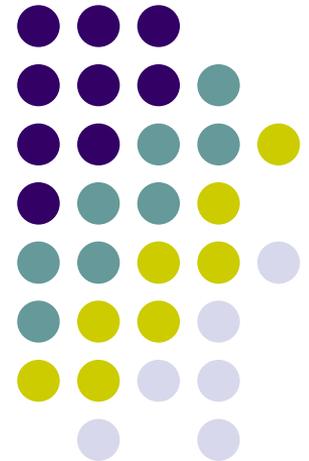


# Kingdom Animalia

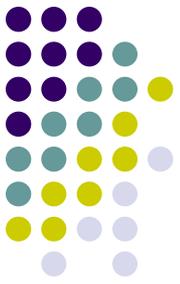
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You will need:

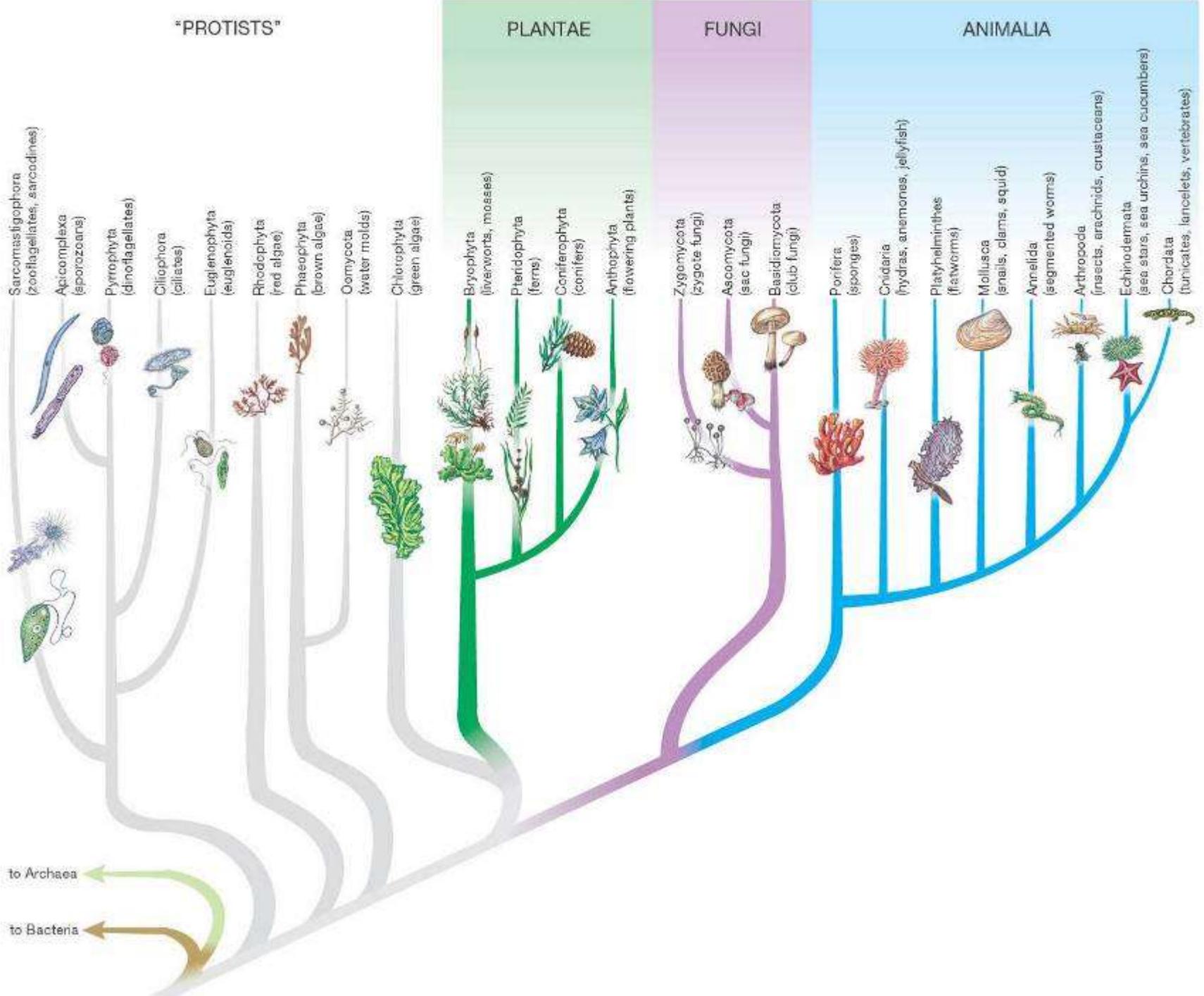
- three colours of pencil crayon or pen (preferably green, blue, red)

