


Kingdom Animalia

Biology 11

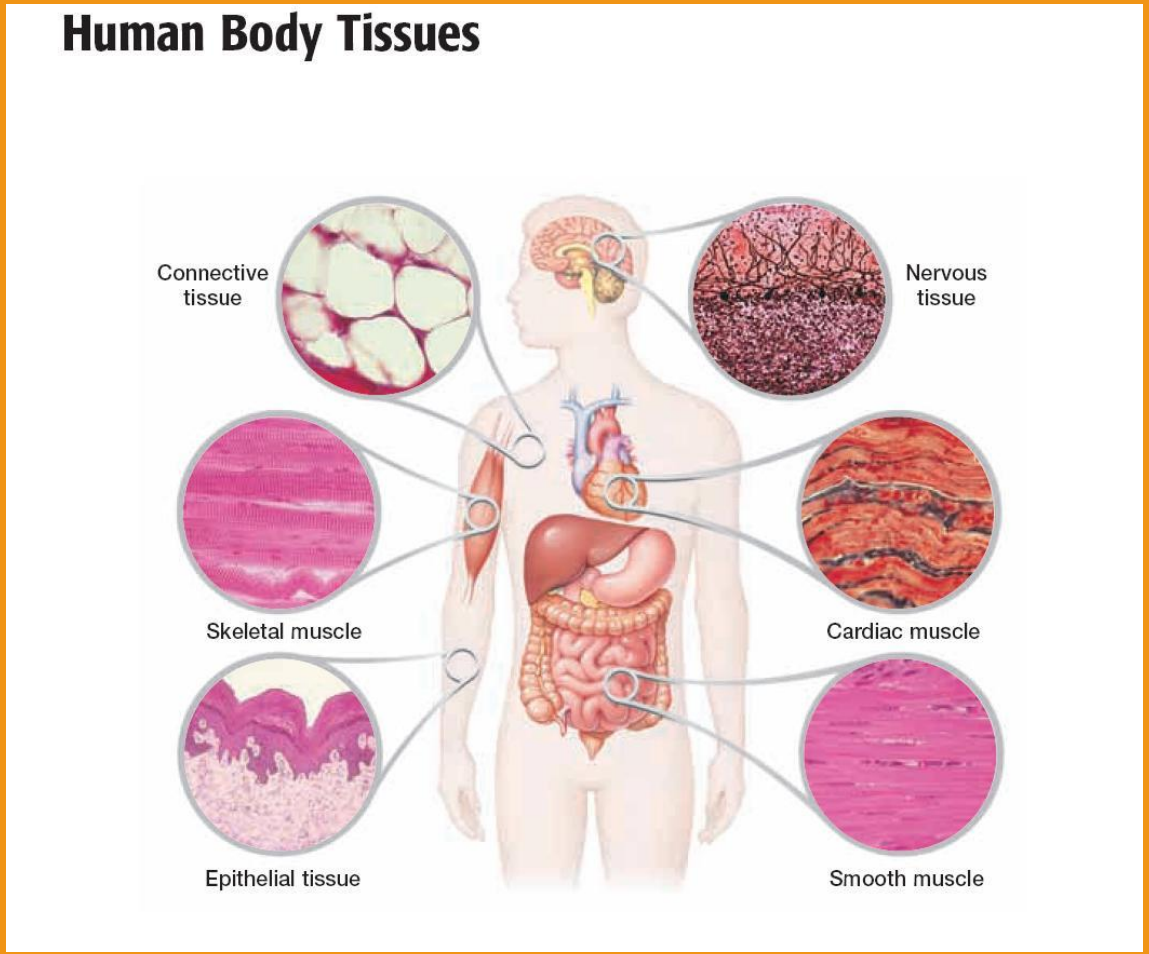



Typical Animal Characteristics

- Eukaryotic
- Multicellular
- Heterotrophic
- No cell walls
- Ability to move
- Very diverse

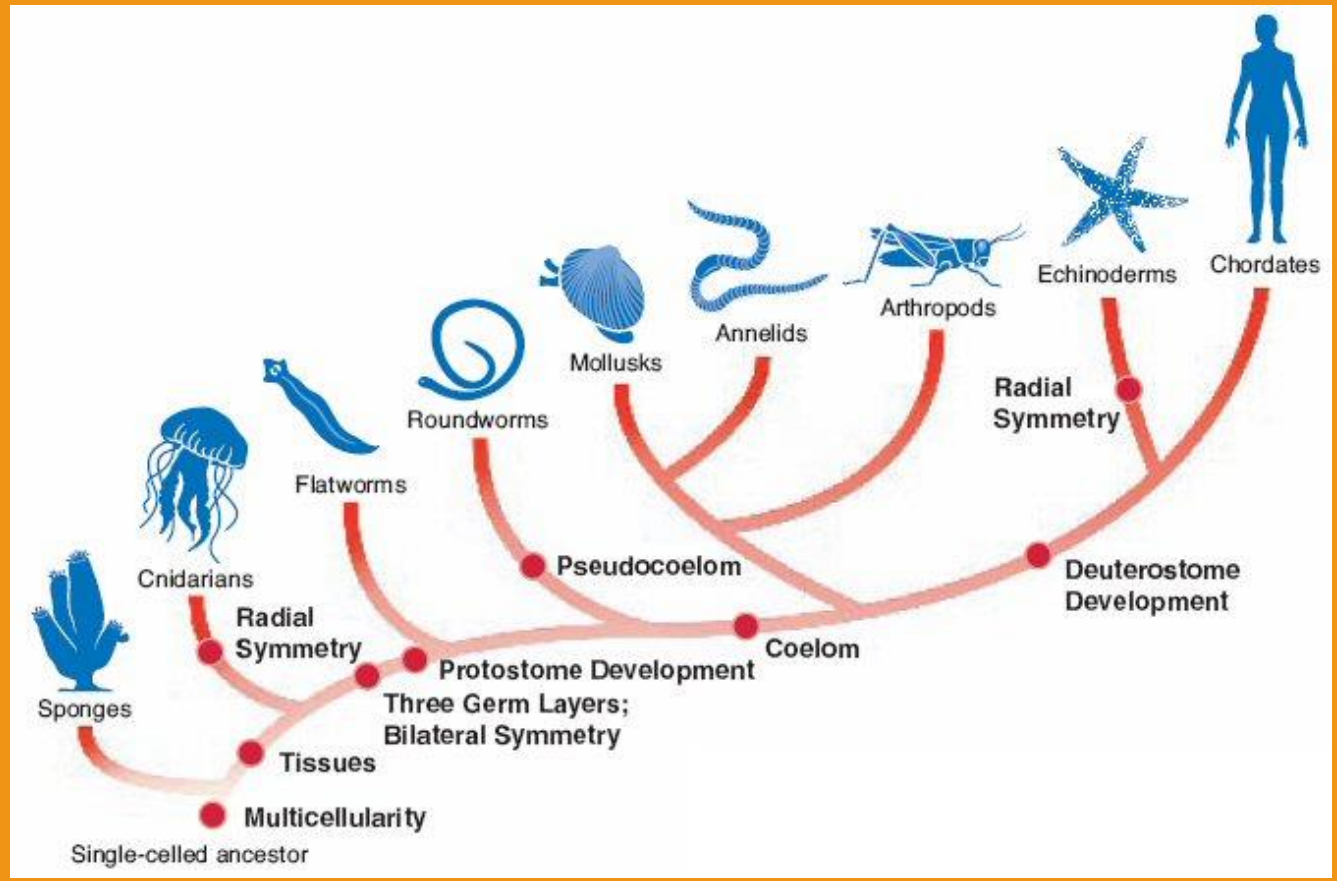
Kingdom Animalia

- 9 phyla
- Bodies of most contain the following tissues:
  - Epithelial
    - Cover body surfaces (lung surfaces)
  - Muscle
    - movement
  - Connective
    - Support and connect (blood and bone)
  - Nervous
    - Carry information throughout the body



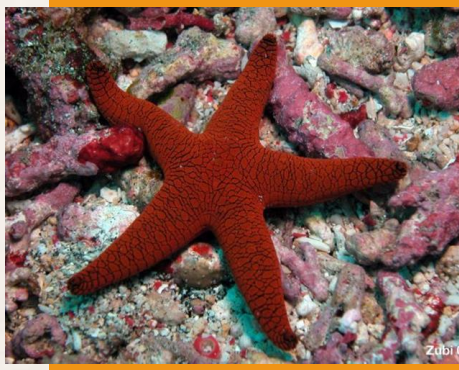
Cladogram of Kingdom Animalia

- Shows evolutionary relationships among all animals
- Constructed based on characteristics of each phyla



Organization

- Split up into two categories
- # 1 : Invertebrates
  - No backbone
  - 95% of all animal species
    - Sea stars, worms, jellyfish insects etc.
- # 2 : Vertebrates
  - Have a backbone (vertebral column
  - 5 % of all animal species
    - Fish, amphibians, reptiles birds and mammals



Essential functions of animals

- Bodies of animals contain specialized cells, tissues, organs and organ systems that carry out different tasks
- 7 essential functions
  - Feeding
  - Respiration
  - Circulation
  - Excretion
  - Response
  - Movement
  - Reproduction

