



## การเจริญของสิ่งมีชีวิต Development

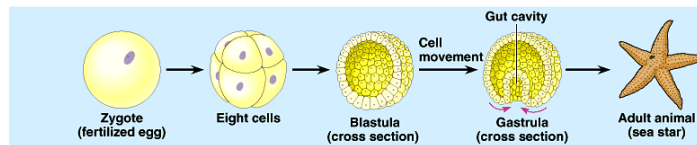
Dr. Boonsatien Boonsoong  
Department of Zoology  
Faculty of Science  
Kasetsart University



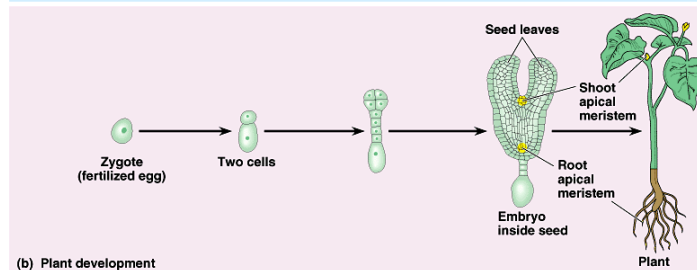
### Objectives:

1. ทราบขั้นตอนการเจริญของเอมบริโอทั้งในพืชและสัตว์อย่างสังเขป
2. สามารถอธิบายความแตกต่างในการเจริญของเอมบริโอสัตว์ชนิดต่างๆ

### Embryonic Development



(a) Animal development



(b) Plant development

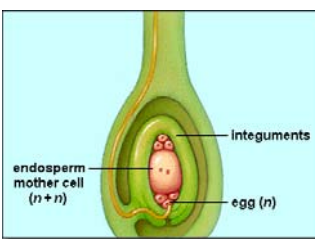
Cell division →

Morphogenesis →

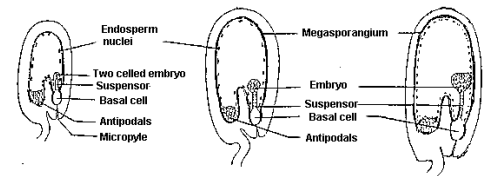
Cell differentiation →

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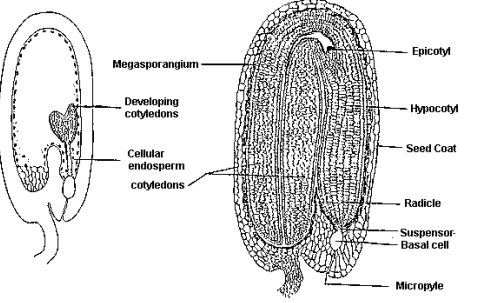
### Plant Embryonic Development



integuments  
egg (n)



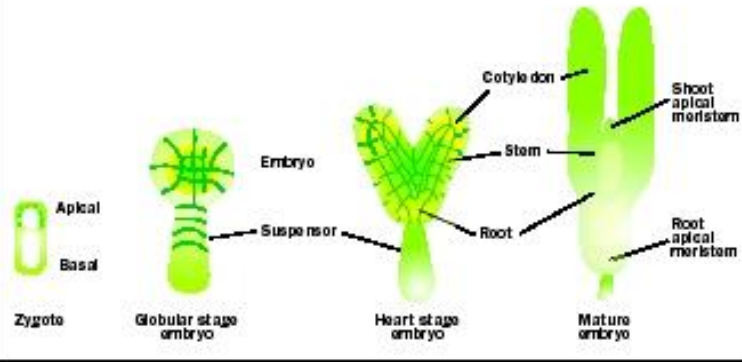
Endosperm nuclei  
Two celled embryo  
Suspensor  
Basal cell  
Antipodals  
Micropyle  
Megasporangium  
Embryo  
Suspensor  
Basal cell  
Antipodals