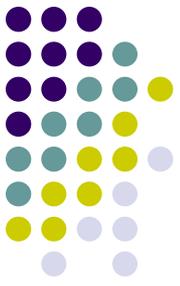


# Characteristics of animals



- eukaryotes
- aerobic chemoheterotrophs
- multicellular





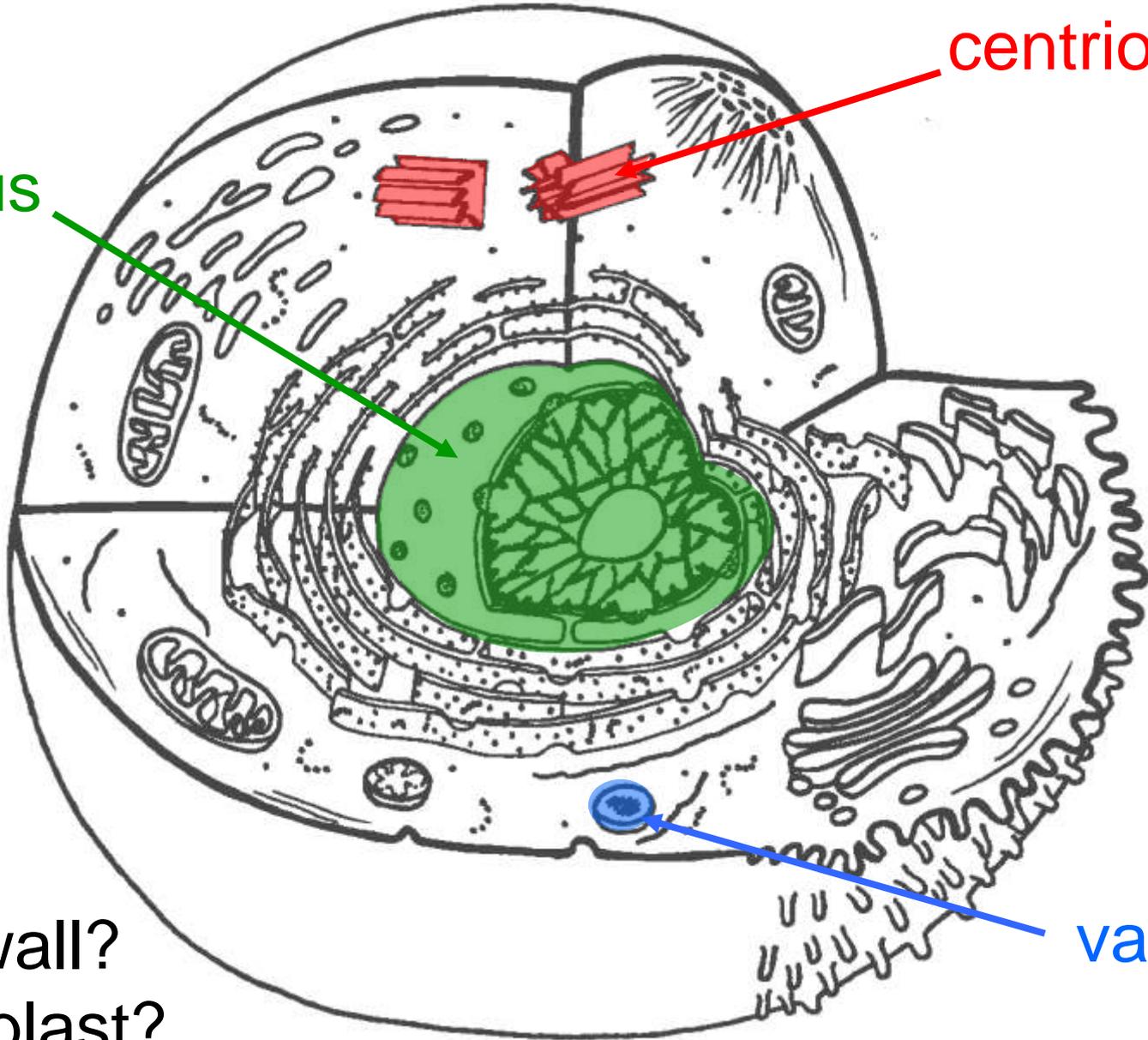
# Animal cell anatomy

Animal cells differ from those of plants in several respects:

- have centrioles
- small vacuoles
- no cell walls or chloroplasts

nucleus

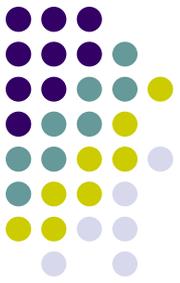
centriole



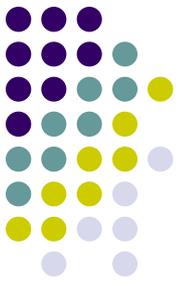
cell wall?  
chloroplast?

vacuole

# Major trends in animal evolution



1. body symmetry
2. development of tissues and embryonic germ layers
3. development of a body cavity
4. development of complex organ systems for digestion, excretion, sense, locomotion, etc.

