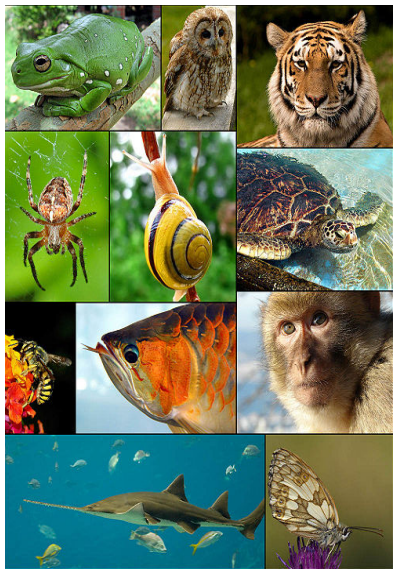
Invertebrates Ch. 23-24

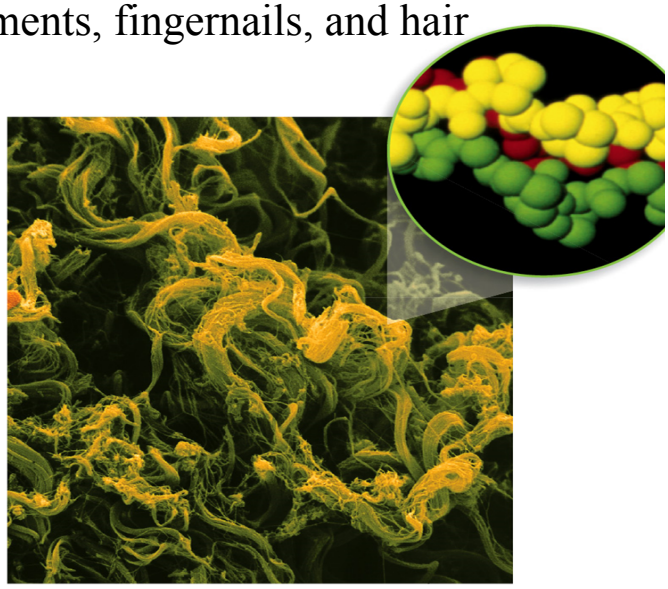
Typical Animal Characteristics



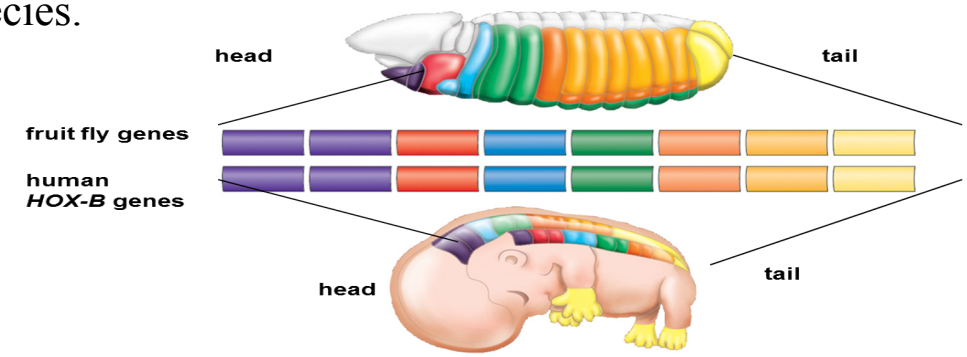
I. Characteristics of animals

- All animals have several characteristics in common: ***eukaryotic***; **multicellular;** ***heterotrophic***; **have no cell** ***walls***; **reproduce with** ***egg*** **and** ***sperm*** (two haploid cells unite to form one diploid cell (zygote).

- **Animal cells are supported by** ***collagen***.
  - > three-stranded protein
  - > found in bone, skin, ligaments, fingernails, and hair
- **Allows animals to** ***move***