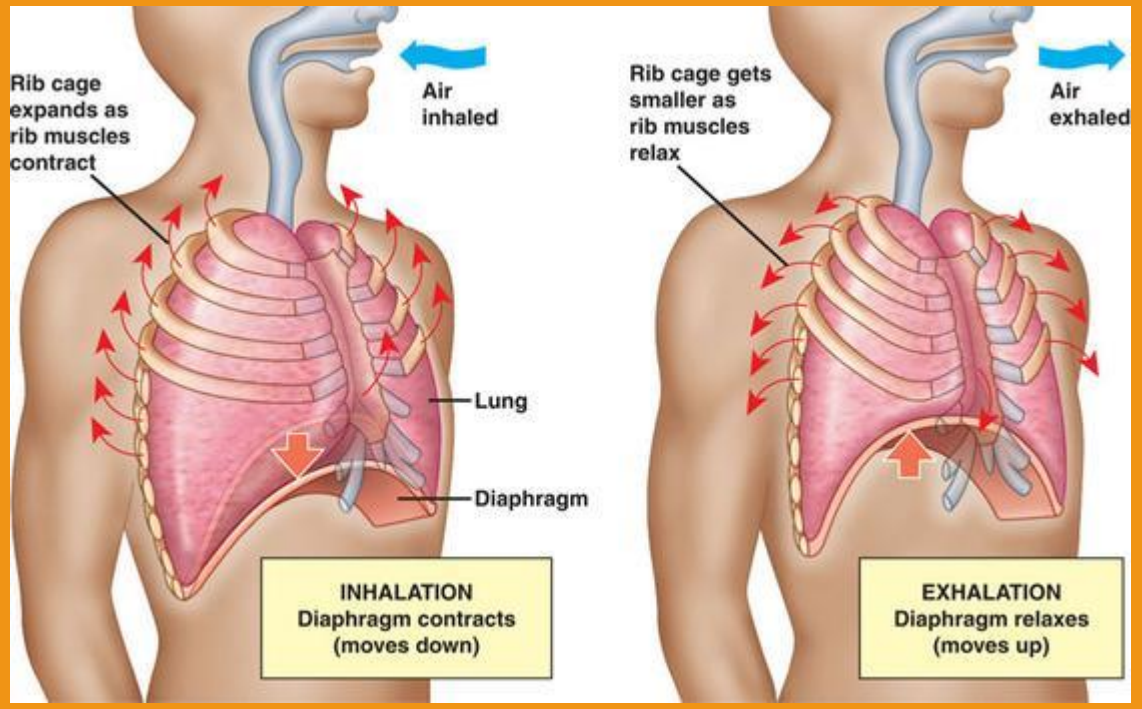
Life Functions

- How does an animal obtain its food?
- # 1 Feeding
  - Herbivore
  - Carnivore
  - Omnivore
  - Detrivore

  - Animals can for symbiotic relationships
    - Parasite
      - Living on or in a host organism

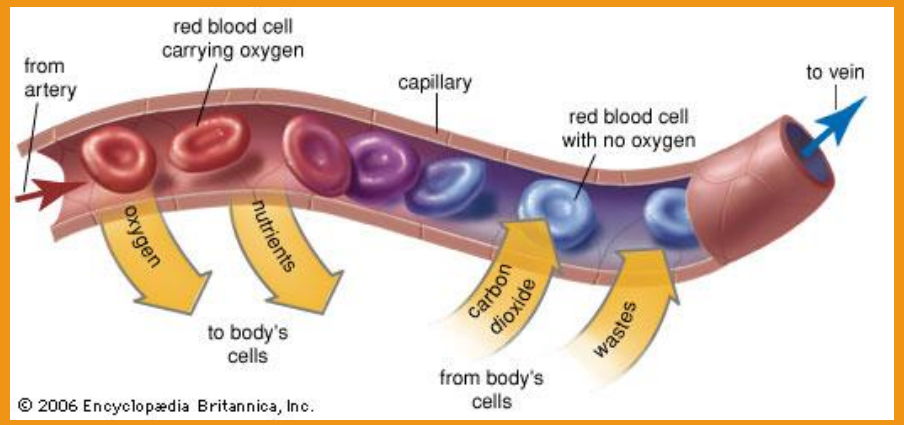
Respiration

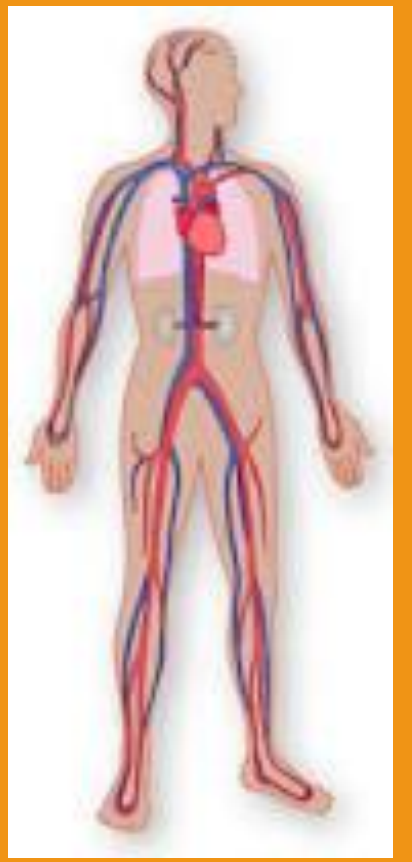
- How does it breathe?
- Take in oxygen, give off carbon dioxide
  - Diffusion
    - Across a cell membrane; no lungs
  - Internal transport
    - Complex tissue and organ systems
    - Circulatory system; lungs



Circulation

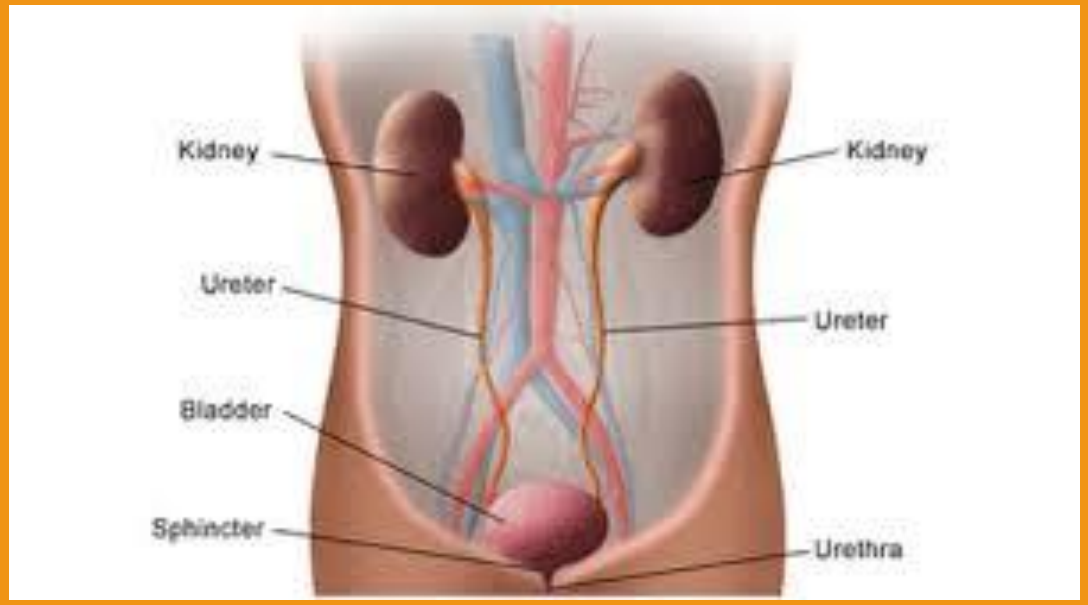
- How does an animal transport oxygen, nutrients and waste products to and from cells?
- Simple animals
  - Diffusion
- Larger more complex animals
  - Have a circulatory system





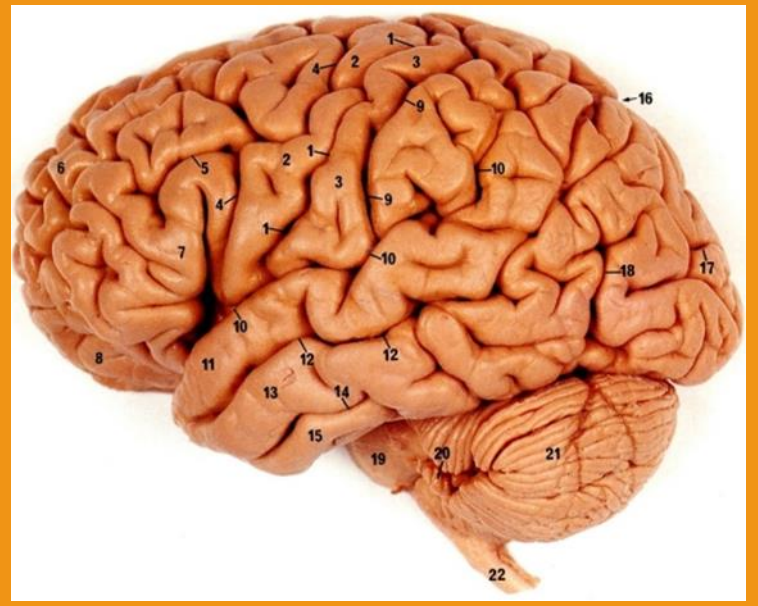
Excretion

- How does an animal rid itself of wastes?
- Most animals have an excretory system



Response

- How does an animal's nervous system and sense organs function?
- Animals respond to events in their environment using nerve cells
  - Some cells respond to light, sound and stimuli
  - Some process information and determine how the animal will respond
  - Diverse throughout phyla

