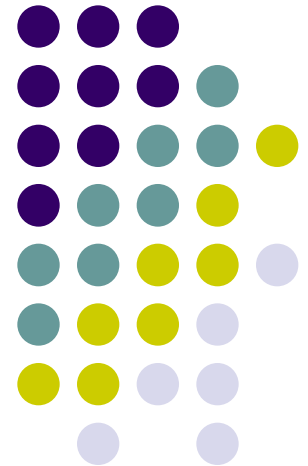


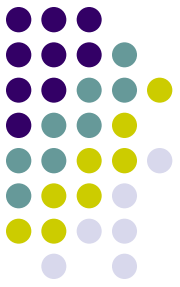
Kingdom Animalia

You will need:

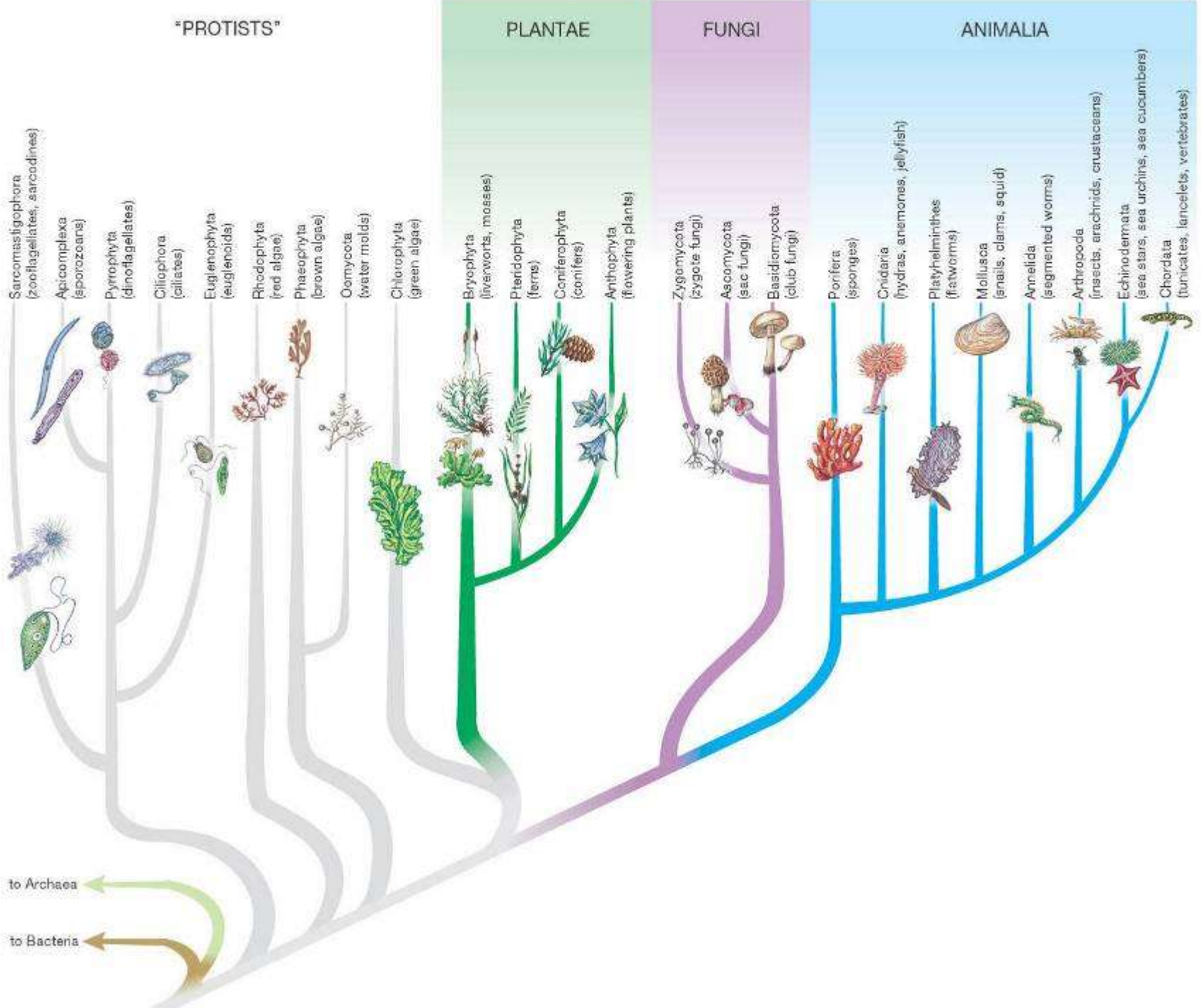
- three colours of pencil crayon or pen (preferably green, blue, red)