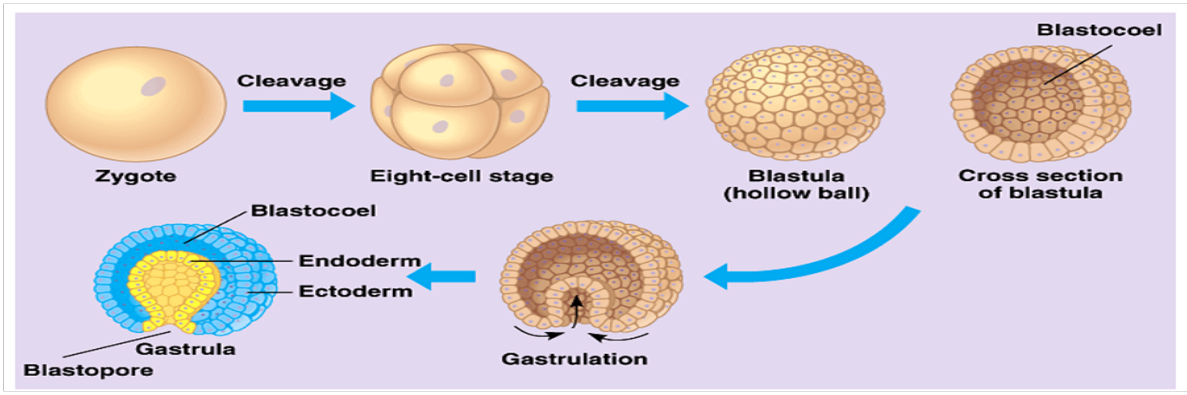
- **Most animals have Hox genes.**
  - > **Homeotic genes** control early development.
  - > ***Hox* genes** determine the position of ***cells differentiation***.
- **Differences** in body plans result from differences in the expression of *Hox* genes.
  - > *Hox* genes tell **embryonic cells** which ***body part to become***.
  - > ***Mutations*** in *Hox* genes led to the vast diversity of animal species.



II. Development of Animals

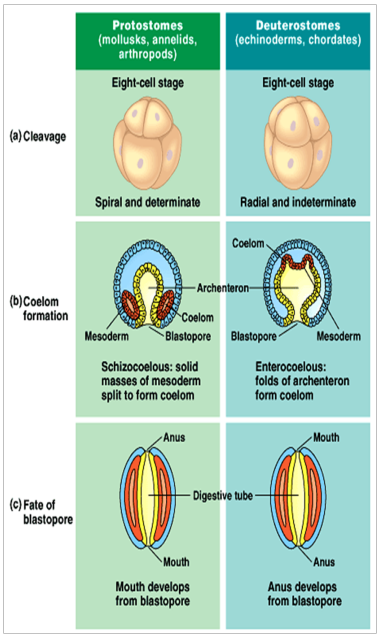
- ***Fertilization*** = when the sperm of a male animal penetrates the egg of a female animal forming a ***zygote***. Most animals reproduce ***sexually***, externally or internally.
- Cell division = A zygote divides by mitosis to form two cells called ***cleavage***. Once cell division begins the organism is now called an ***embryo***.
- ***Blastula*** = the continued cell division of the ***embryo*** continues until a layer of cells ***surrounds*** a fluid-filled space. The layer of cells around the space varies among animal species.

- ***Gastrula*** = after the blastula formation, celldivision continues until two layers of cell with anopening at one end, called a ***blastopore***, occurs. **Ectoderm** is the outer layer of cells; and the**endoderm** is the inner layer of cells.
- ***Mesoderm*** = some animals continue to develop until a ***third*** layer between the ectoderm and endoderm forms.



PreAP ONLY

- ***Protostome*** = what an organism is called if the opening on the gastrula eventually forms a ***mouth***.
  Ex: snails, earthworms, insects.
- ***Deuterostome*** = when the mouth forms ***not*** at the opening of the gastrula, but elsewhere in an organism.
- Scientists hypothesize protostomes evolved before deuterostomes and can determine the ***phylogeny*** of an unknown organism if they observe its ***development*** rather than its adult form.

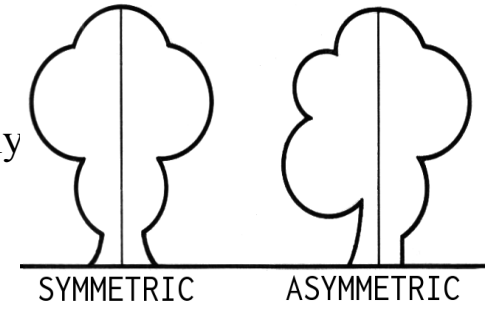


Body Plans and Adaptations

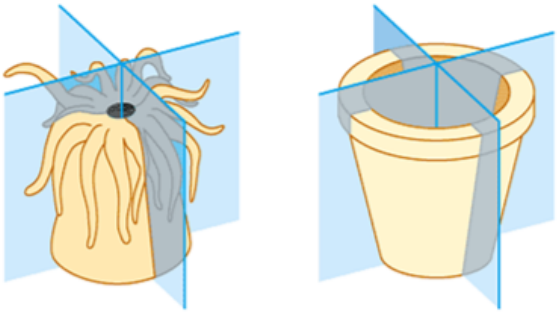
I. What is symmetry?