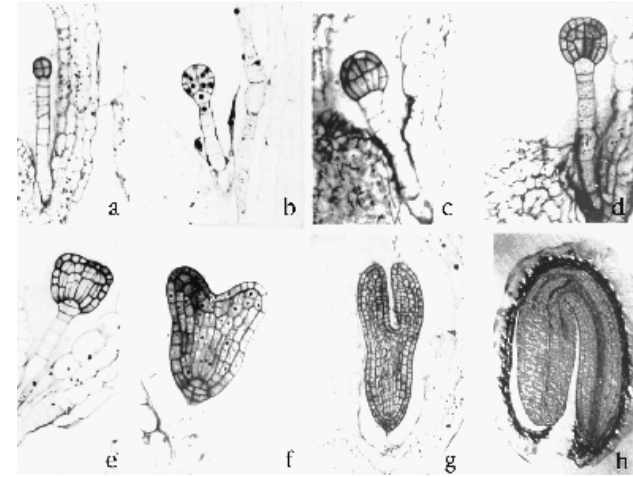
Megasporangium  
Developing cotyledons  
Cellular endosperm cotyledons  
Epicotyl  
Hypocotyl  
Seed Coat  
Radicule  
Suspensor  
Basal cell  
Micropyle

## Plant Embryonic Development

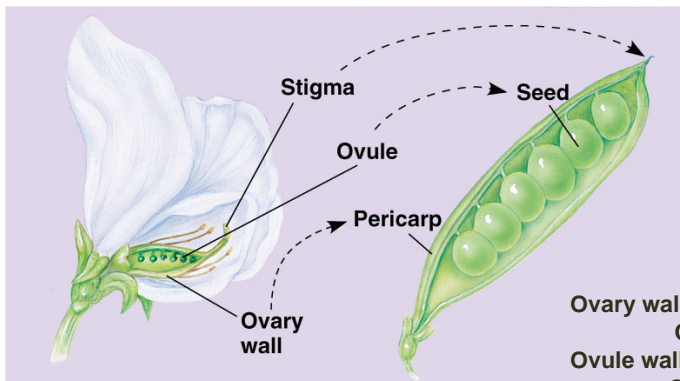
### Embryogenesis



## Plant Embryonic Development



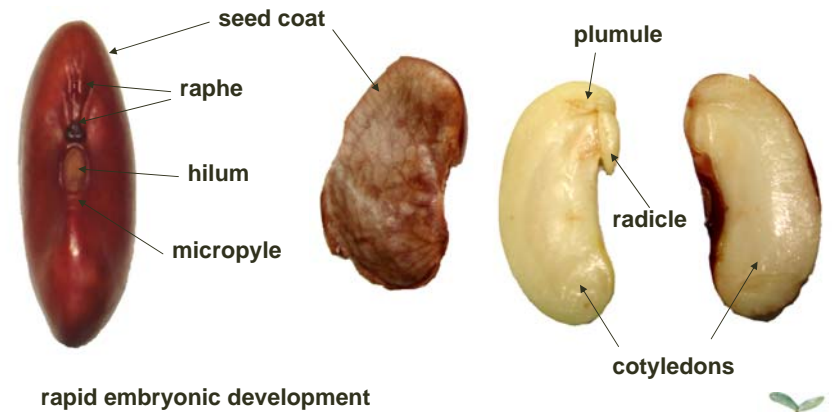
## Plant Embryonic Development



Ovary wall → fruit coat  
 Ovary → fruit  
 Ovule wall → seed coat  
 Ovule → seed