Characteristics of animals



- eukaryotes
- aerobic chemoheterotrophs
- multicellular

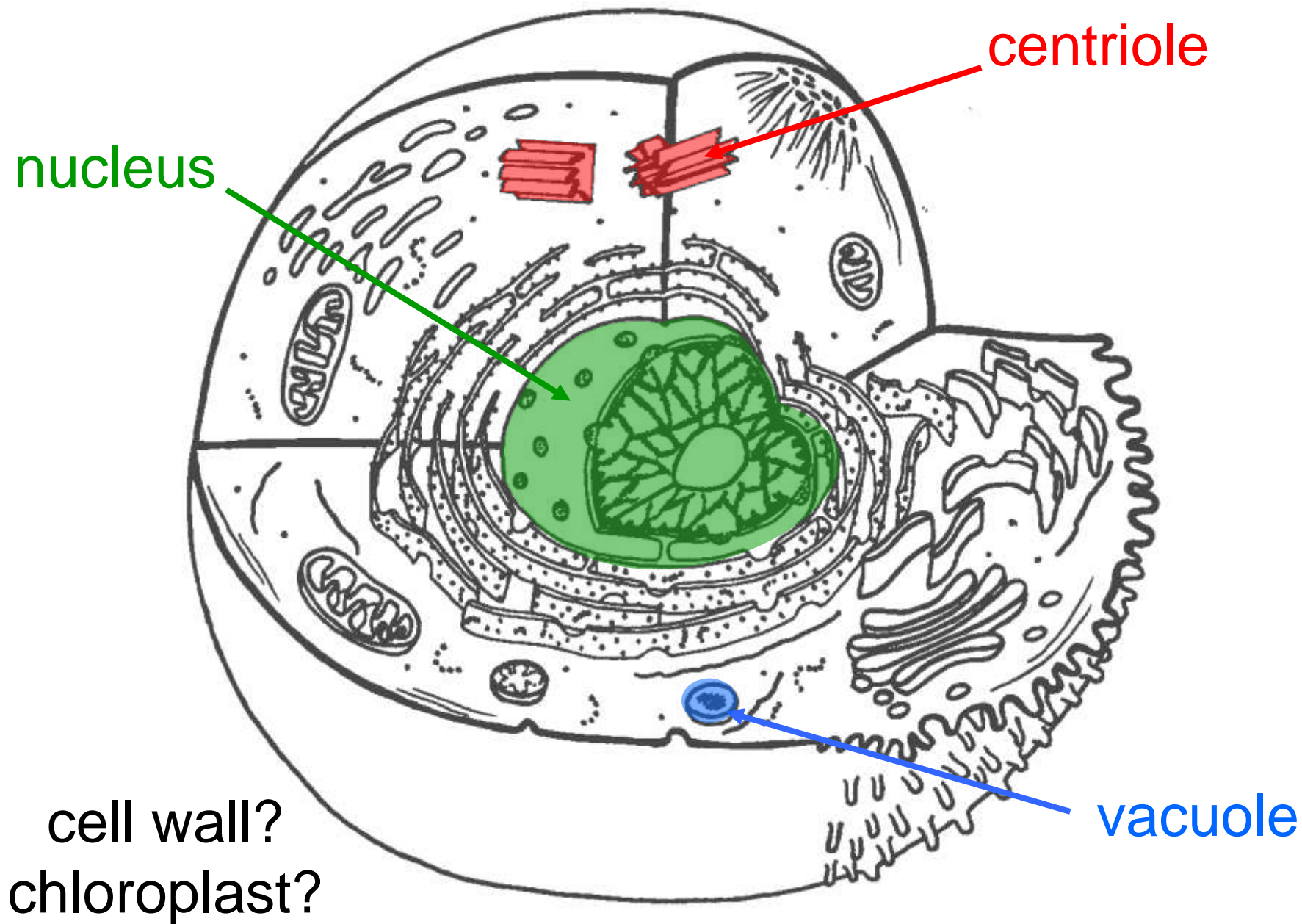




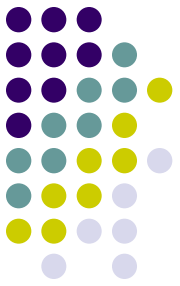
Animal cell anatomy

Animal cells differ from those of plants in several respects:

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



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.