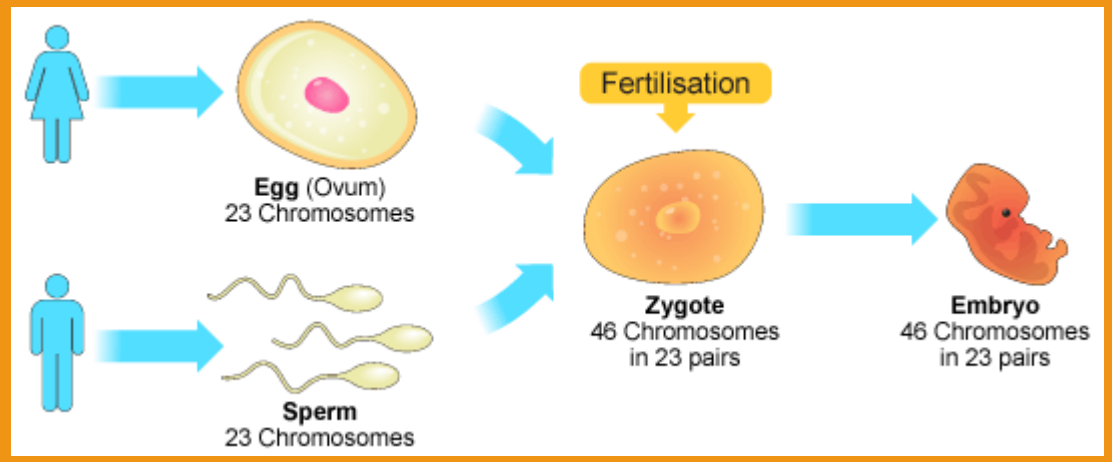


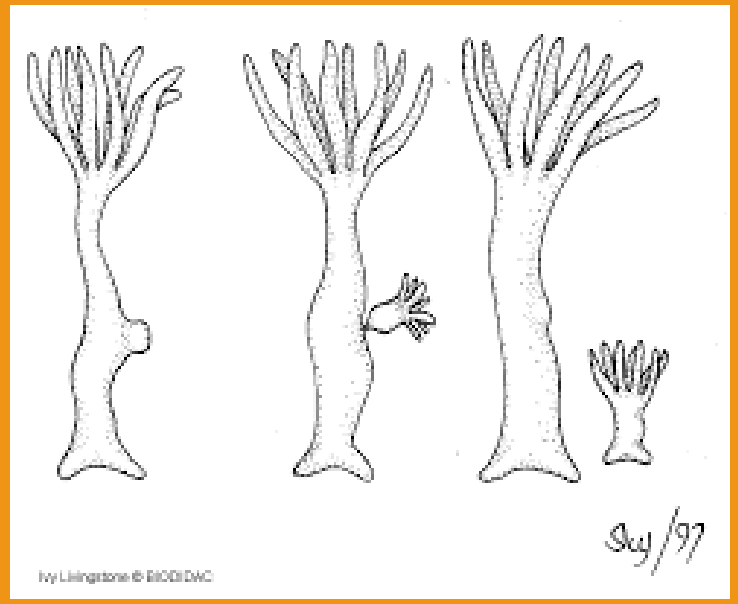
Movement

- If an animal does move, how does it do so?
- Some animals remain attached to a single spot
- Most are motile
  - Muscular and skeleton system
  - Muscles help sedentary animals feed/pump materials through their body

Reproduction

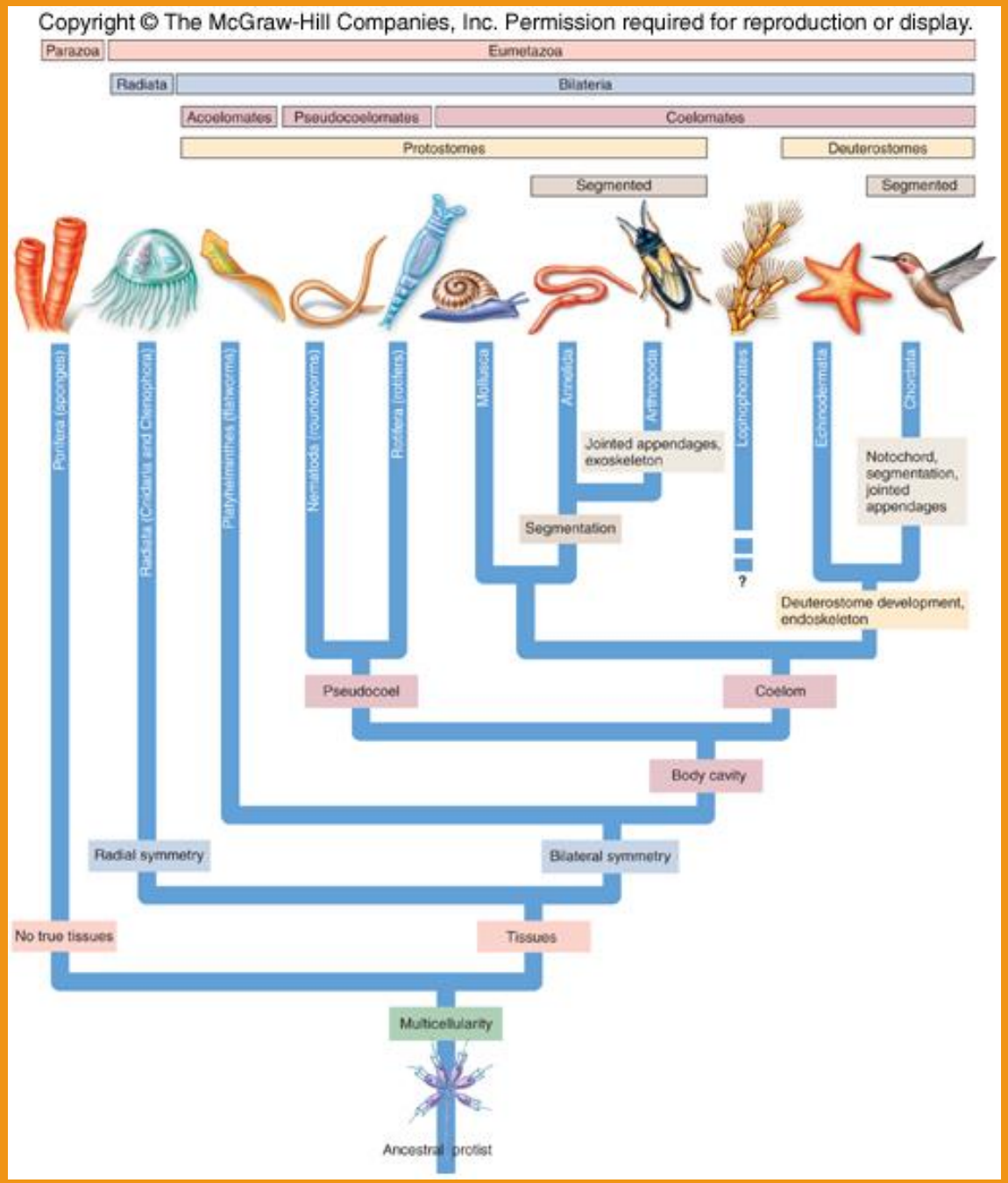
- How does an animal carry out fertilization, reproduction and birth?
  - Most Reproduce sexually
  - Helps maintain diversity
  - Improves a species ability to evolve
  - Some invertebrates also reproduce asexually
    - Allows to increase numbers rapidly





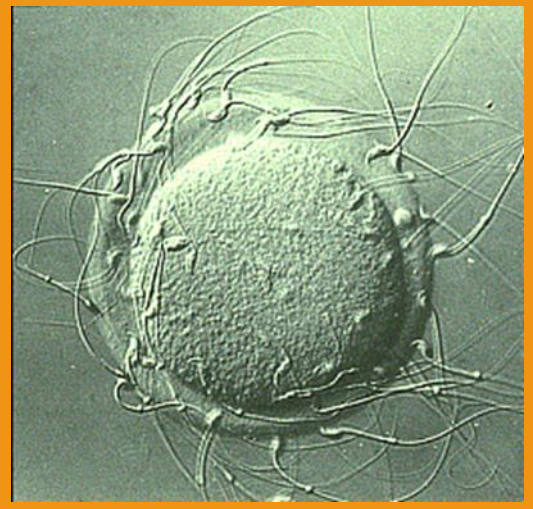
Trends in Animal Evolution

- Ranges from simple to complex
- Phyla related by evolutionary heritage
- **Complex animals tend to have:**
  - **high levels of cell specialization and internal body organization**
  - **bilateral body symmetry**
  - **a front end or head with sense organs**
  - **a body cavity**



Stages of Growth and Development

- Animals that reproduce sexually begin as a zygote or fertilized egg



Growth cont’d

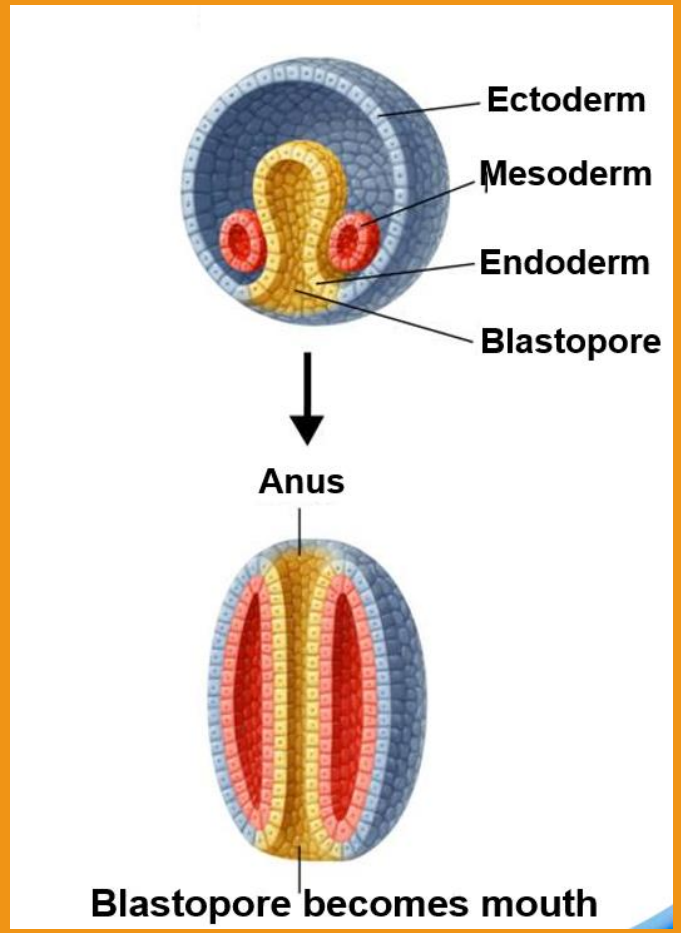
- The zygote undergoes a series of divisions to form a blastula, a hollow ball of cells.
- Blastula folds in on itself to form a single opening called a blastopore
  - Leads to a central tube that runs the lengths of the developing embryo (digestive tract)