## Seed Structure and Anatomy

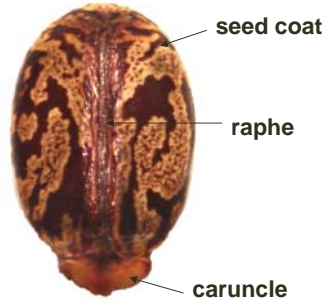
### Red kidney bean



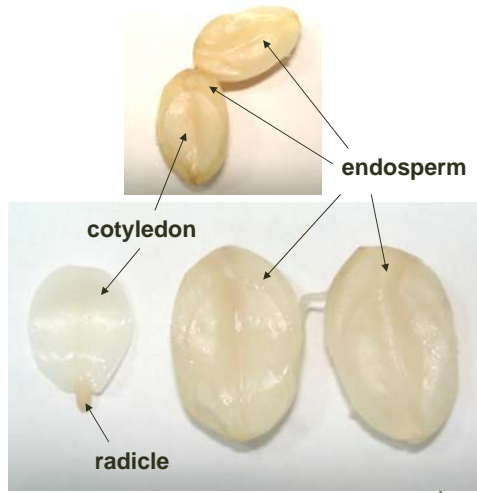
rapid embryonic development

# Seed Structure and Anatomy

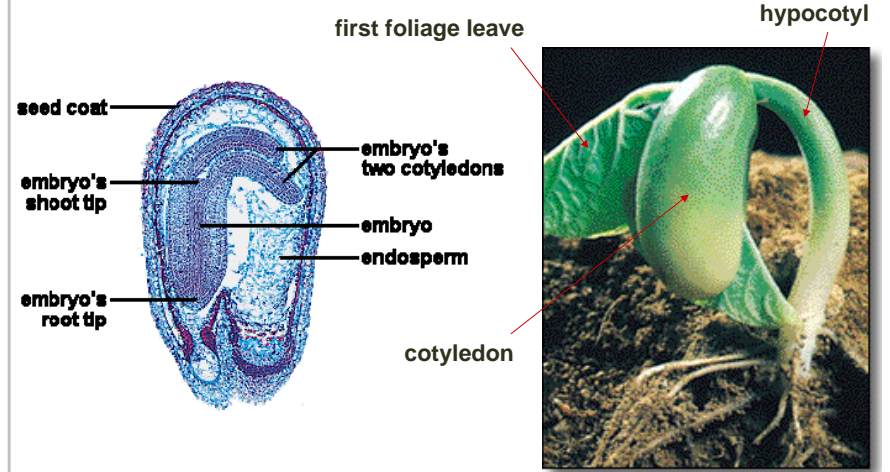
## Castor bean



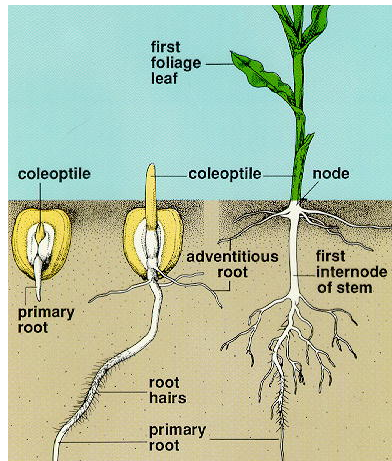
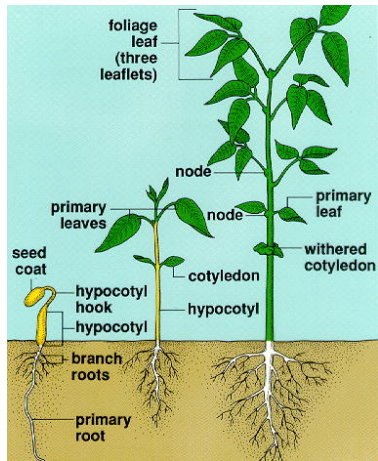
slowly embryonic development