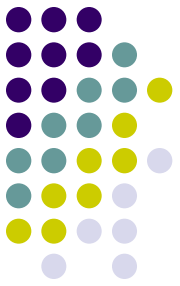


1. Body symmetry

There are three symmetries found in animals:

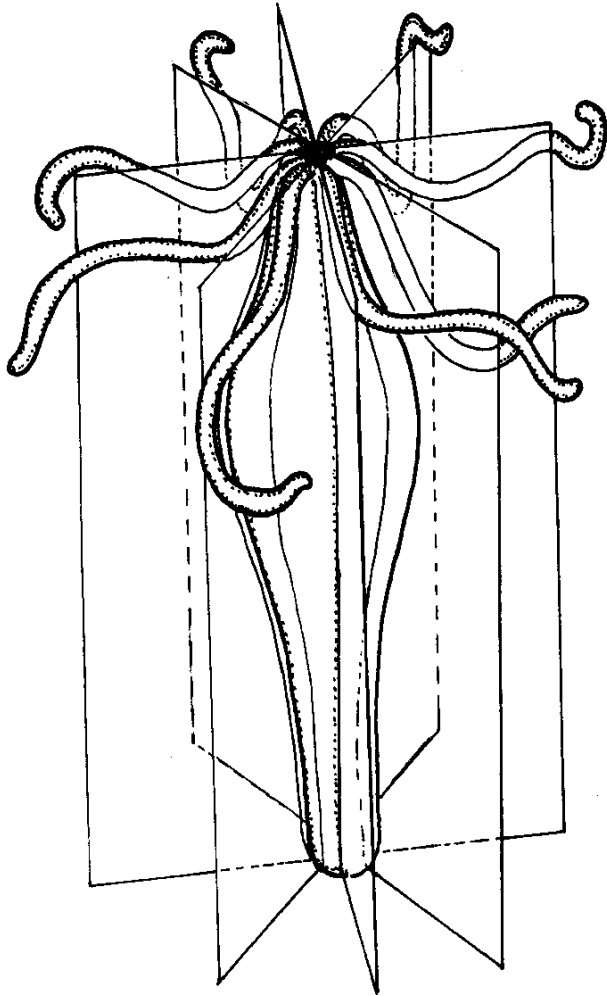
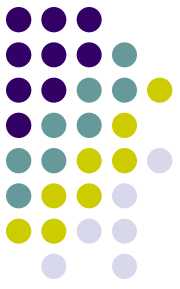
1. asymmetry – no symmetry at all
2. radial symmetry – the body is symmetrical along any vertical plane
3. bilateral symmetry – the body is symmetrical along a single vertical plane