Blastula

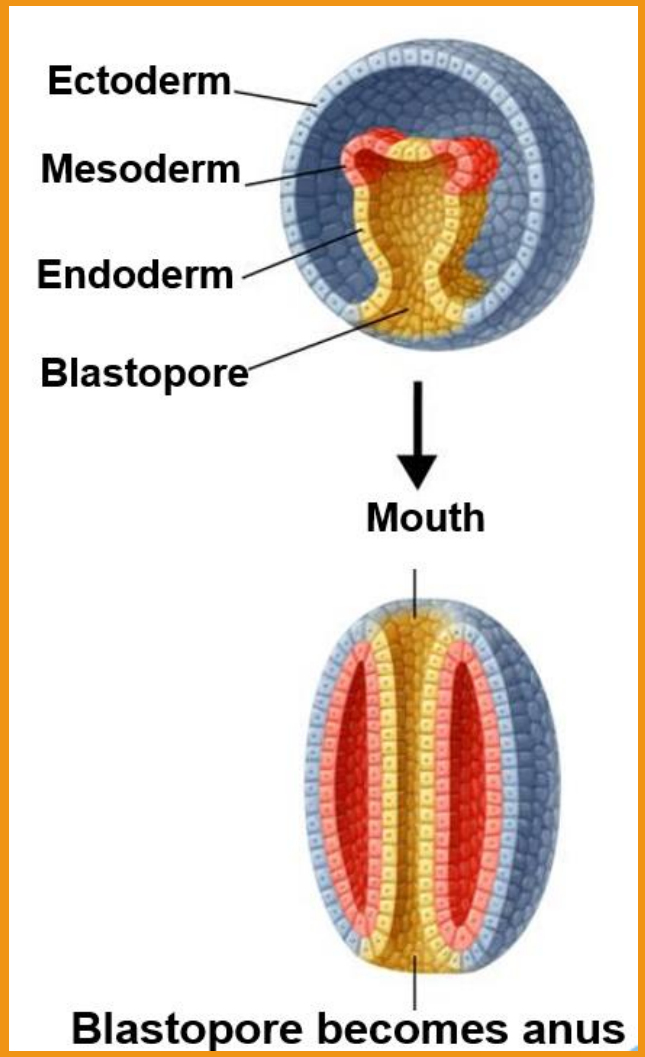
(cross section)

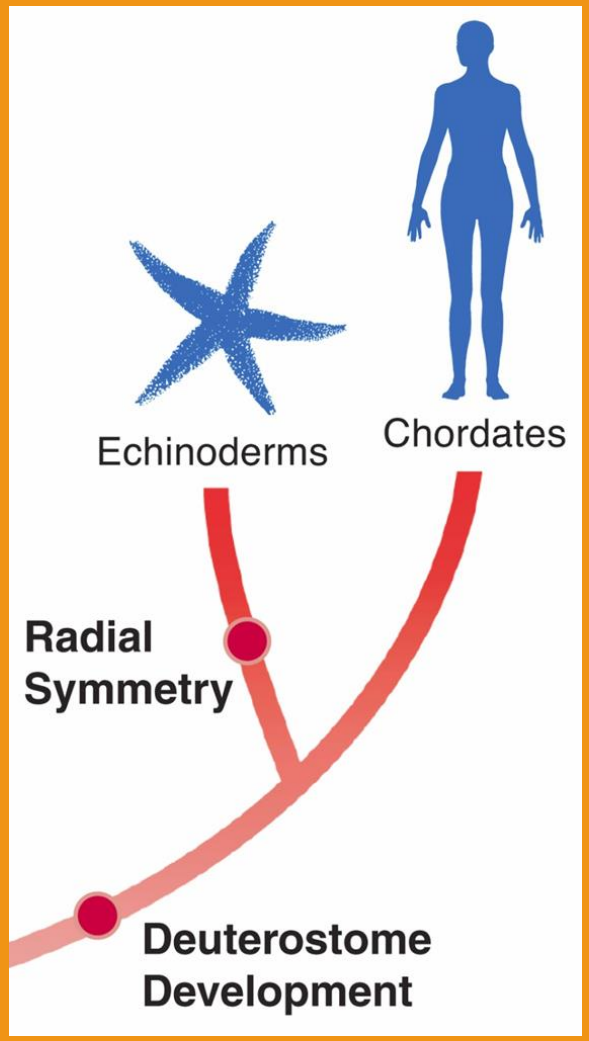
Digestive tract forms in one of two ways

- #1 Protostome
  - is an animal whose mouth is formed from the blastopore.
- Most invertebrate animals are protostomes.



- A **deuterostome** is an animal whose anus is formed from the blastopore.
- The **anus** is the opening through which wastes leave the digestive tract
  - Echinoderms and chordates
  - This similarity in embryology may indicate that vertebrates have a closer evolutionary relationship to echinoderms than to other invertebrates.

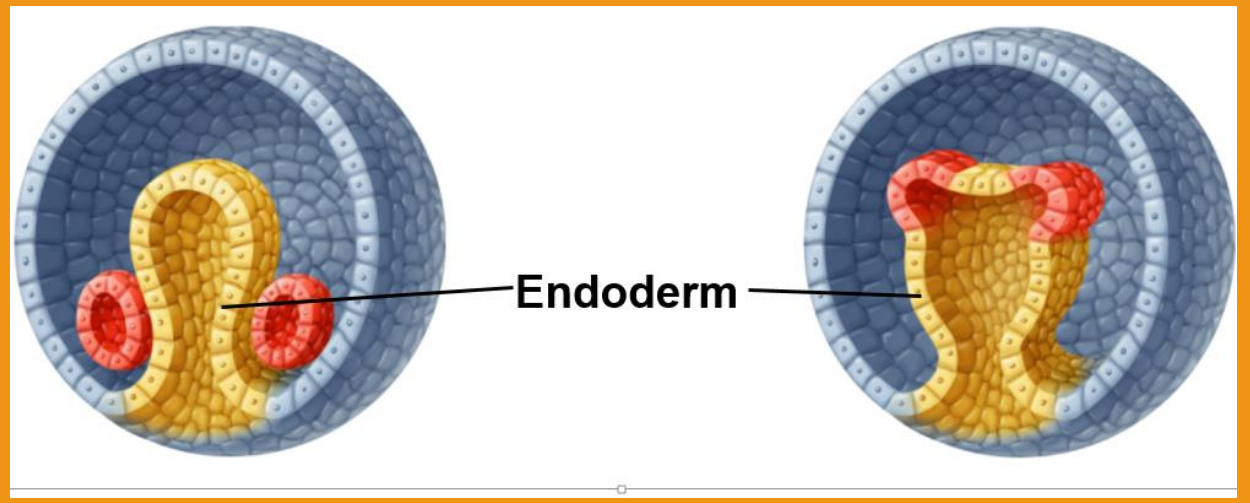




Germ Layers

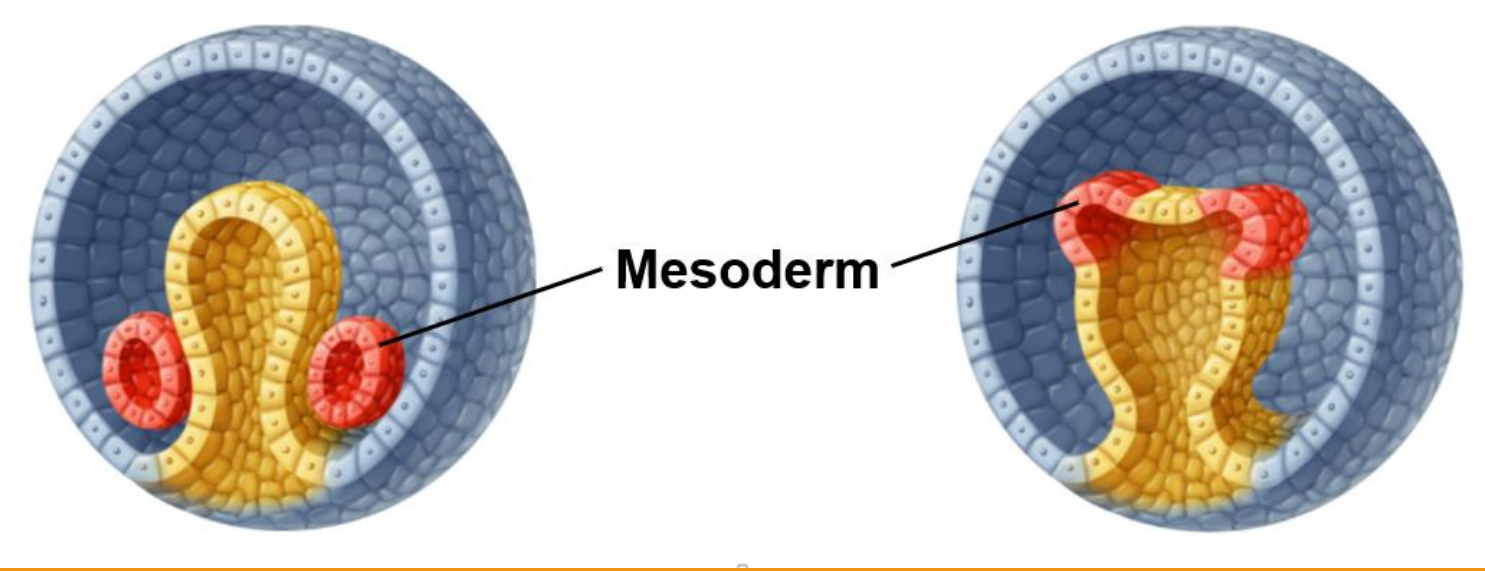
- Cells of most animal embryos develop into three layers
- #1 **Endoderm** (innermost germ layer)
  - develop into the linings of the digestive tract and much of the respiratory system.

