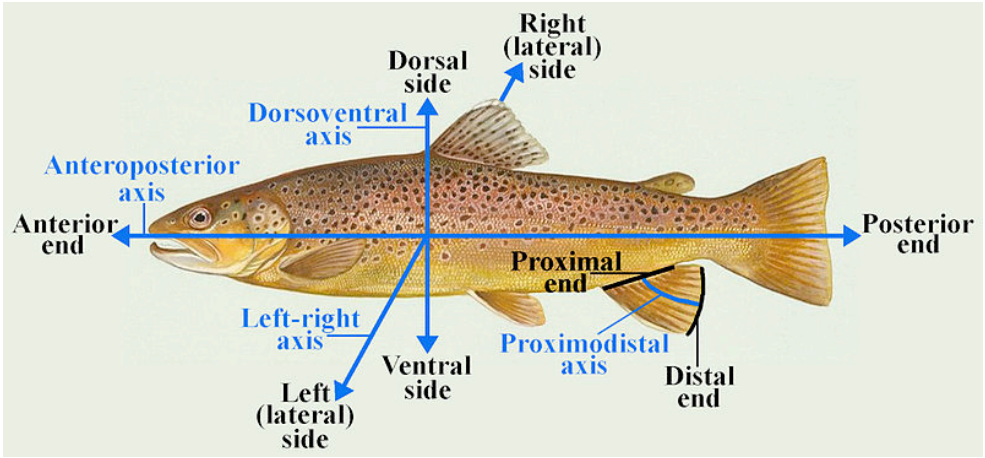


4 separating tissue layers:
Endothelium
Connective tissue (EEM)
Cytotrophoblast
Syncytiotrophoblast