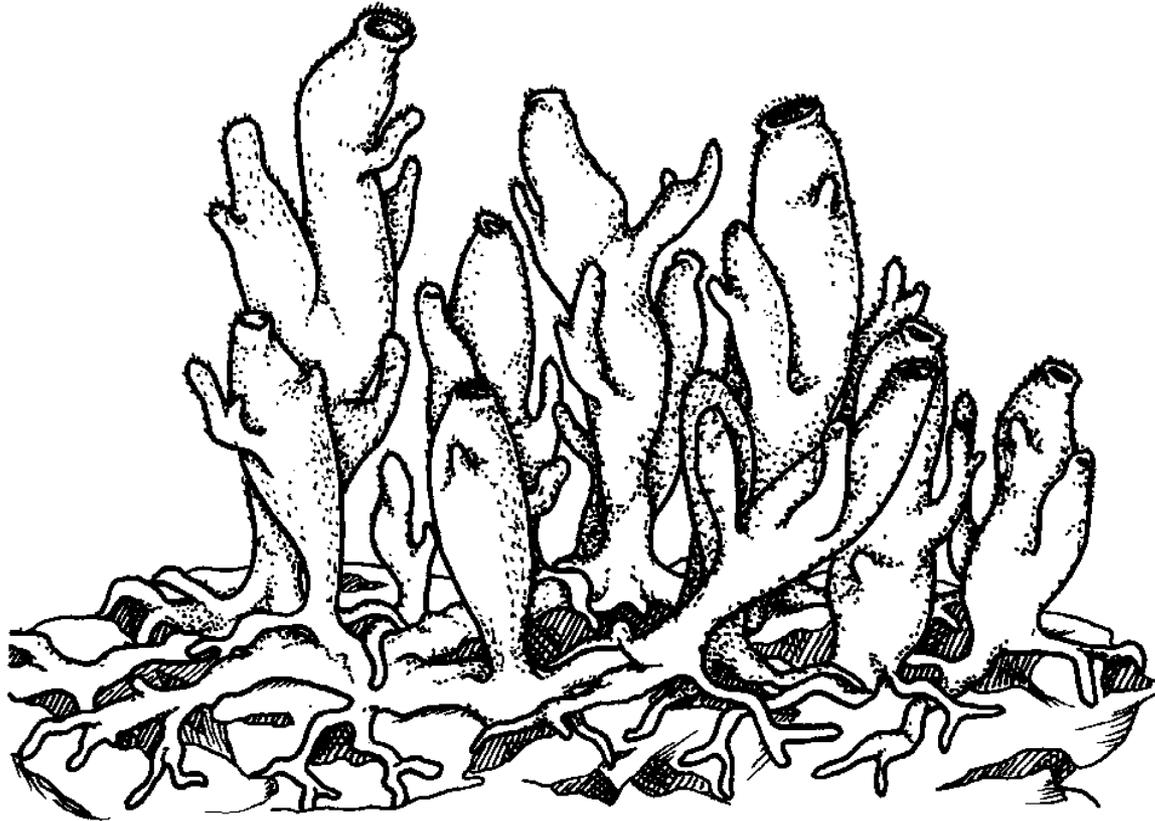
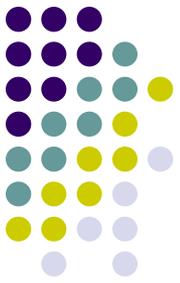


# 1. Body symmetry

There are three symmetries found in animals:

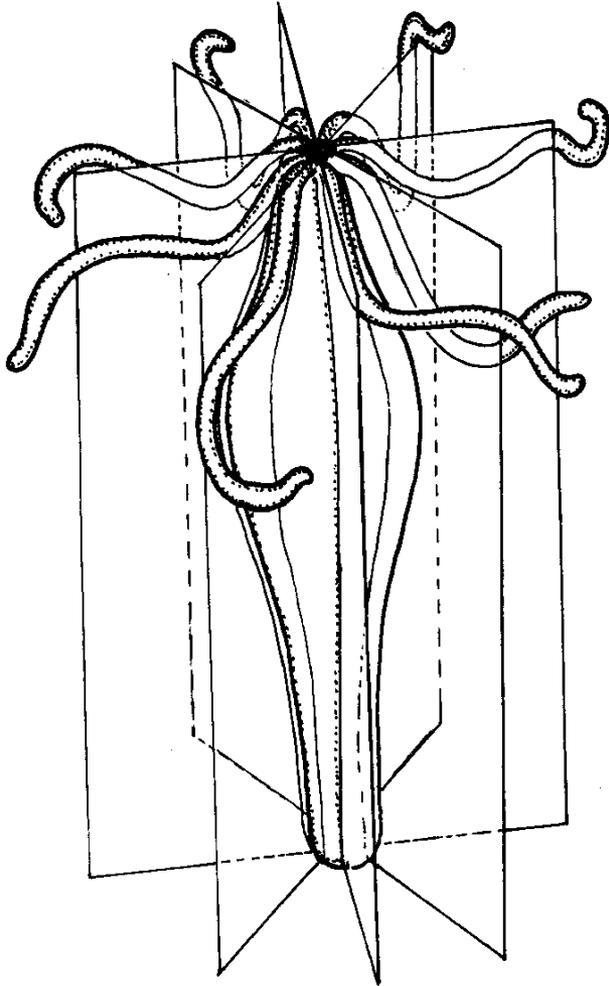
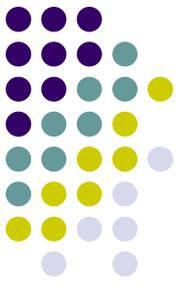
1. asymmetry – no symmetry at all
2. radial symmetry – the body is symmetrical along any vertical plane
3. bilateral symmetry – the body is symmetrical along a single vertical plane

# Asymmetry = no symmetry

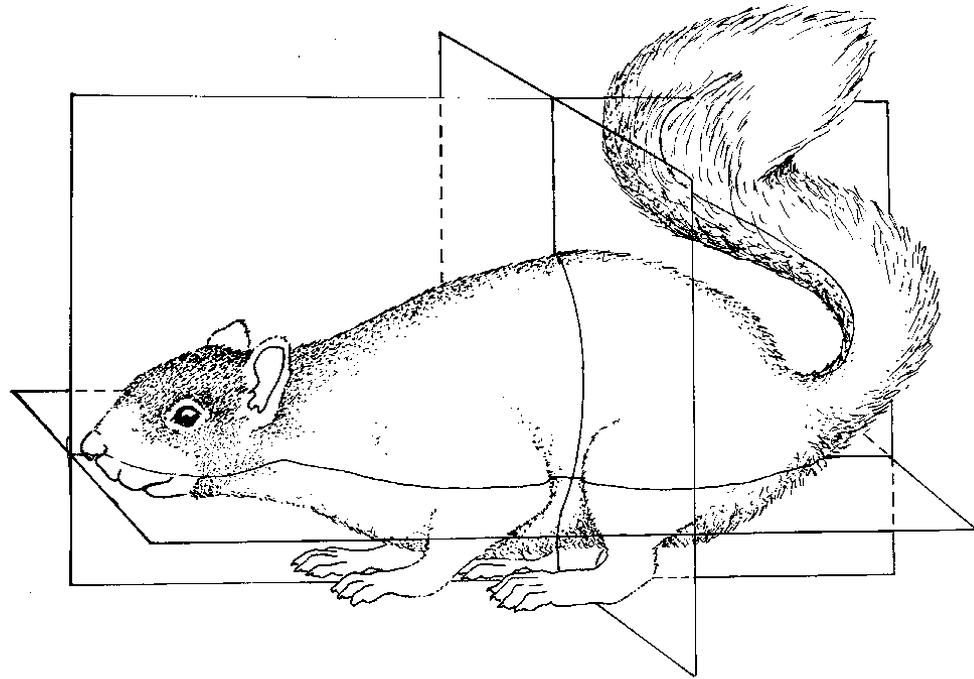


A sponge showing asymmetry

# Bilateral vs. radial symmetry

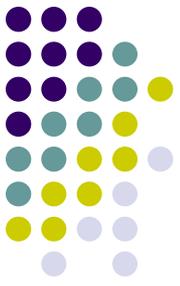


radial symmetry



bilateral symmetry

# Evolution of body symmetry



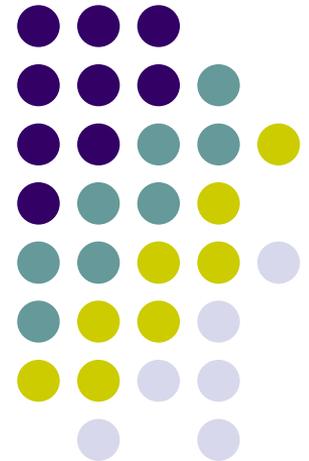
- only primitive animals are asymmetrical
  - radial symmetry is an advantage to animals that do not move (sessile), because they can encounter food from any direction
  - bilateral symmetry evolved in organisms which move, because they encounter food with the front end first, becoming cephalised
- cephalisation = the concentration of nerves and sense organs at one end of the body