Asymmetry = no symmetry

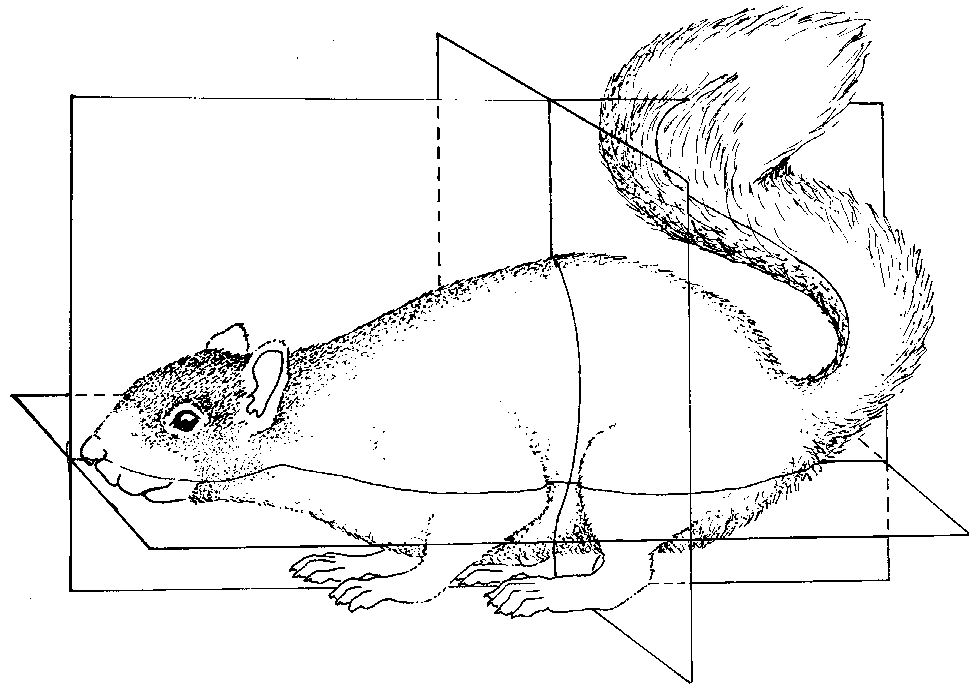


A sponge showing asymmetry

Bilateral vs. radial symmetry

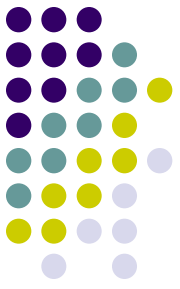


radial symmetry



bilateral symmetry

Evolution of body symmetry

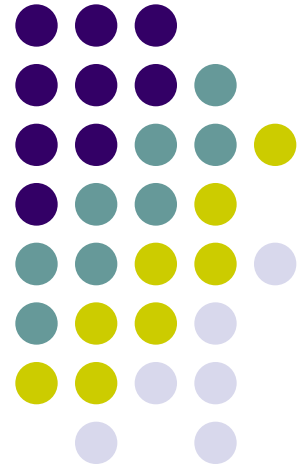


- only primitive animals are asymmetrical
 - radial symmetry is an advantage to animals that do not move (sessile), because they can encounter food from any direction
 - bilateral symmetry evolved in organisms which move, because they encounter food with the front end first, becoming cephalised
- cephalisation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

Kingdom Animalia (cont.)