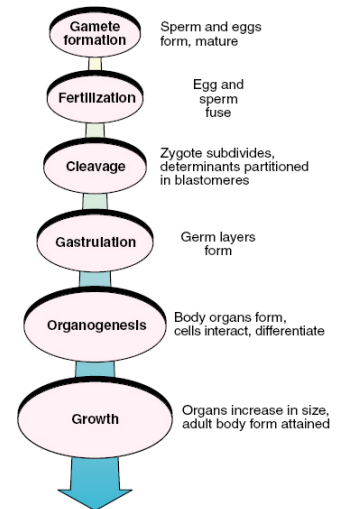
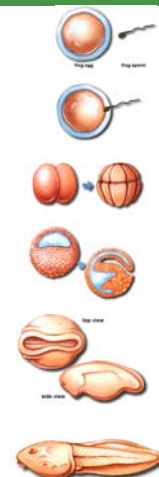
# Plant Embryonic Development



# Germination




# Development in Animal Embryo




## Egg type: amount of yolk

**Sea star: Homolecithal egg**




**Frog: Mesolecithal egg**

Animal pole  
Gray crescent  
Vegetal pole




**Chick: Polylecithal egg**



## Egg type: distribution of yolk


**Isolecithal egg**    **Sea star**




**Telolecithal egg**

**Frog: Moderately telolecithal egg**

Animal pole    Gray crescent  
Vegetal pole

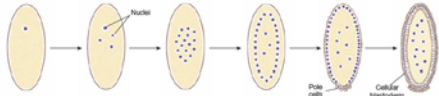


**Chick: Polytelecithal egg**



**Centrolecithal egg**    **Insect**


Nuclei  
Pole cells  
Cellular blastoderm



## Embryonic development: Cleavage


**RADIAL HOLOBLASTIC CLEAVAGE**

**Sea star**




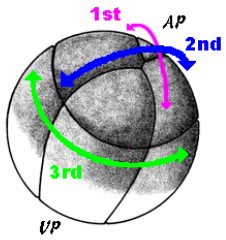
**Frog**

Animal pole    Gray crescent  
Vegetal pole

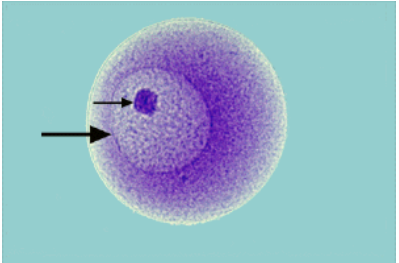
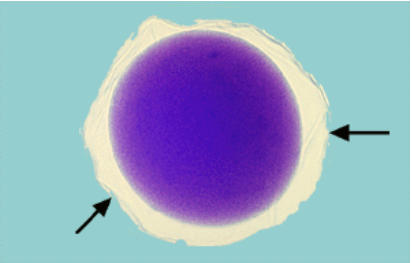


**DISCOIDAL MEROBLASTIC CLEAVAGE**

**Chick**

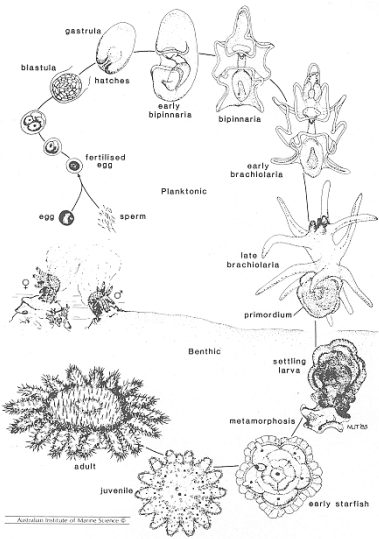
## Unfertilized egg or Fertilized egg ?