# Kingdom Animalia (cont.)

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You will need:

- three colours of pencil crayon or pen (preferably blue, red, yellow)

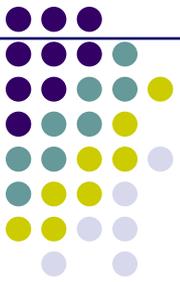




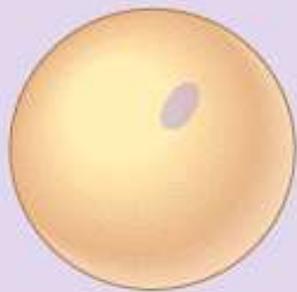
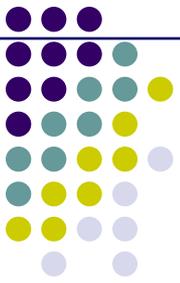
## 2. Embryonic germ layers

- special layers of tissue form early in the development of animal embryos
- these layers are called “germ layers” because they are the source of adult tissues
- two germ layers, ectoderm and endoderm, are found in all animals with tissues
- a third germ layer, mesoderm, evolved later

# Embryonic development of animals

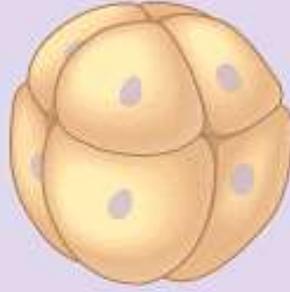


# Embryonic development of animals



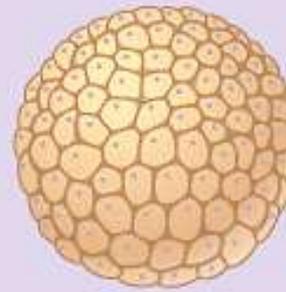
Zygote

Cleavage

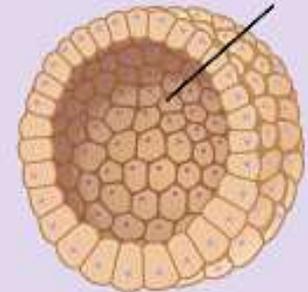


Eight-cell stage

Cleavage



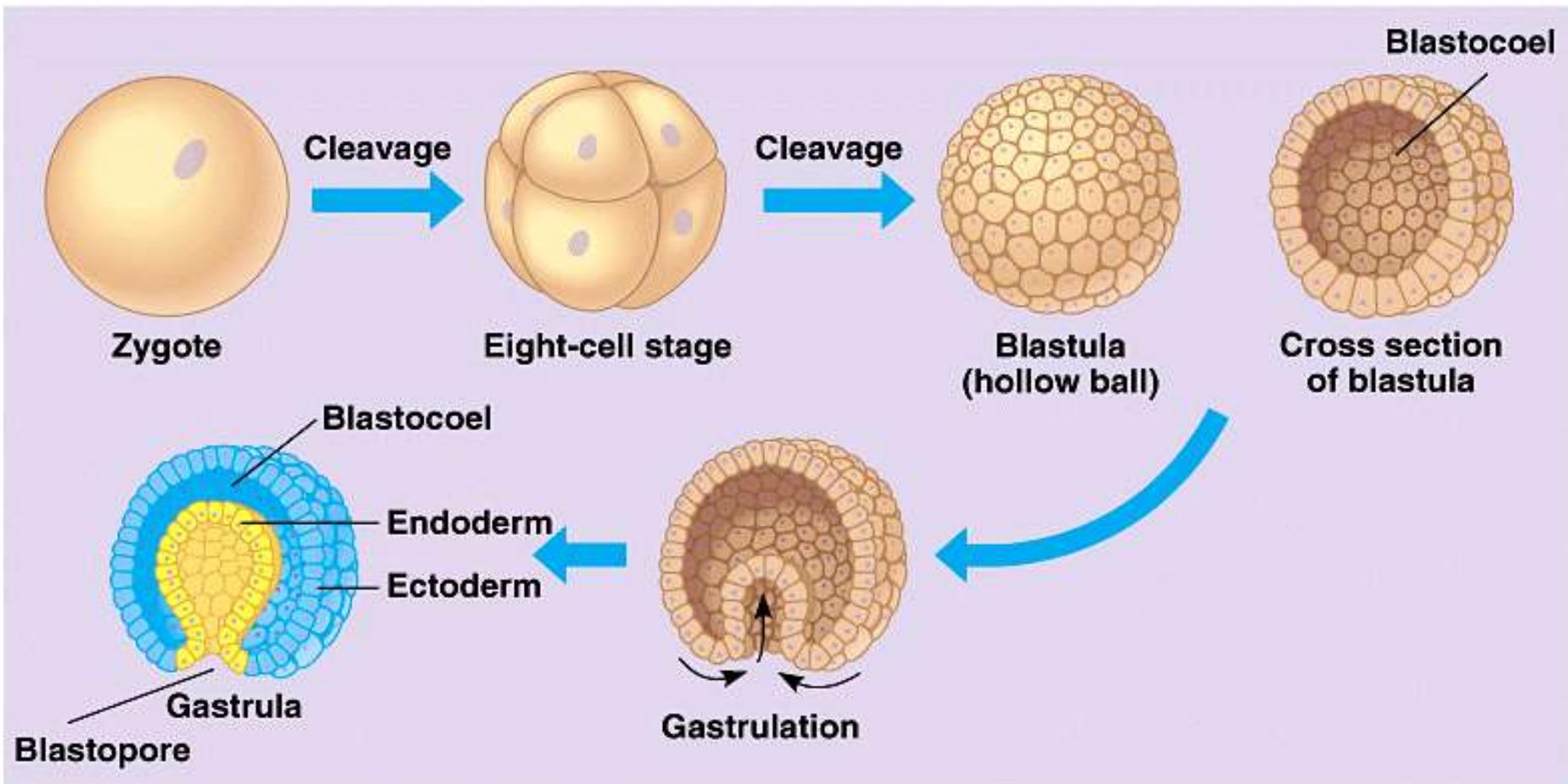
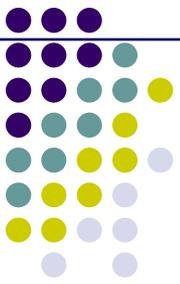
Blastula  
(hollow ball)

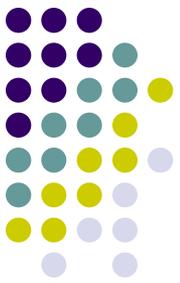


Blastocoel

Cross section  
of blastula

# Embryonic development of animals





# Embryonic germ layers

Each layer forms different adult tissues:

1. ectoderm = outer germ layer, forms skin and nervous system
2. mesoderm = middle germ layer, forms skeleton, muscles, other organs
3. endoderm = inner germ layer, forms digestive organs