- Protosome on left side



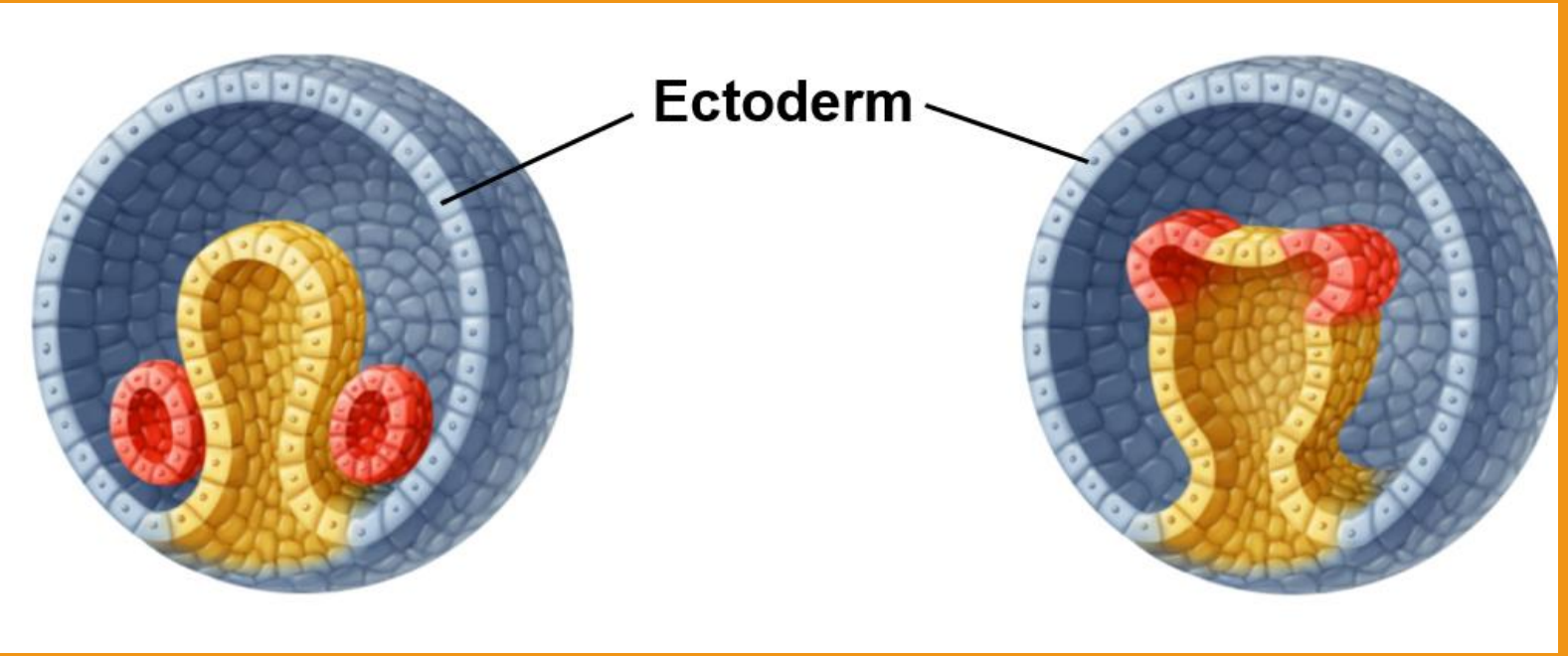
Mesoderm

- #2 Mesoderm (middle layer)
    - develop into muscles and much of the circulatory, reproductive, and excretory organ systems.



Ectoderm

- #3 Ectoderm (outer layer)
  - develops into the sense organs, nerves, and the outer layer of the skin.

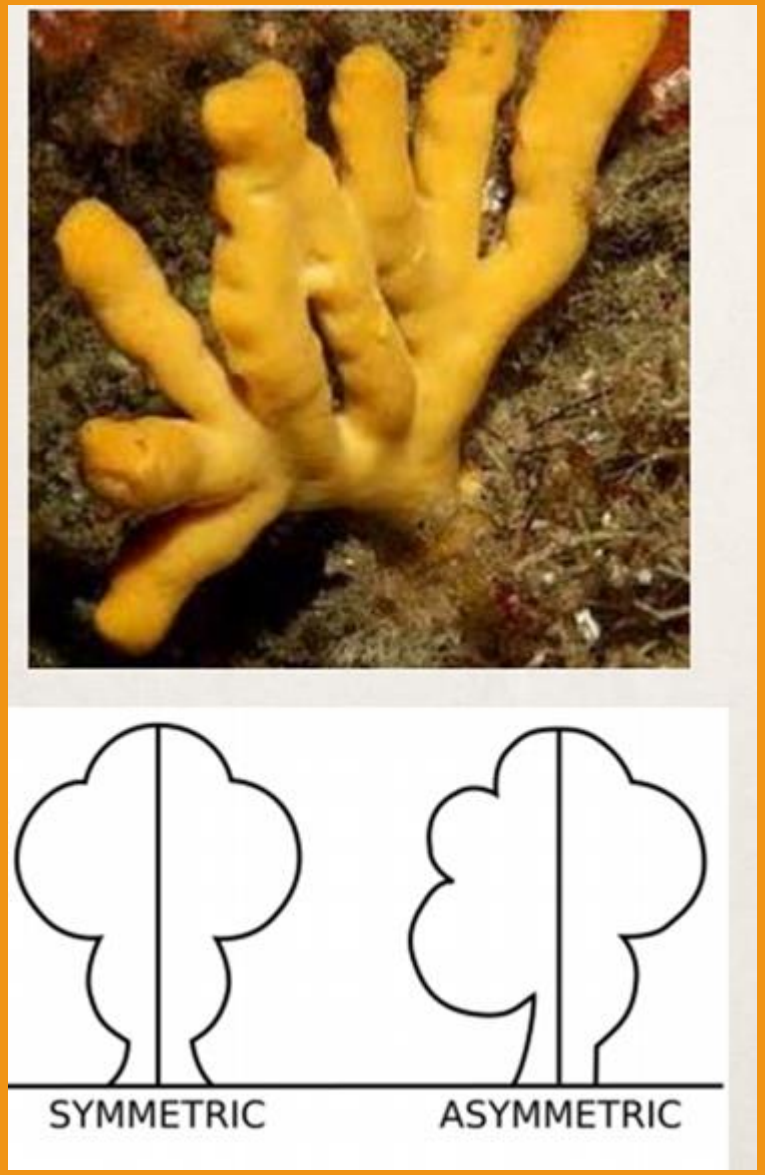


Body Symmetry

- Except for sponges, every animal exhibits some body symmetry in its structure.
- Many simple animals, like the sea anemone, have body parts that repeat around the center of the body.