**Remark**

- Nucleus
- Vitelline membrane
- Perivitelline space – *Ascaris* sp.
- Polar body

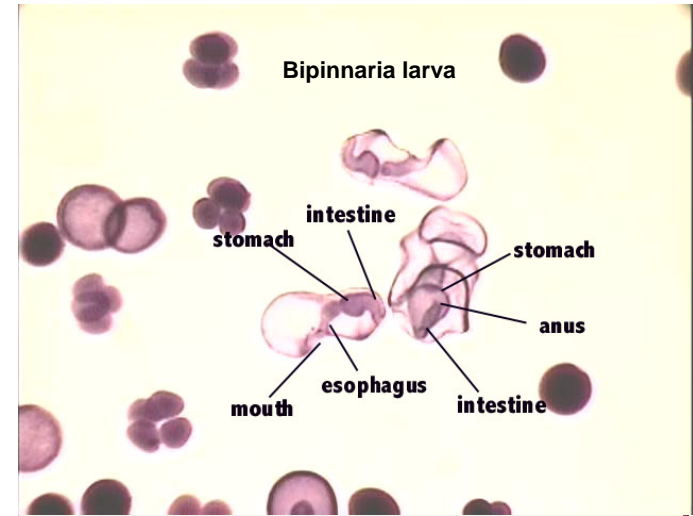
# Starfish embryonic development



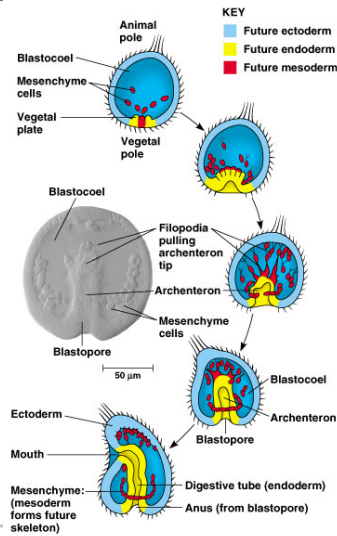
- Homolecithal egg
- Isolecithal egg



# Starfish embryonic development

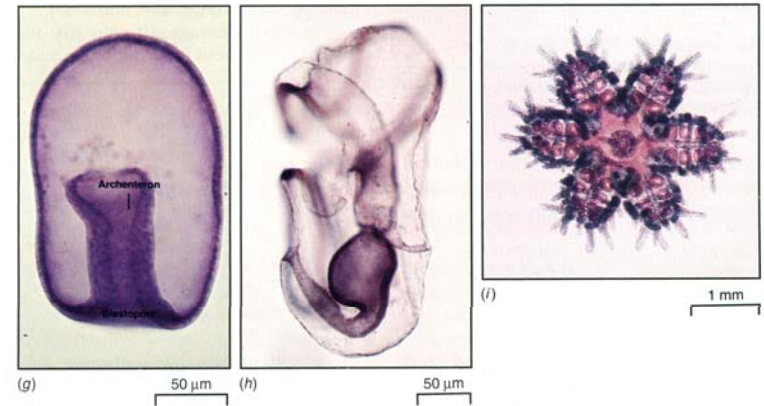


# Starfish Embryonic: Gastrulation

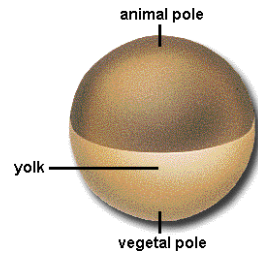
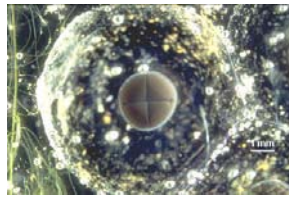
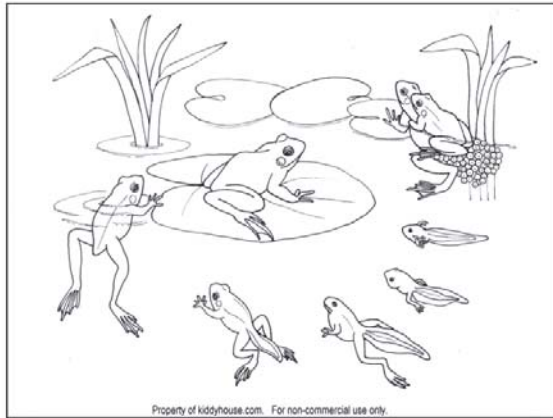