Body axes

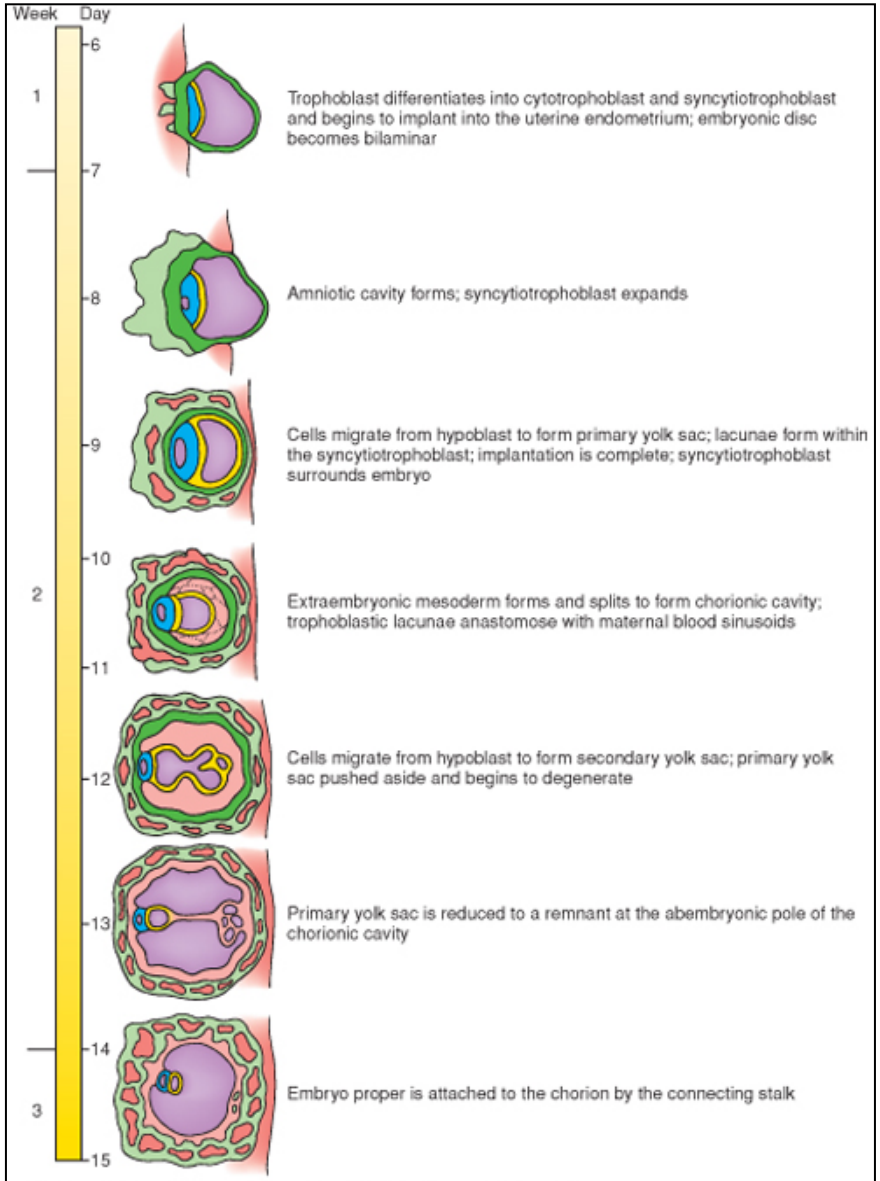
Anatomical orientation





Implantation

Week 2

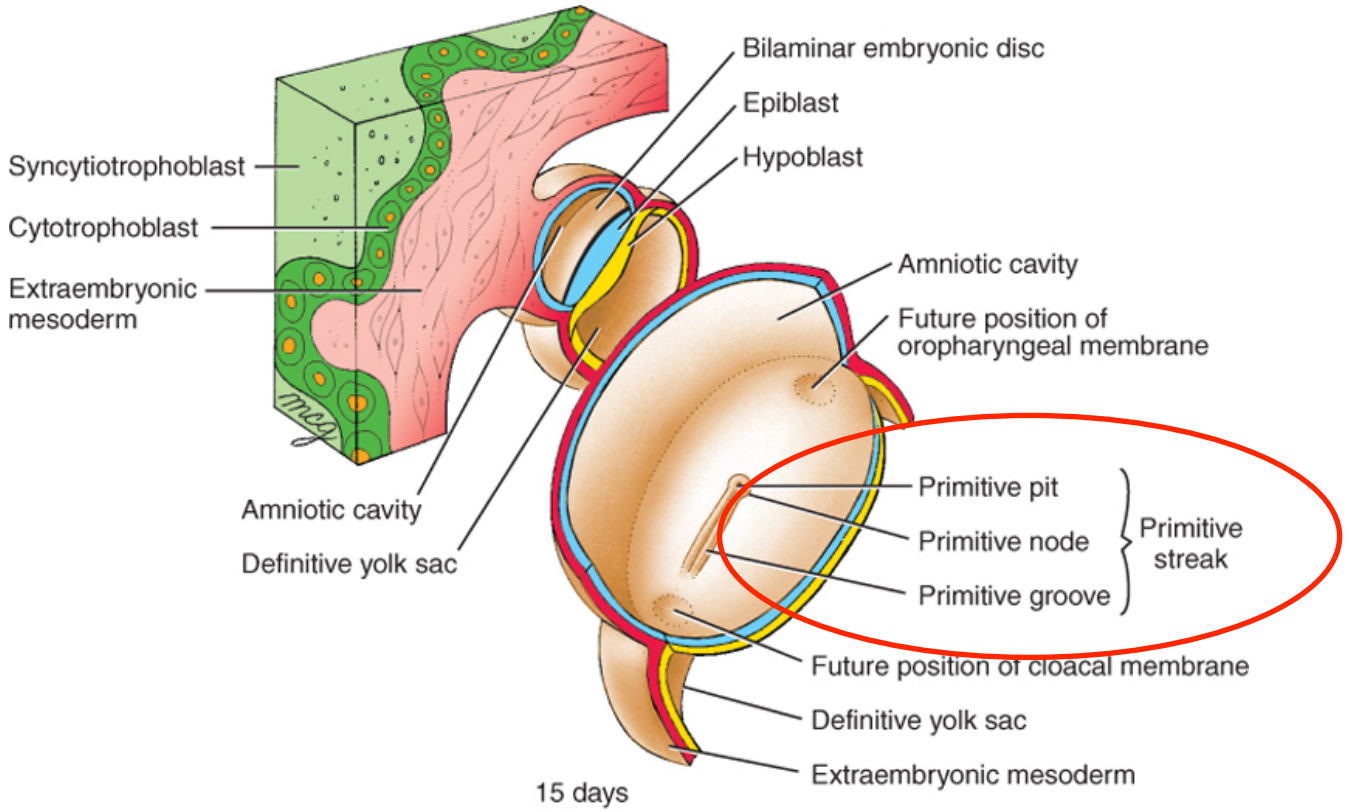


Schoenwolf et al: Larsen's Human Embryology, 4th Edition.

Gastrulation

Day 15

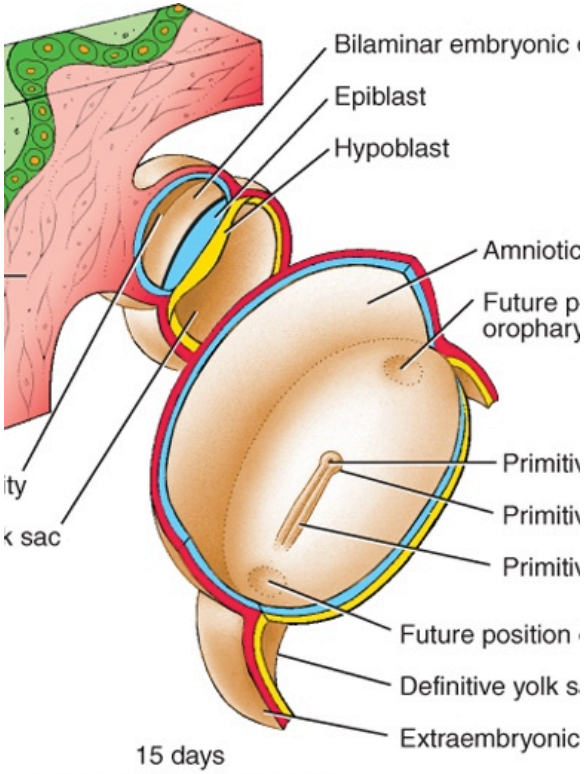
Formation of third germ layer
Formation of body axes

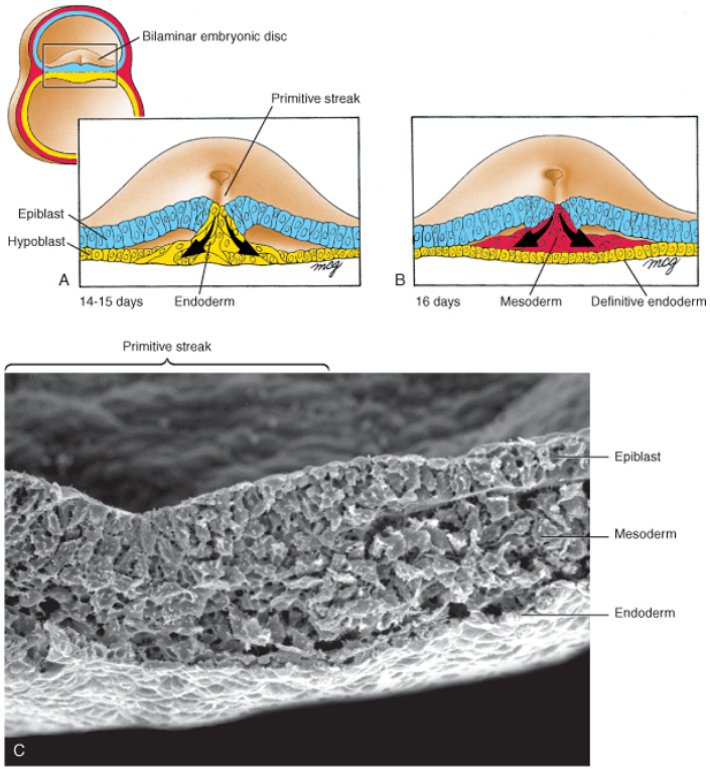


Gastrulation

Day 16

Ingression of epiblast cells: EMT transition
Generation of definitive endoderm
Generation of intra-embryonic mesoderm
Oropharyngeal and cloacal membrane
Embryonic ectoderm