# Embryonic germ layers



**Loading**



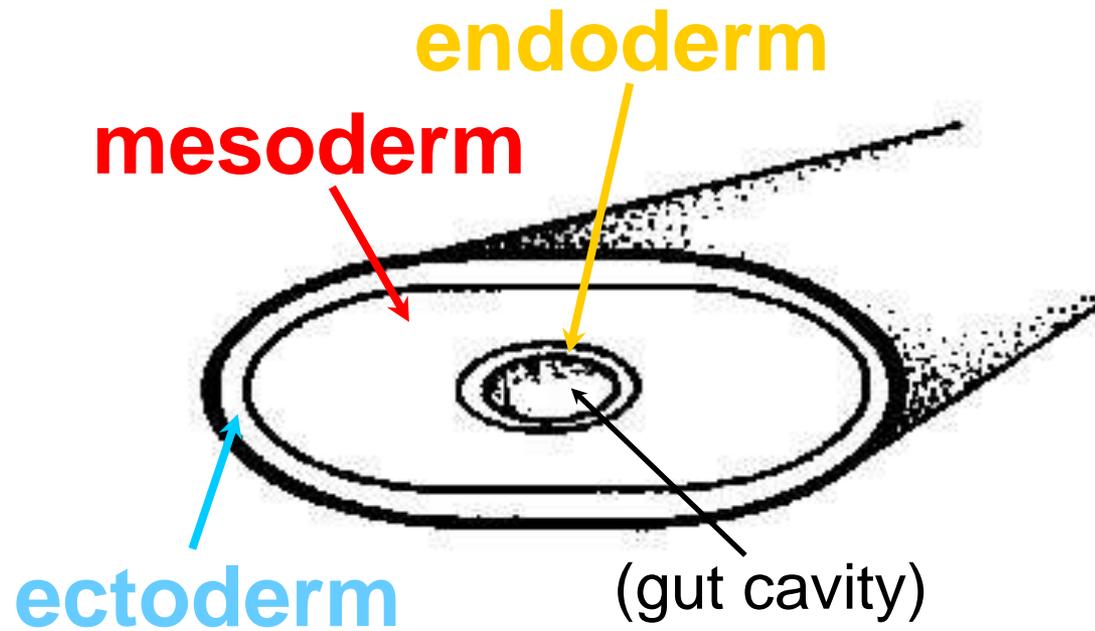


### 3. Body cavities

- animals often possess a cavity within the body, called the coelom
- three types of body cavities are defined by the shape of the germ layers:
  1. acoelom = no body cavity
  2. pseudocoelom = body cavity lined by mesoderm on the outside *only*
  3. coelom = true body cavity completely lined by mesoderm