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# Starfish embryonic development

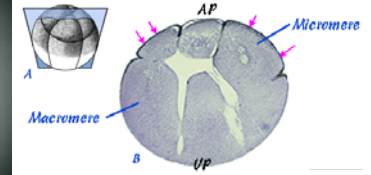
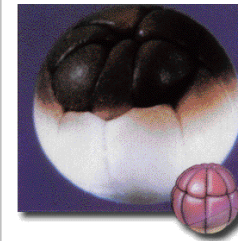
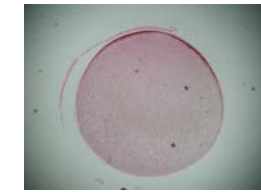


## Embryonic development in Frog



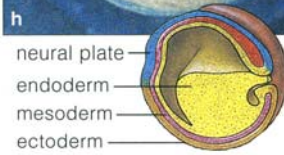
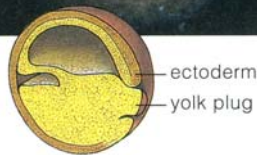
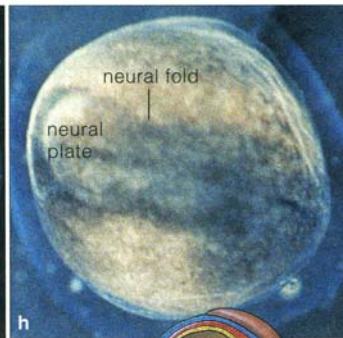
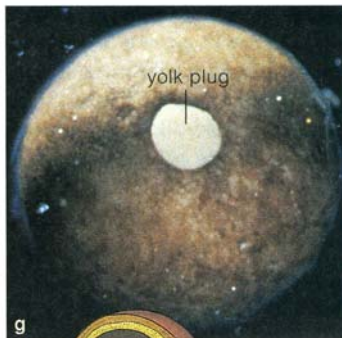
- Mesolecithal egg
- Moderately telolecithal egg

## Embryonic development: Cleavage

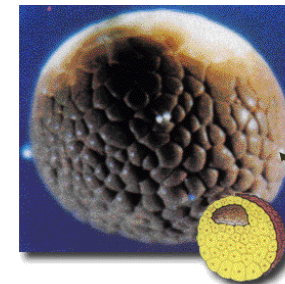
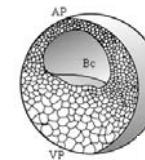