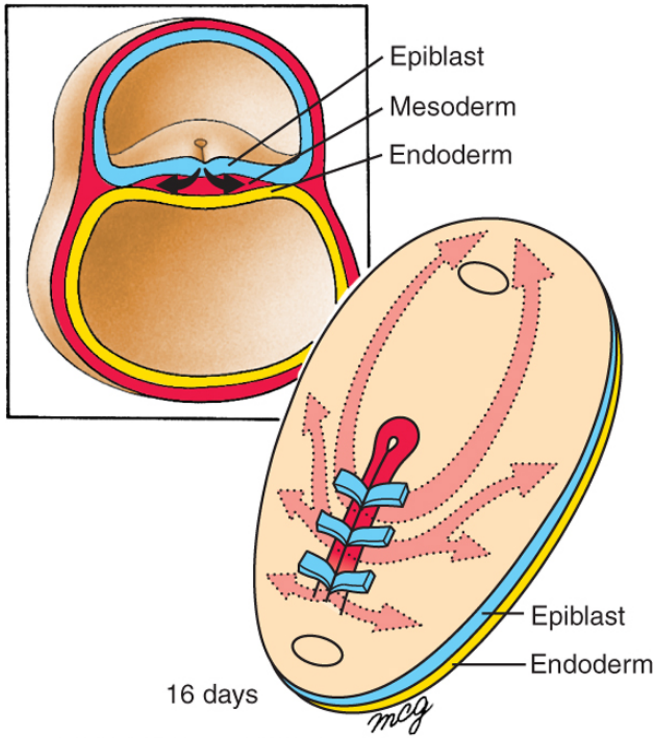




Gastrulation

Day 16

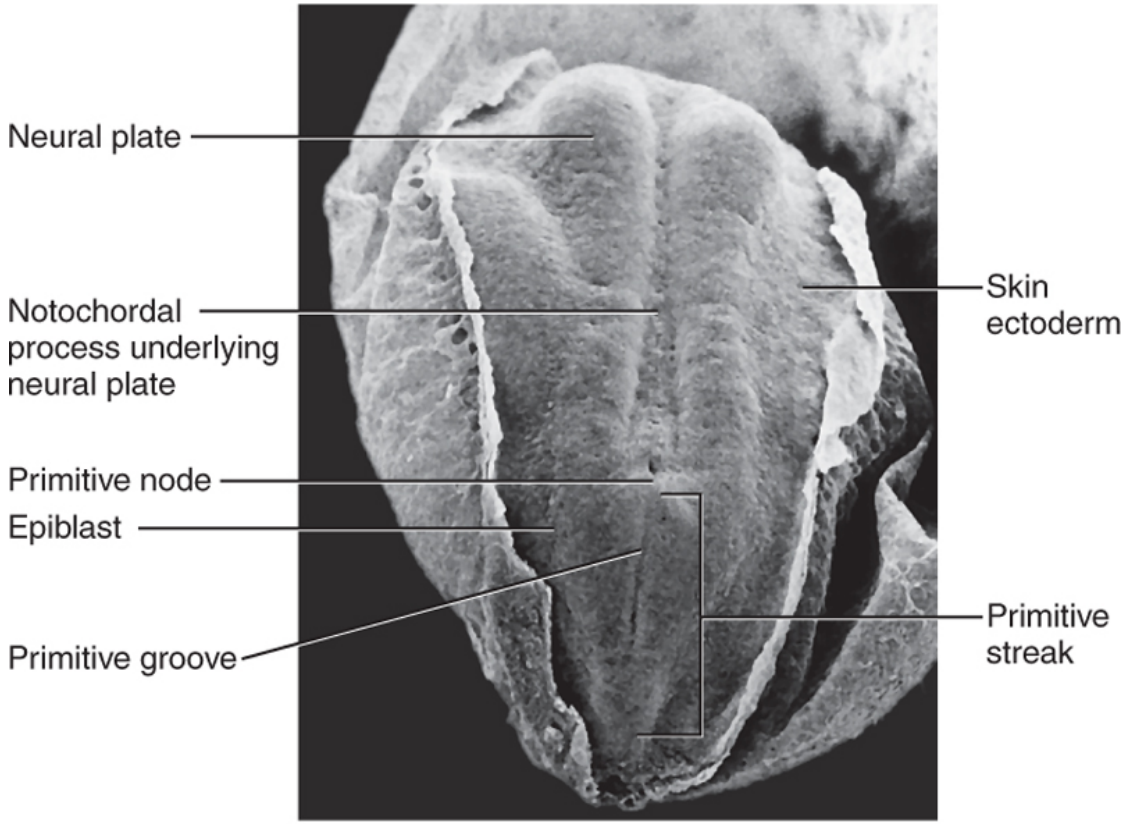
Ingression of epiblast cells: EMT transition
Generation of definitive endoderm
Generation of intra-embryonic mesoderm
Oropharyngeal and cloacal membrane
Embryonic ectoderm