- Each animal can be described in terms of ***symmetry*** - describes the arrangement of ***body*** structures.
- An animal that is irregular in shape has no symmetry or an ***asymmetrical*** body plan.

  Ex: ***sponges***
- Animals with no symmetry often are ***sessile,*** meaning they are permanently attached to a surface.



- Animals with ***radial*** symmetry can be divided along any plane, through a ***central*** axis, into roughly equal ***halves***. Ex: **hydra, jellyfish**



(a) Radial symmetry

- An organism with ***bilateral*** symmetry

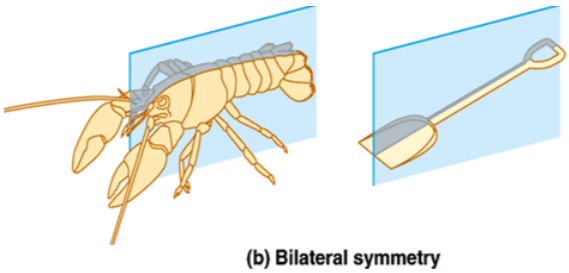
*can be divided down its length into similar ***right*** and ***left*** halves.

*can be divided ***only*** along ***one*** plane

*the ***anterior*** (head end) often has the ***sensory*** organs; the ***posterior*** is the tail end.

*the upper (or back) surface is the ***dorsal***, and the ***ventral*** is the lower (or front) side.

Ex: **butterfly, lobster, man**



(b) Bilateral symmetry

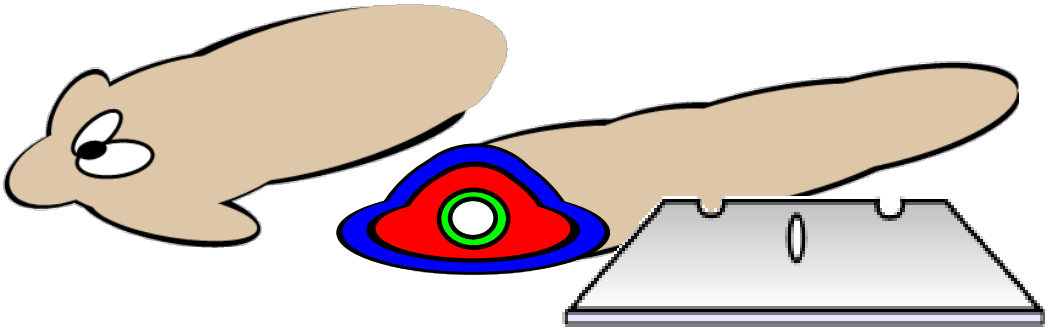
II. Bilateral Symmetry and Body Plans

- All bilaterally symmetrical animals developed from three embryonic cell layers.

1. ***Ectoderm*** - gives rise to skin and nerve tissues
2. ***Endoderm*** - gives rise to digestive tract and related organs
3. ***Mesoderm*** - gives rise to muscle tissues, circulatory, reproductive systems & related organs, and in some animals the respiratory system.