Morula – 32 cell stage

## Embryonic development in Frog



## Embryonic development: Blastulation



Blastula

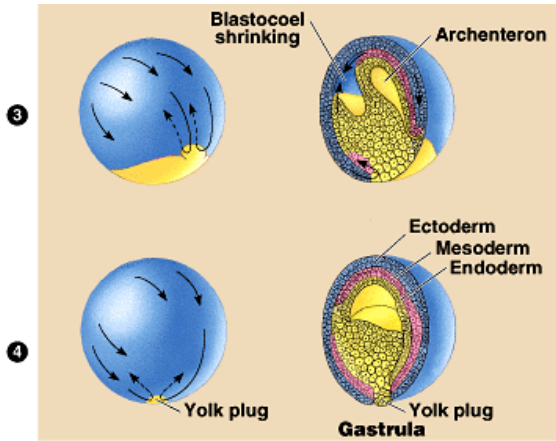
blastocoel

- blastoderm  
- blastomere

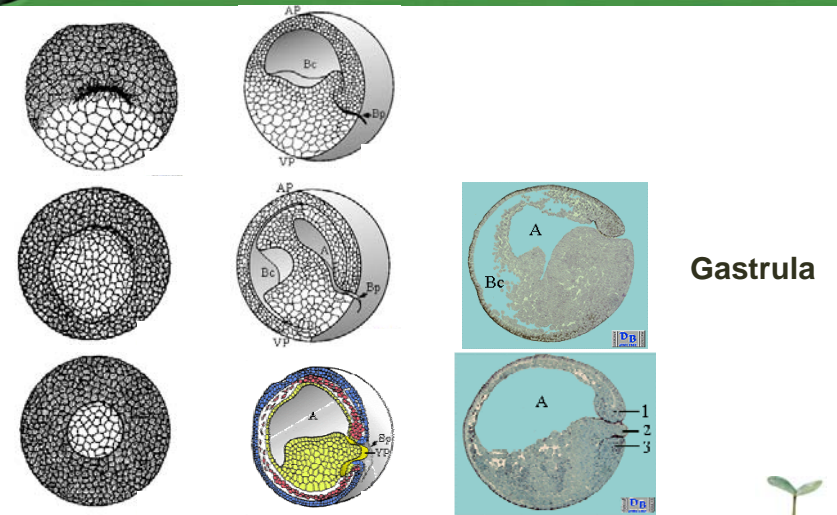
## Embryonic development in Frog

**KEY**  
 ■ Future ectoderm  
 ■ Future endoderm  
 ■ Future mesoderm

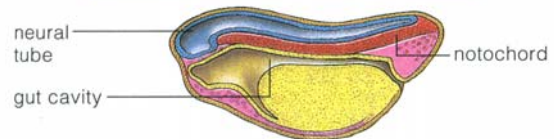
“Epiboly”



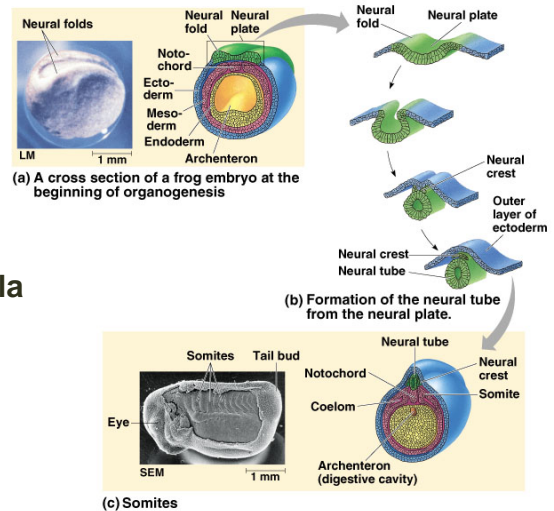
## Embryonic development: Gastrulation



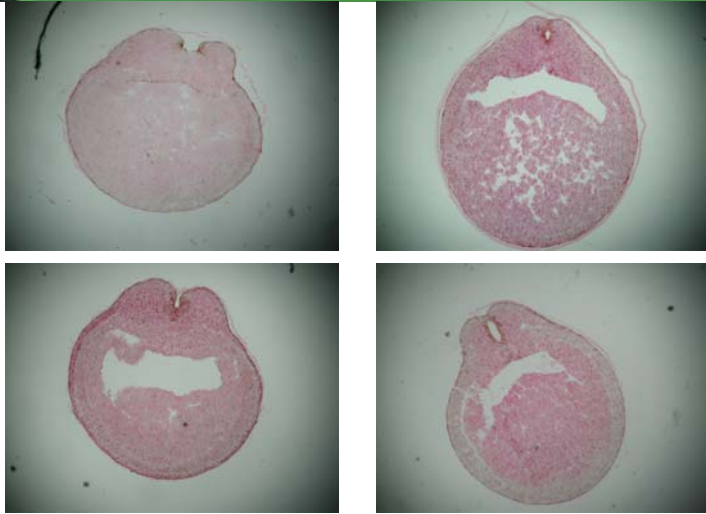
## Embryonic development: Organogenesis



## Embryonic development: Organogenesis



## Embryonic development: Neurulation



## Differentiation of germ layers