You will need:

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

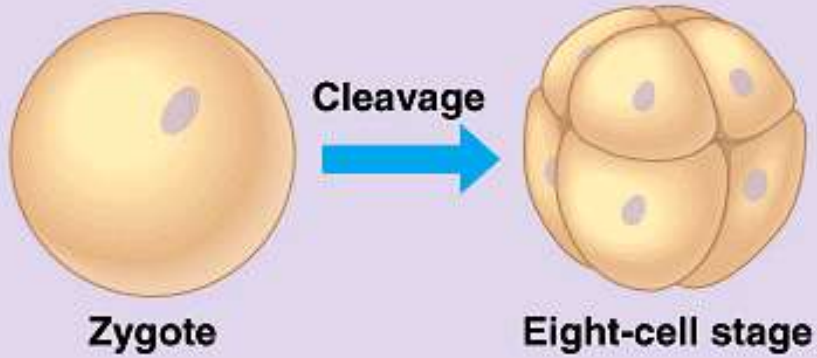
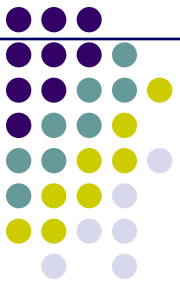




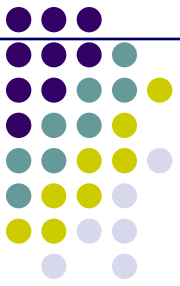
2. Embryonic germ layers