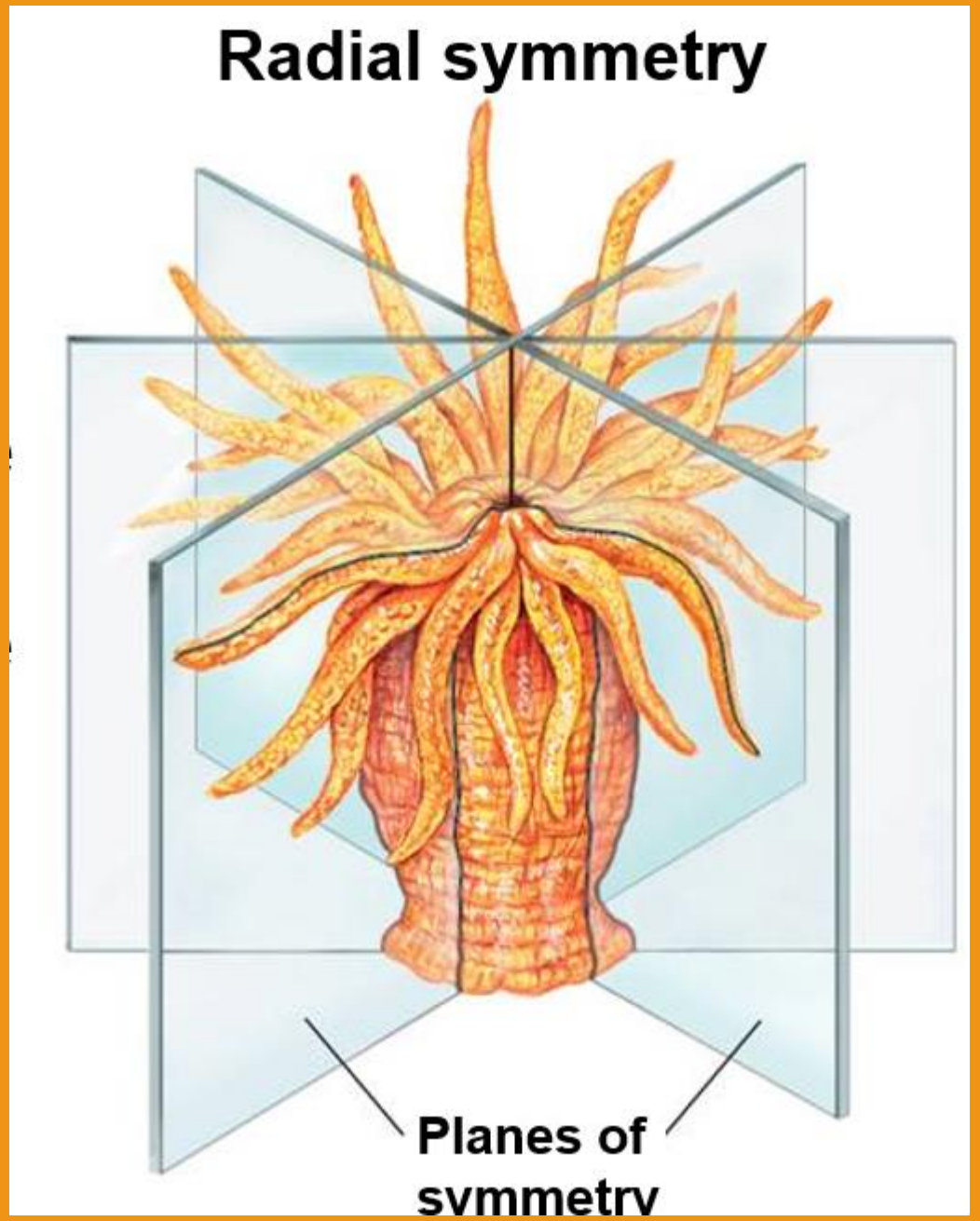
Asymmetry

- Irregular shape
- Cannot be divided into equal pieces
- Often sessile (do not move)
- Live in water
  - sponge



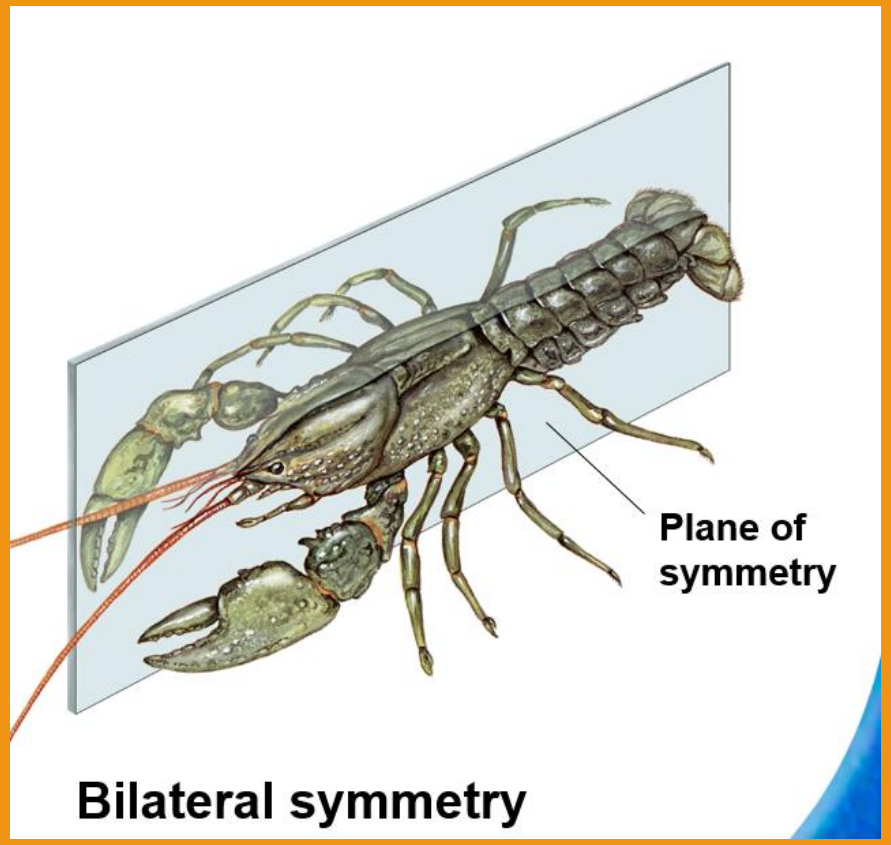
Radial Symmetry

- These animals exhibit radial symmetry
  - any number of imaginary planes can be drawn through the center
  - each dividing the body into equal halves.
  - Has a top and bottom but no left and right



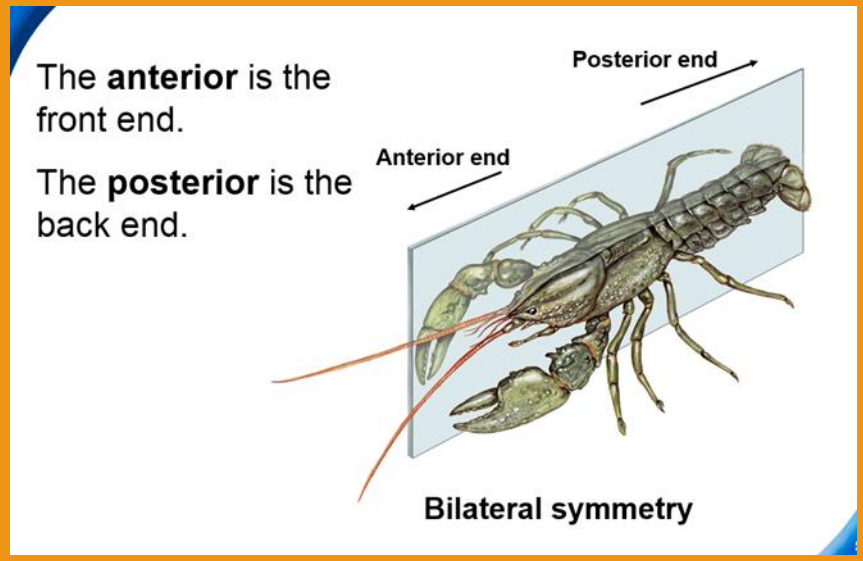
Bilateral Symmetery

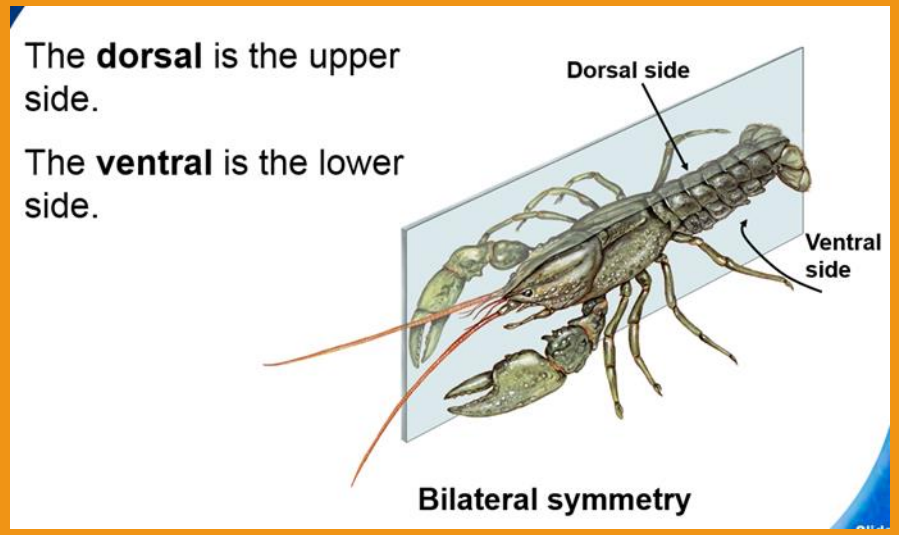
- only one imaginary plane can divide the body into two equal halves
- Has left and right sides
  - Butterfly, humans



Anatomical terms

- Anterior- front (head) region
- Posterior- end region
- Lateral – side region
- Dorsal- top (back region)
- Ventral- bottom region



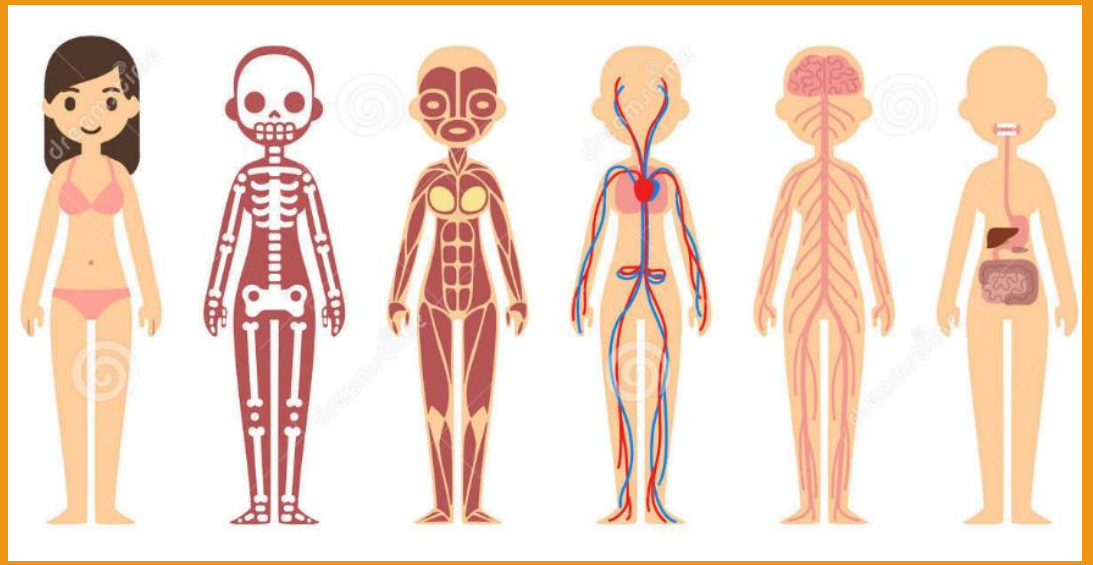


Cephalization

- Animals with bilateral symmetry exhibit cephalization
  - which is the concentration of sense organs and nerve cells at the front end of the body
- Respond to the environment quicker