acoelom:  
flatworm



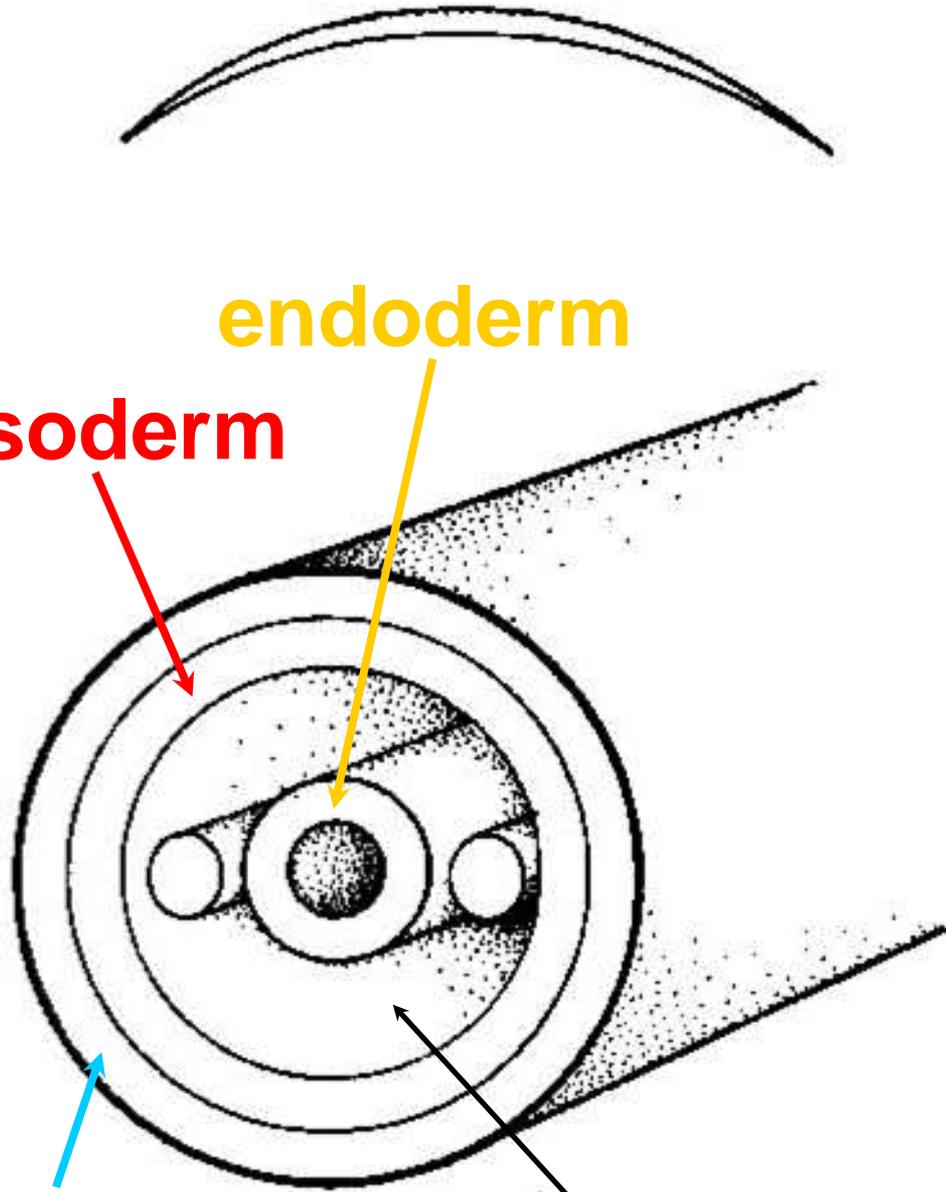
pseudocoelom:  
roundworm

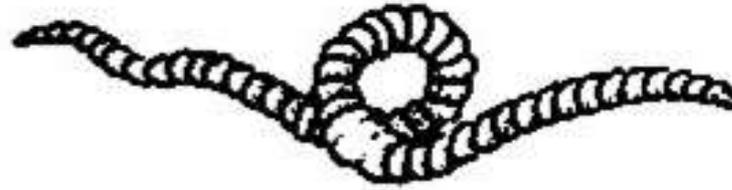
**mesoderm**

**endoderm**

**ectoderm**

**pseudocoelom**



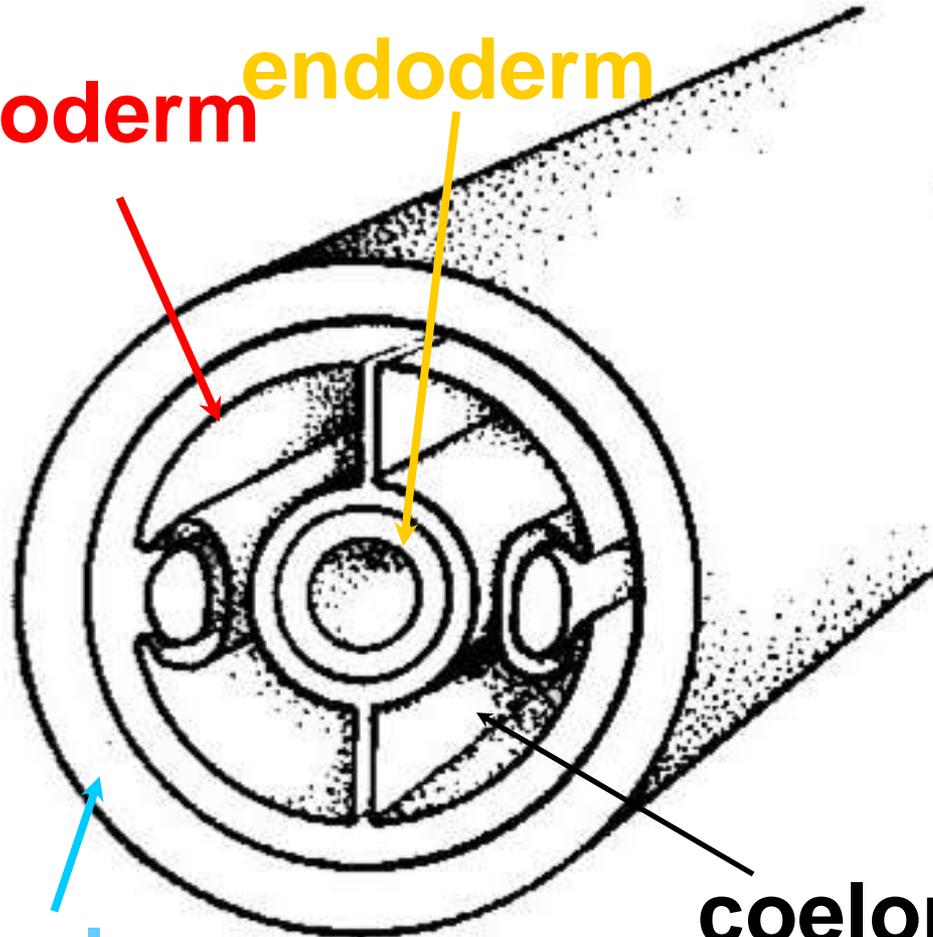


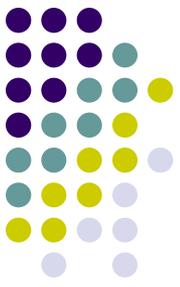
coelom:  
segmented worm

**mesoderm** **endoderm**

**ectoderm**

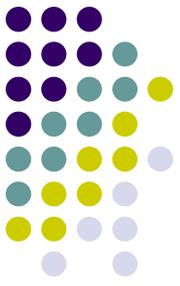
**coelom**





## 4. Organ Systems

- in animals we see these systems evolve:
  1. digestive – organs which break down food into useful organic chemicals
  2. excretory – removing waste that accumulates in tissues
  3. circulatory – tissues that move throughout the body delivering nutrients
  4. nervous – collects sensory information and coordinates the animal's responses



# Animal phyla we will study:

- **Porifera** - sponges
- **Cnidaria** - jellyfish, hydras, anemones
- **Platyhelminthes** - flatworms
- **Nematoda** - roundworms
- **Annelida** - segmented worms and leeches
- **Arthropoda** - insects, crustaceans, arachnids
- **Mollusca** - clams, snails, octopodes, squid
- **Echinodermata** - starfish, brittlestars, sand dollars
- **Chordata** - vertebrates - fish, amphibians, reptiles, birds, mammals