- 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



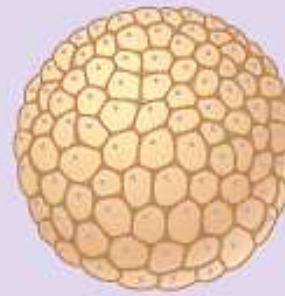
Zygote

Cleavage

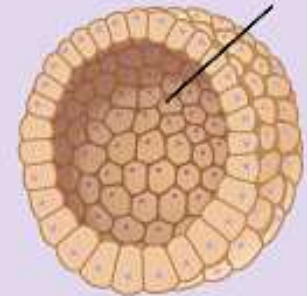


Eight-cell stage

Cleavage



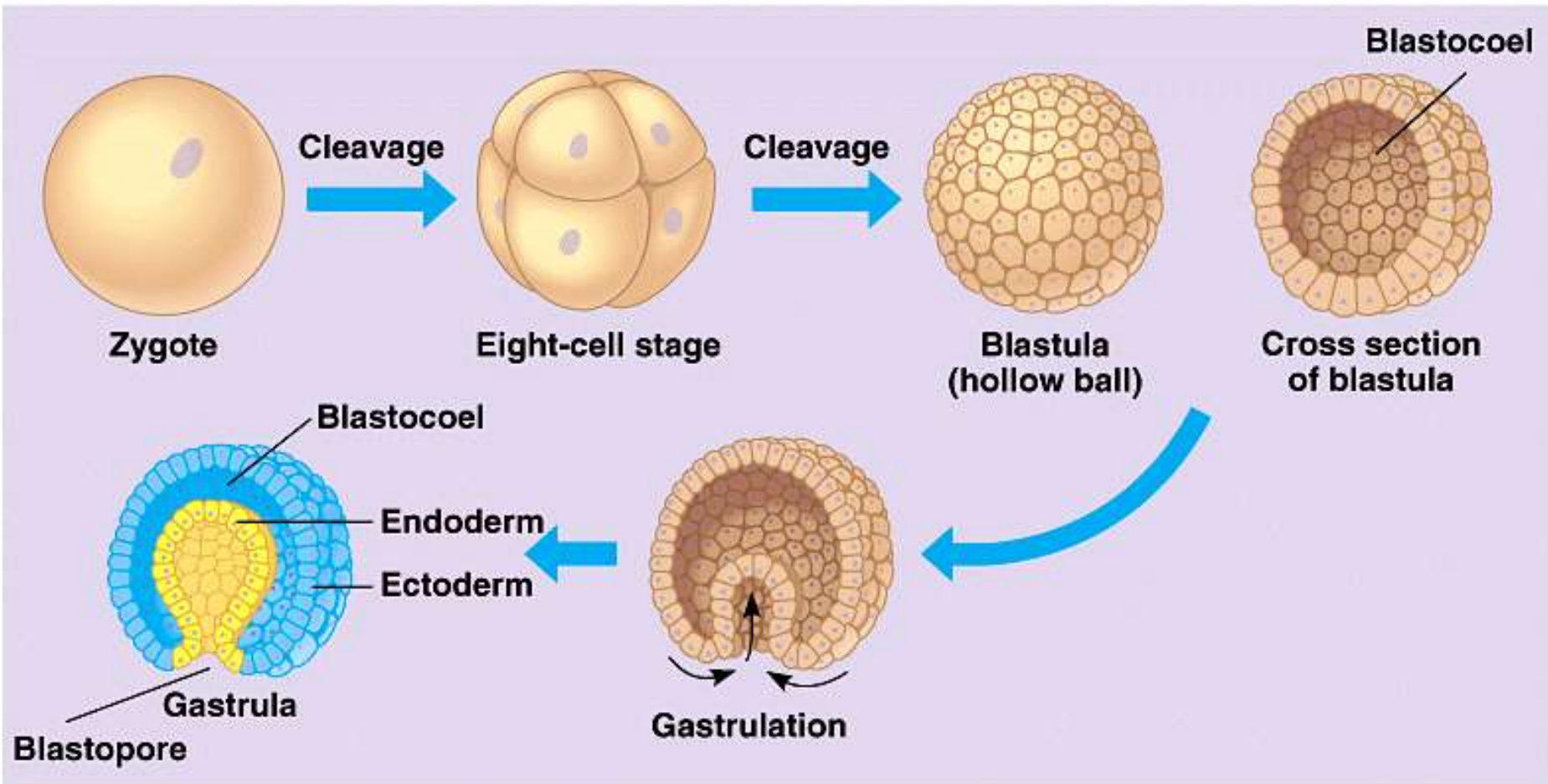
Blastula
(hollow ball)