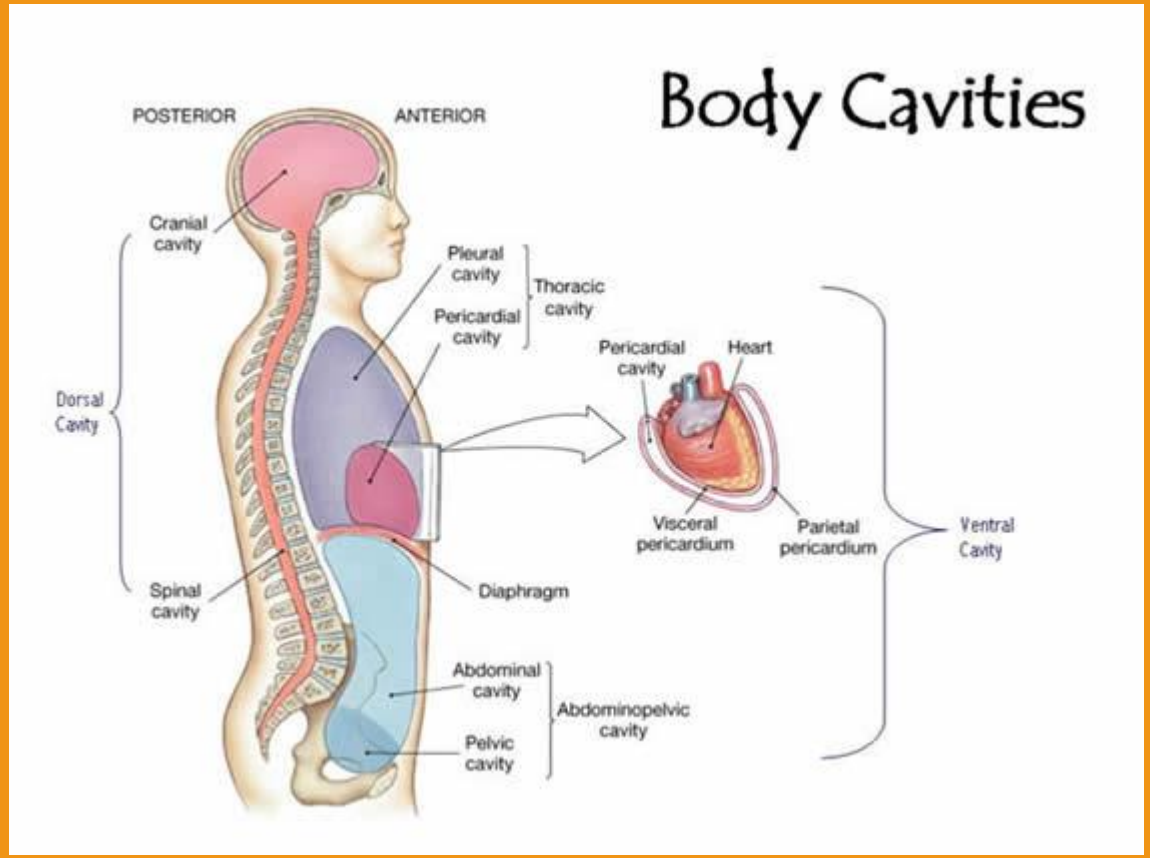
Specialized Cells, Tissues, and Organs

- As larger and more complex animals evolved, specialized cells joined together to form tissues, organs, and organ systems that work together to carry out complex functions.
- Flatworms have simple organs for digestion, excretion, response, and reproduction.
- More complex animals, such as mollusks and arthropods, have organ systems



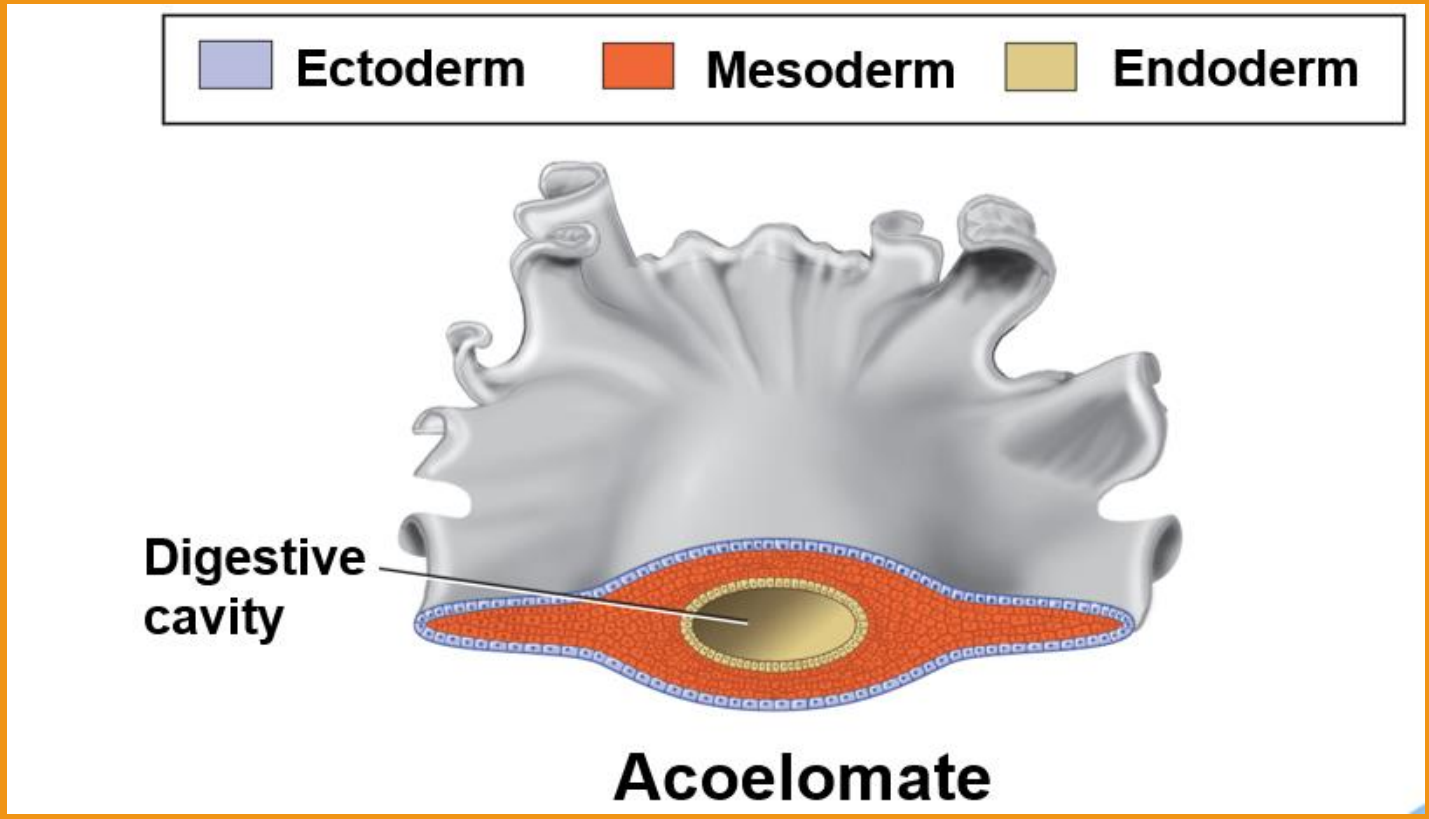
Body Cavity Formation

- Most animals have a **body cavity**
  - a fluid-filled space between the digestive tract and body wall.
- Provides a space in which internal organs can be suspended so that they are not pressed on by muscles or twisted out of shape by body movements