http://php.med.unsw.edu.au/embryology/images/5/55/Mesoderm_001.mp4

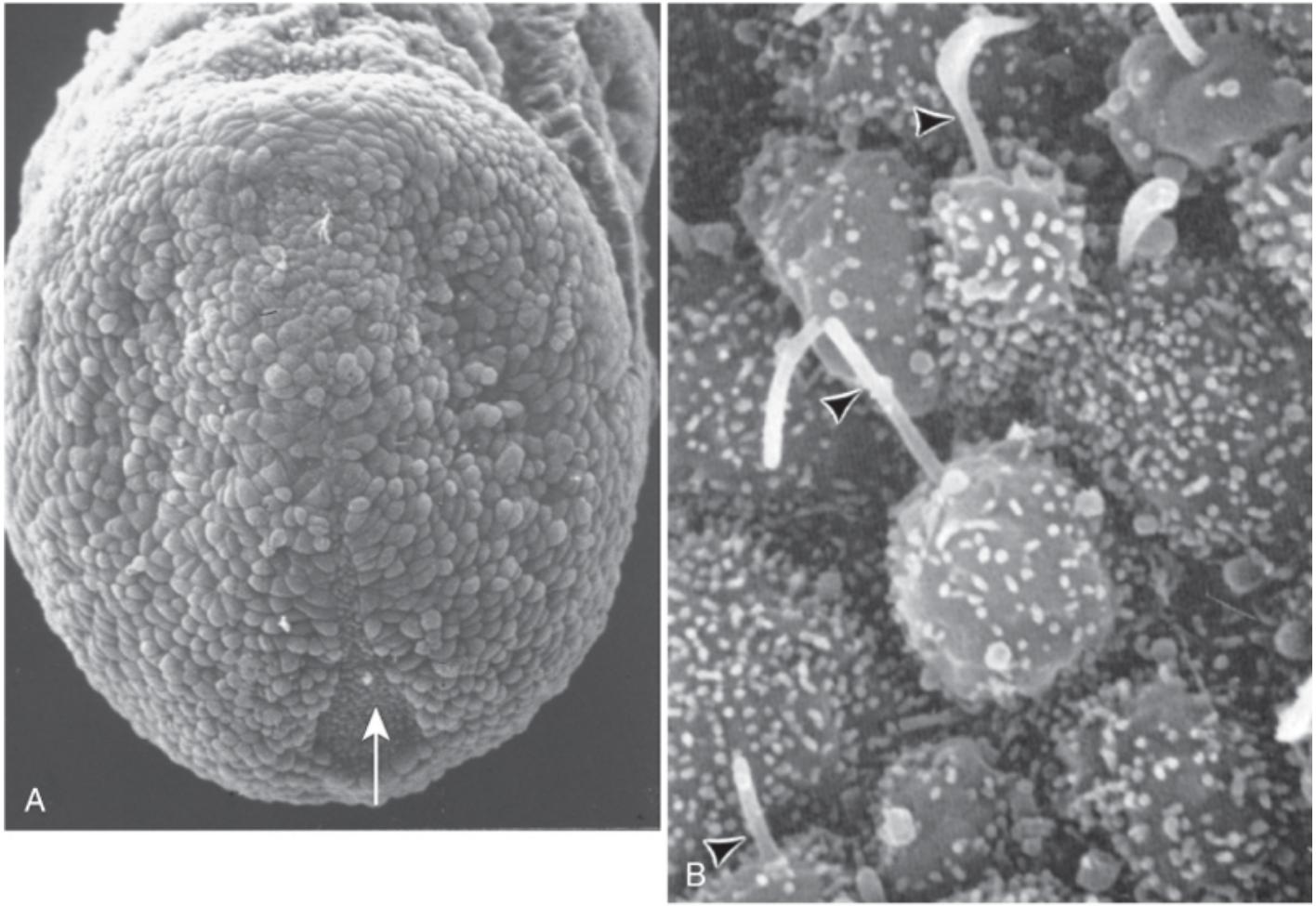
Gastrulation

Ingression of epiblast cells: EMT transition



Gastrulation

DV axis generation: Nodal cilia, Lefty/Nodal signalling



http://php.med.unsw.edu.au/embryology/images/a/a9/Nodal_cilia_001.mp4

Gastrulation

Epiblast forms 3 germ layers:

- Ectoderm: epithelium (previous epiblast)
- Mesoderm: mesenchymal layer (embryonic connective tissue)
- Endoderm: epithelium

Hypoblast:

- replaced by definitive endoderm

End product gastrulation:

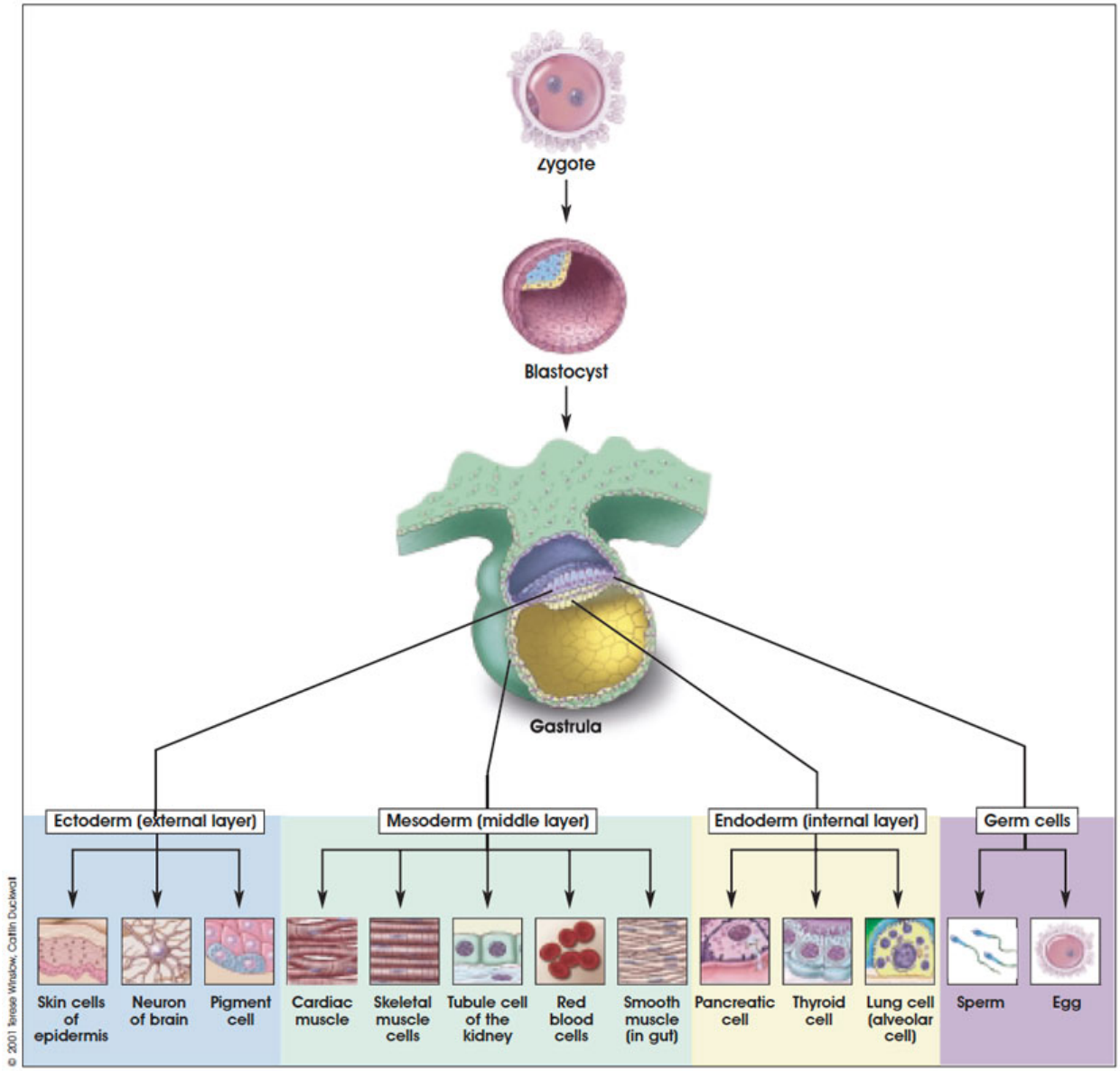
Trilaminar embryo

Ectoderm *(Neural crest)*
brain, spinal cord, eyes, *peripheral nervous system*
epidermis of skin and associated structures,
melanocytes, cranial connective tissues (dermis)

Mesoderm
musculo-skeletal system, limbs
connective tissue of skin and organs
urogenital system, heart, blood cells

Endoderm
epithelial linings of gastrointestinal, liver, pancreas,
thyroid and respiratory tracts

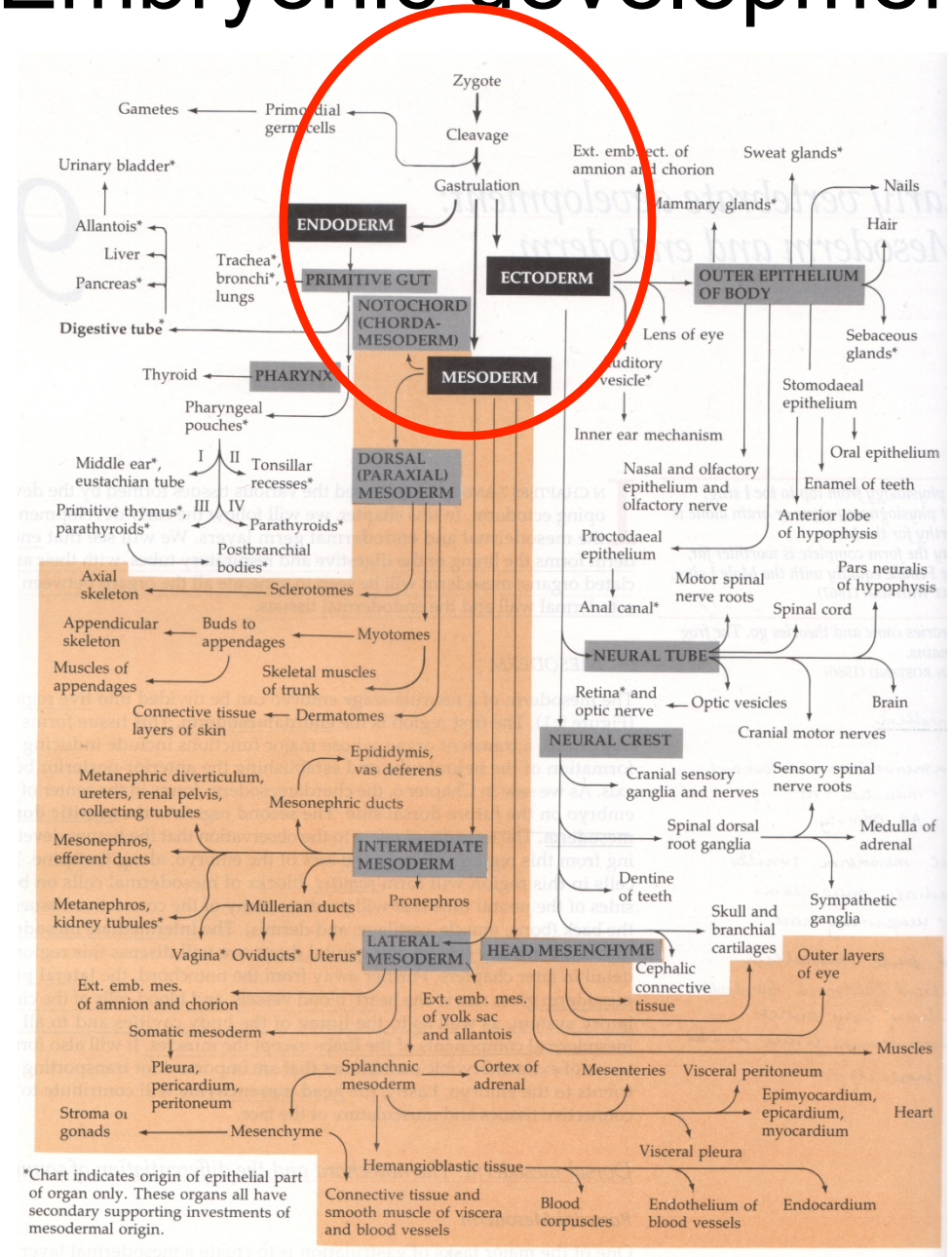
Embryonic development:



3 weeks

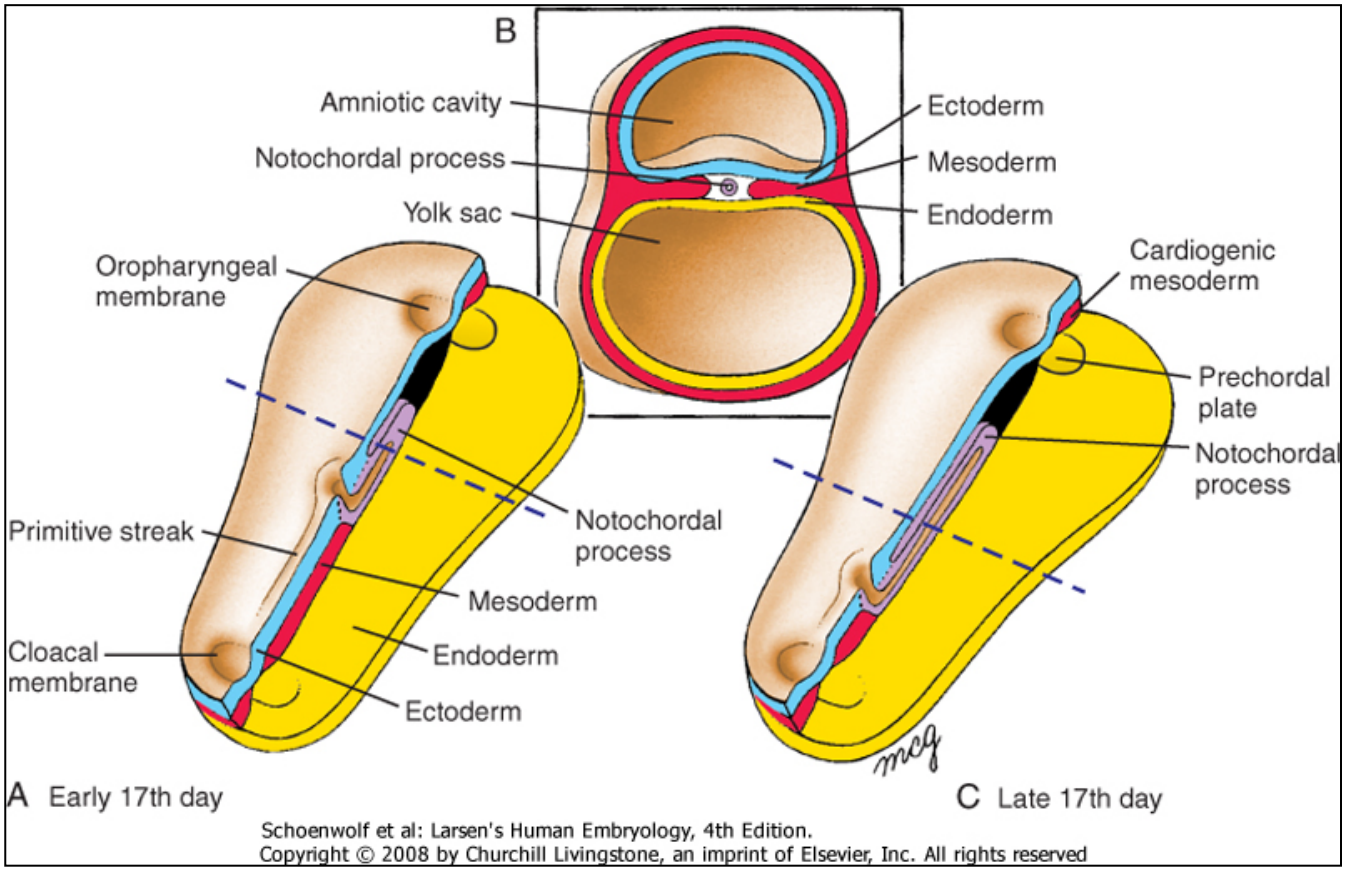
37 weeks

Embryonic development:



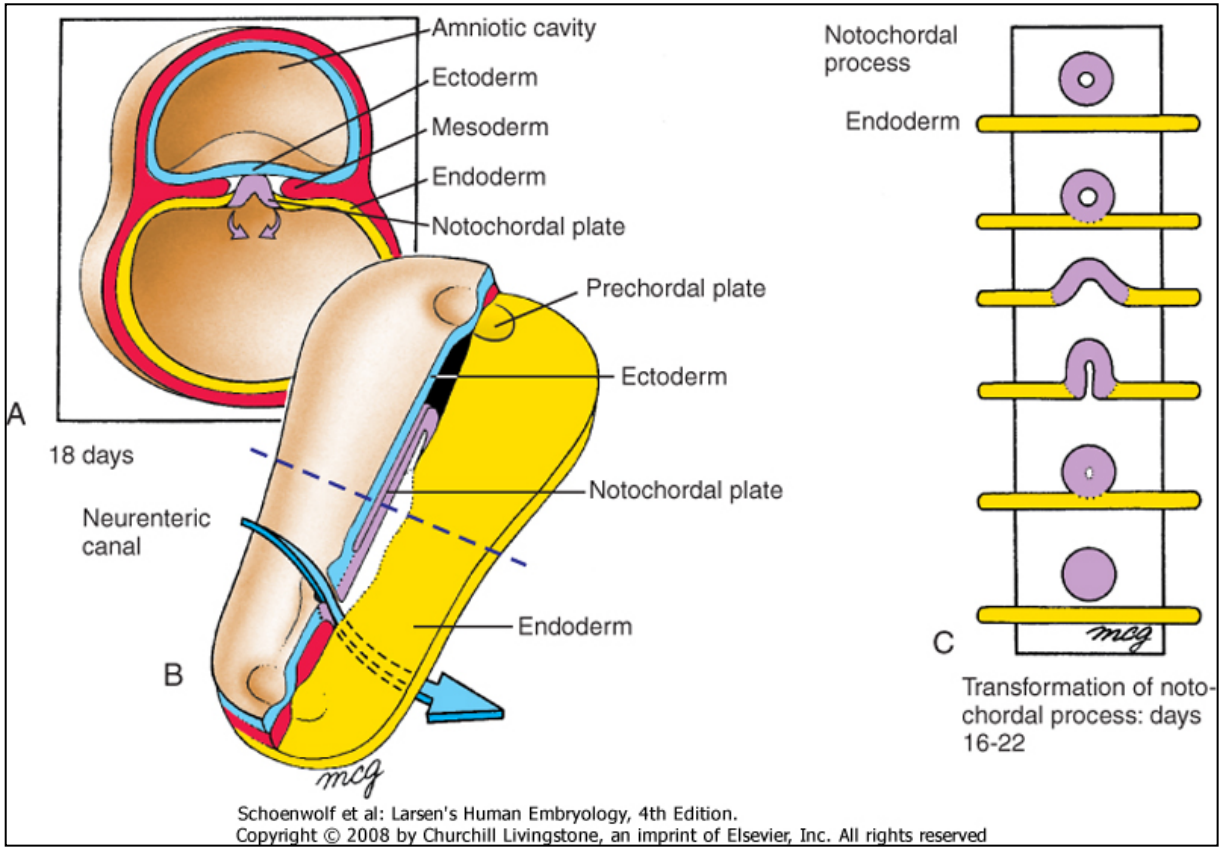
Page 342
S.F. Gilbert
Developmental Biology
5th edition

Notochord



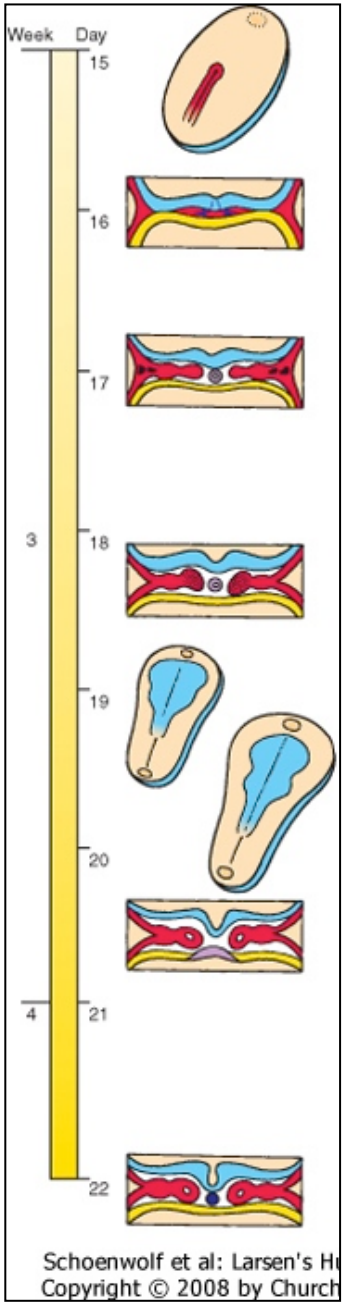
- Axial mesoderm
- Transient
- Crucial signalling centre
- Mechanical role in embryonic folding