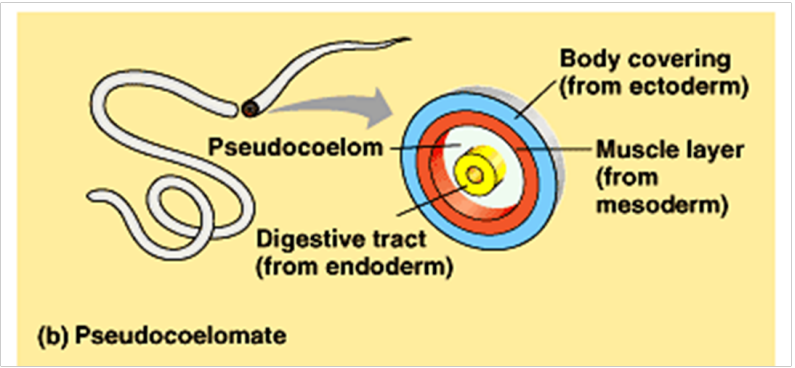
A. Acoelomates

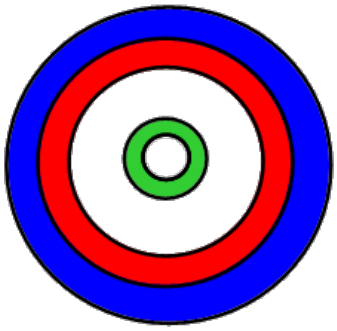
- Animals that develop from three layers - ectoderm, endoderm, and mesoderm - but have ***no*** body cavities are called ***acoelomate*** animals.
  Ex: ***phylum Platyhelminthes***



B. Pseudocoelomates

- Pseudocoelom = a ***fluid***-filled body cavity that develops between the ***endoderm*** and mesoderm.
- Pseudocoelomates have a ***one***-way digestive tract.
  Ex: ***Nemotodes***

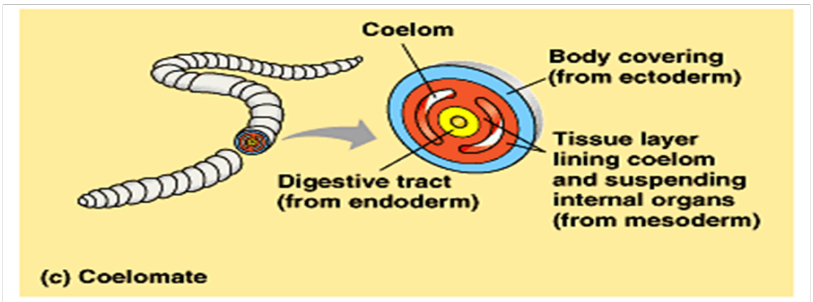


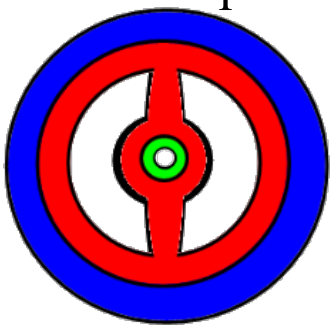


C. Coelomates

- Coelom = fluid-filled ***space*** that is completely surrounded by ***mesoderm*.**
- The greatest ***diversity*** of animals is found among the coelomates.

  Ex: humans, insects, fish
- Specialized ***organs*** and organ systems develop in the ***coelom***.



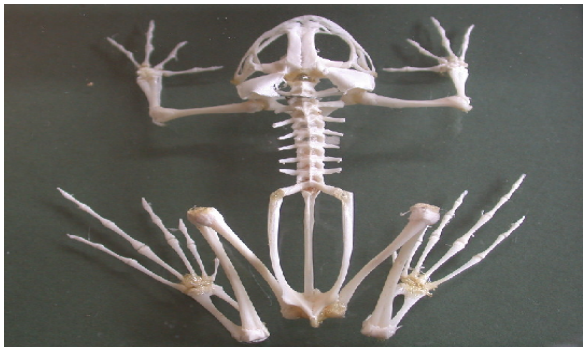


III. Animal Protection and Support

- ***Exoskeleton*** = hard covering on the outside of the body that provides a framework for ***support*.** ***Protects*** soft tissue, ***prevents*** water loss, and provide protection from predators and are often found in ***invertebrates***
- Invertebrate = an animal that does not have a ***backbone***.

  Ex: ***crabs, spiders, worms***

- **Endoskeleton** = ***internal*** skeleton that provides support and protects ***internal*** organs.
- Vertebrate = animal with an ***endoskeleton*** and a ***backbone***.
  Ex: amphibians, ***reptiles*****,** birds, ***mammals***
- All ***vertebrates*** are bilaterally symmetrical.



FYI: Origin of Animals

Most biologists agree that animals evolved from aquatic, colonial**protists**, during the late Precambrian era. Bilateral symmetrical animals came much **later**. All body plans were in existence by the beginning ofthe **Cambrian** Period, **543** million years ago.

REMEMBER WHICH ERA?