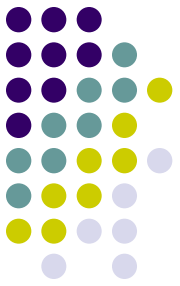
Blastocoel

Cross section
of blastula

Embryonic development of animals



Embryonic germ layers



Each layer forms different adult tissues:

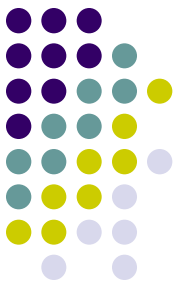
1. ectoderm = outer germ layer, forms skin and nervous system
2. mesoderm = middle germ layer, forms skeleton, muscles, other organs
3. endoderm = inner germ layer, forms digestive organs

Embryonic germ layers



Loading



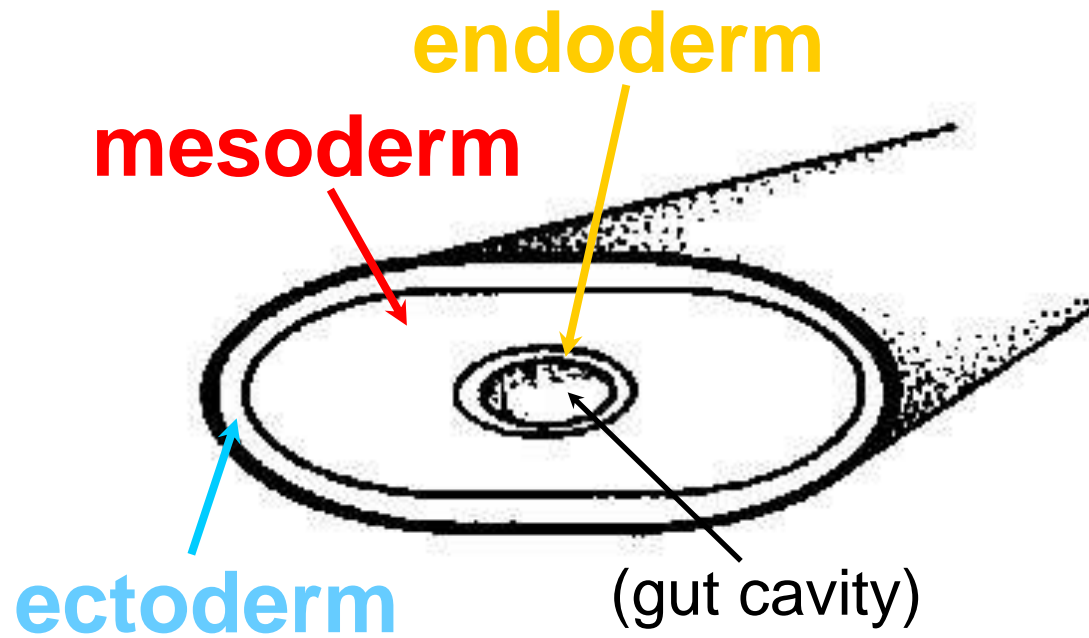


3. Body cavities

- 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



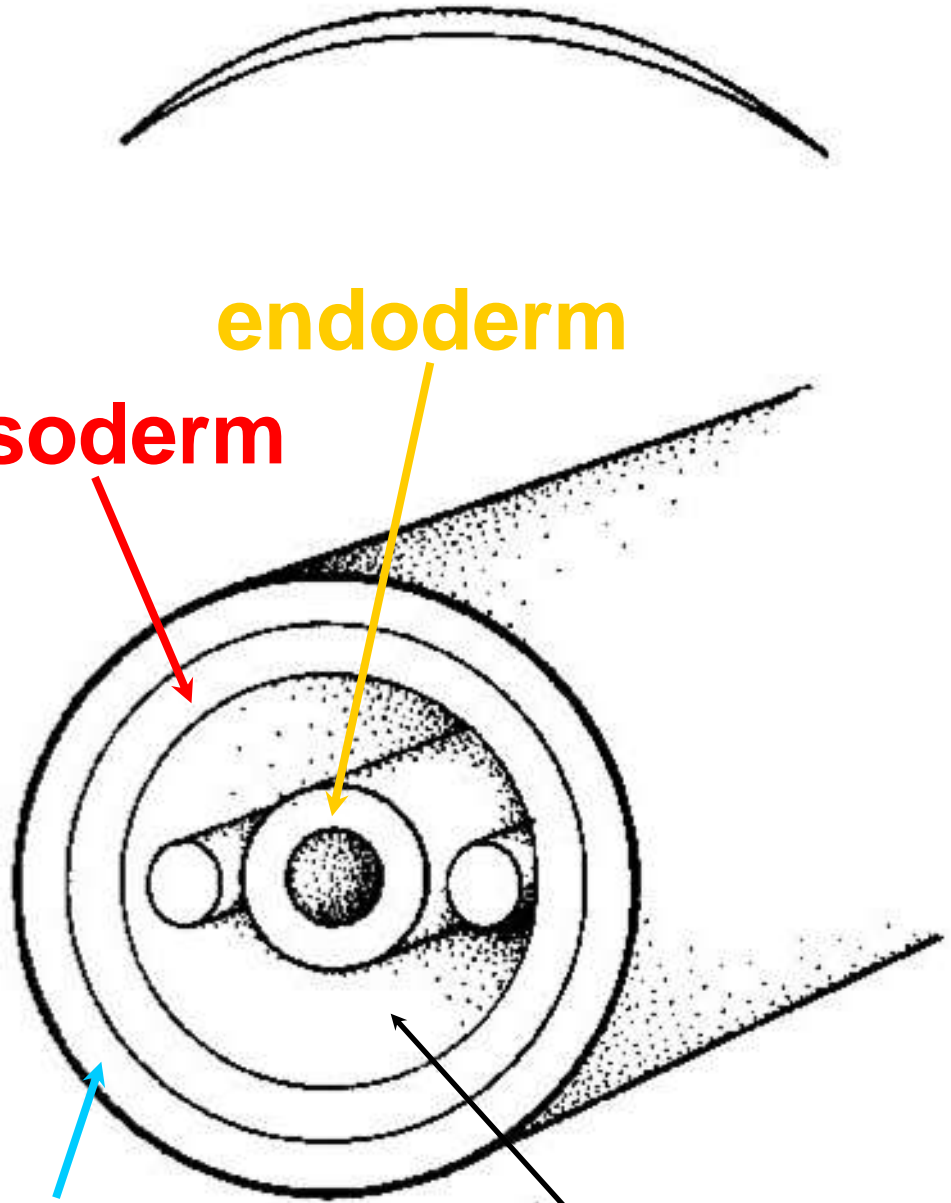
pseudocoelom:
roundworm

mesoderm

endoderm

ectoderm

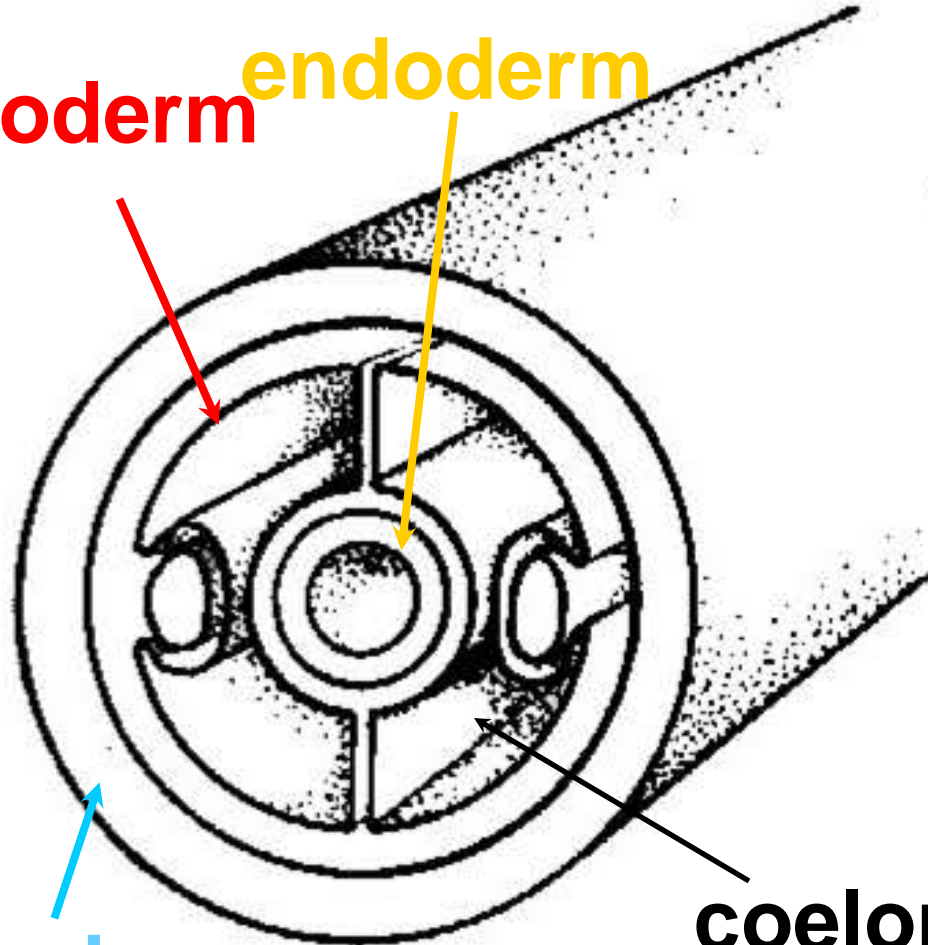
pseudocoelom





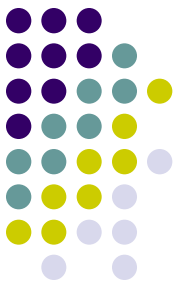
coelom:
segmented worm

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