Notochord



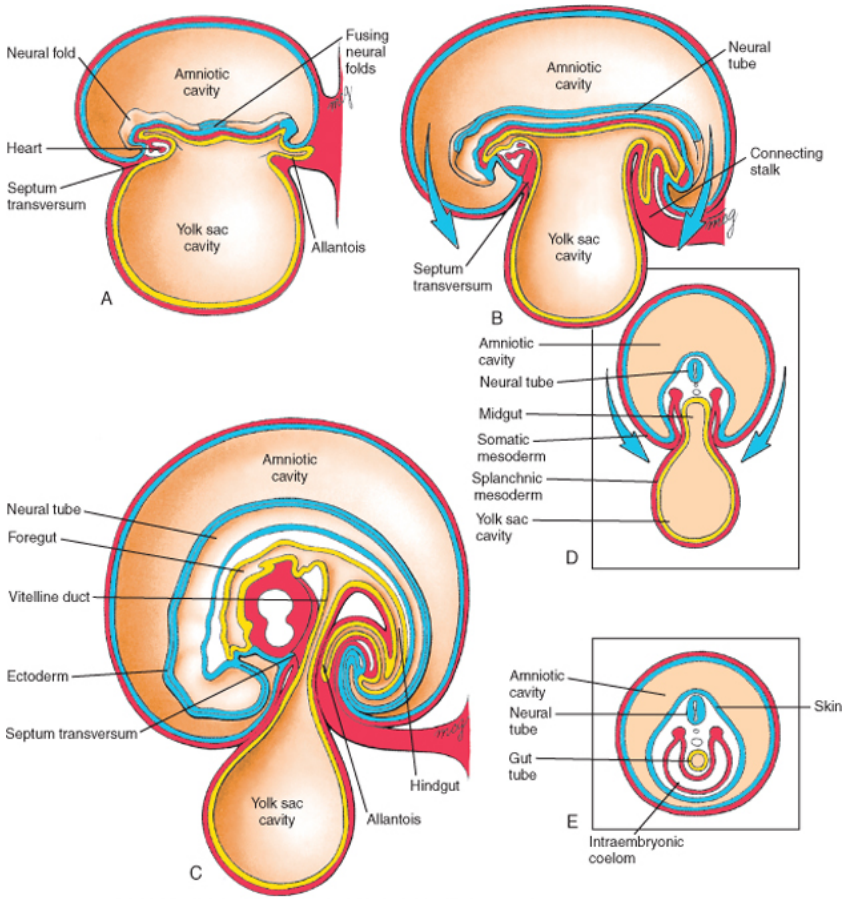
Notochordal plate

- Axial mesoderm
- Transient
- Crucial signalling centre
- Mechanical role in embryonic folding



Embryo folding

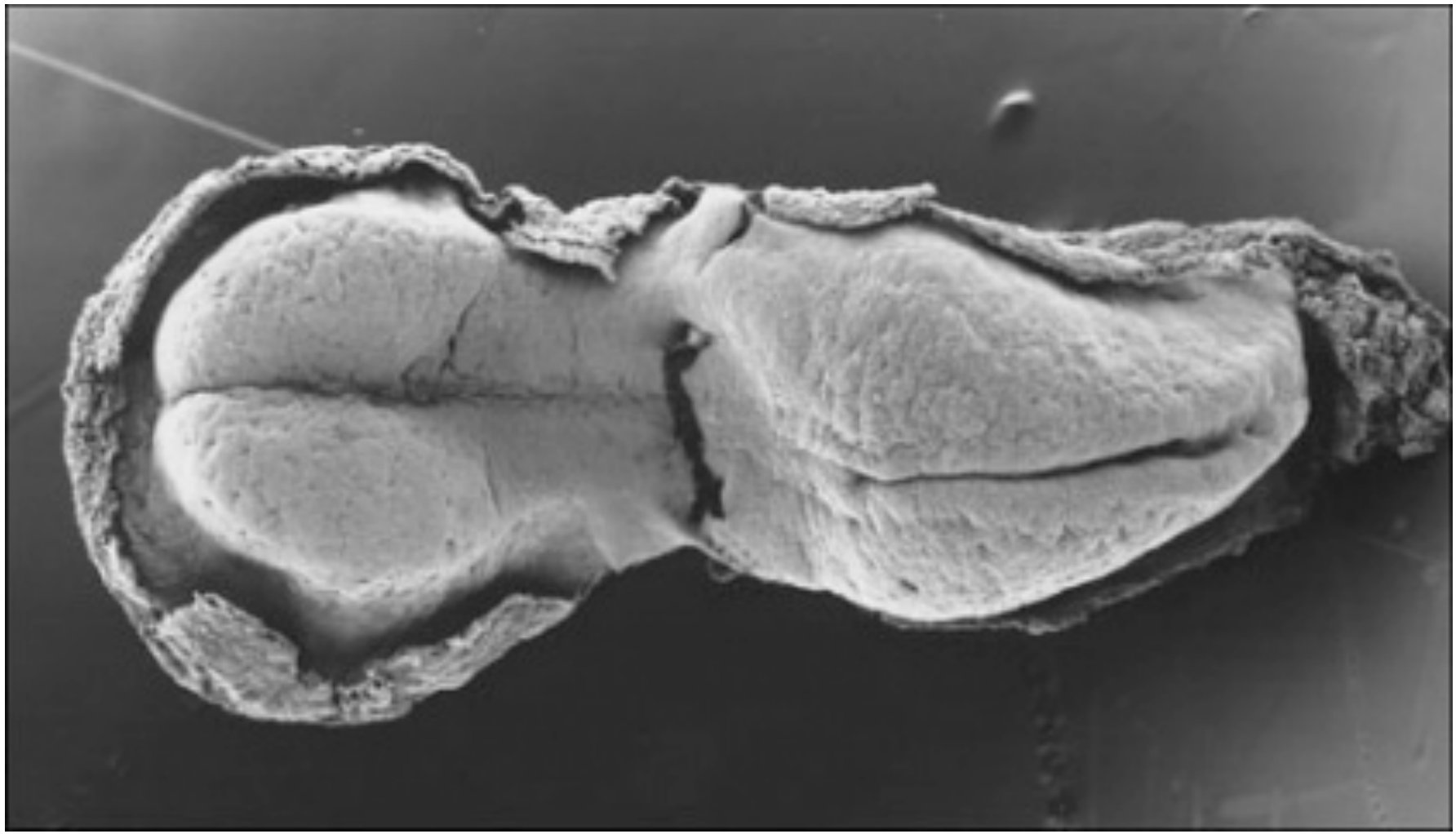
Generation of primitive gut
Neural plate and neural tube



Schoenwolf et al: Larsen's Human Embryology, 4th Edition.

http://php.med.unsw.edu.au/embryology/images/2/27/Week3_folding.mp4

≈ 3 week old embryo



≈ 4 week old embryo

Week 3 Lecture overview

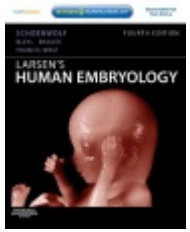
Placentation

Body axes

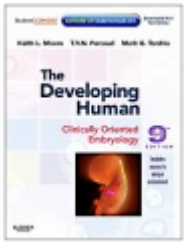
Gastrulation

Notochord formation

Embryo folding



Resources:
http://php.med.unsw.edu.au/embryology/
Larsen's Human Embryology
The Developing Human: Clinically Oriented Embryology



Dr Annemiek Beverdam – School of Medical Sciences, UNSW
Wallace Wurth Building Room 234 – A.Beverdam@unsw.edu.au