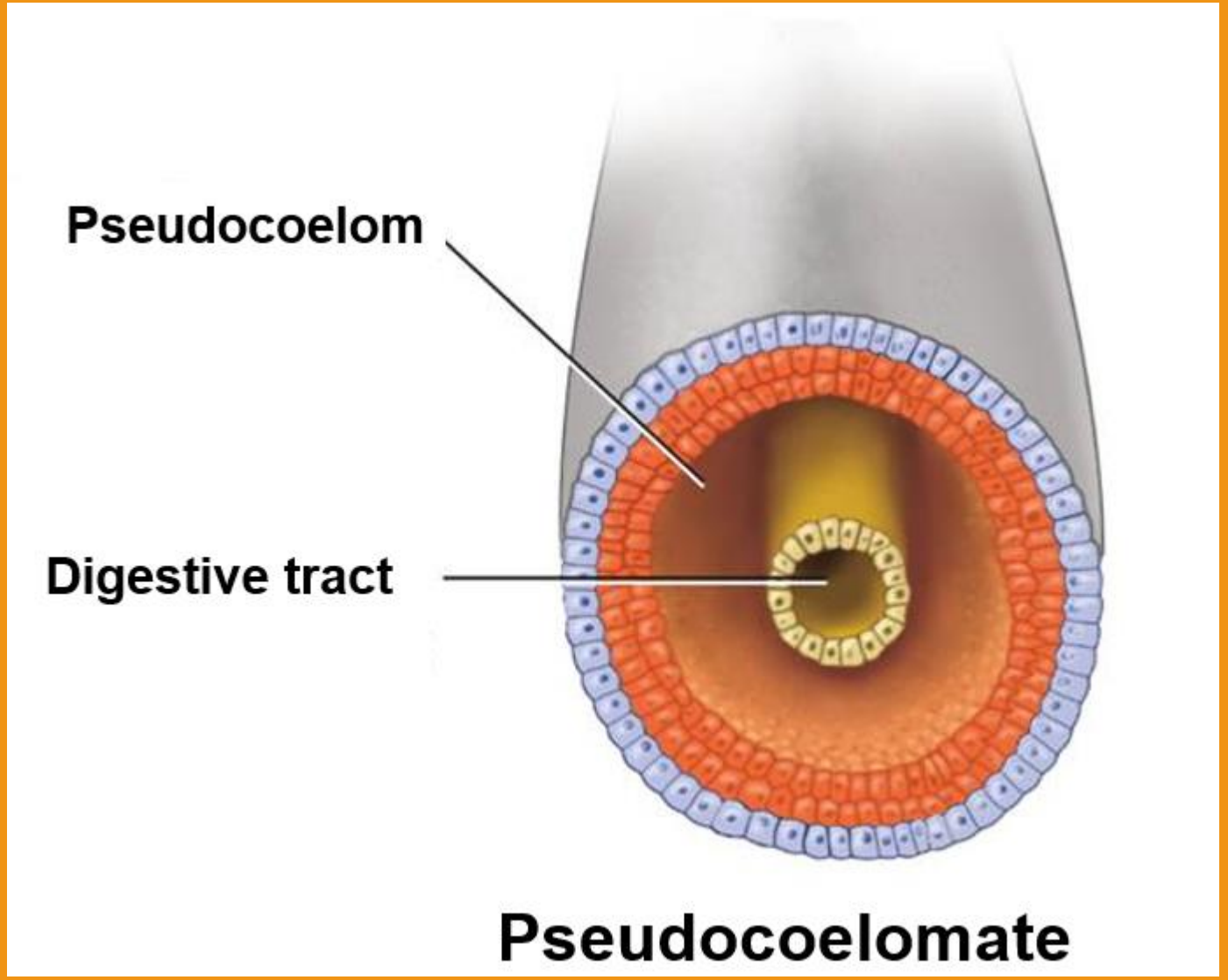
Coelom Formation

- Acoelomates
  - This means they have no coelom, or body cavity, that forms between the germ layers.
  - Simple organs
    - Flatworms



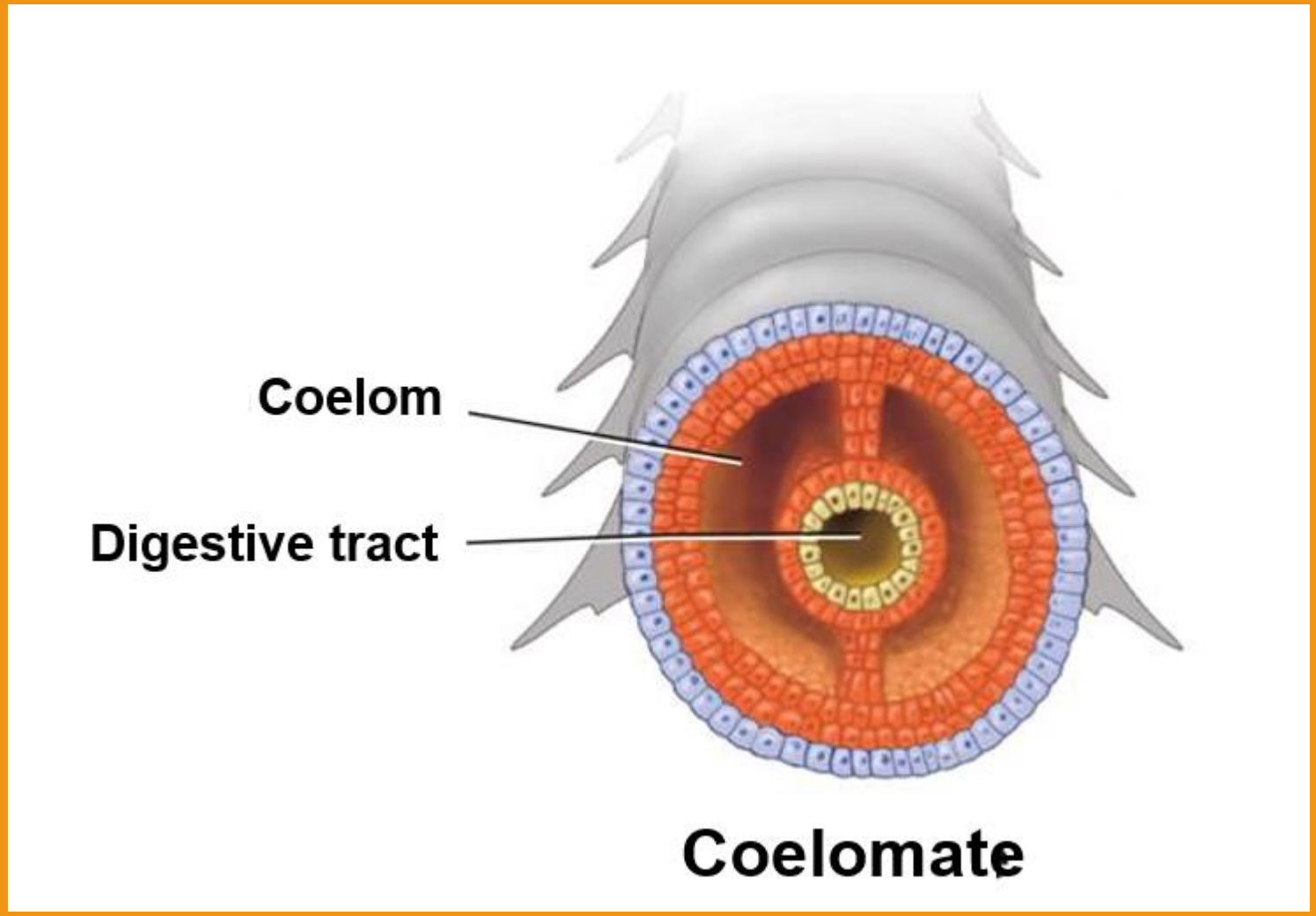
Pseudocoelomates

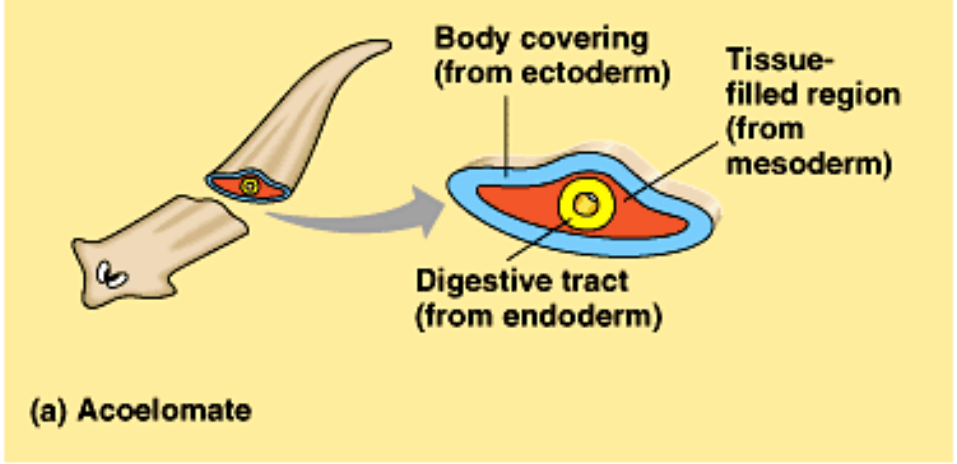
- Pseudocoelomates
  - have a fluid filled body cavity lined partially with mesoderm
    - roundworms



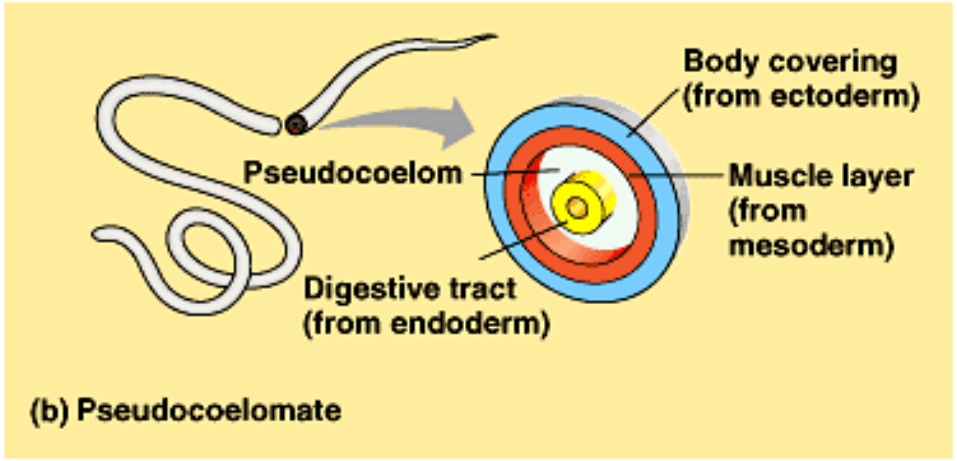
Coelomates

- Most complex animal phyla have a true coelom
  - have a fluid-filled space between the gut and body wall
  - Lined completely with mesoderm.
  - Cushions and protects internal organs
  - Provides room for growth
    - Humans, earthworms,

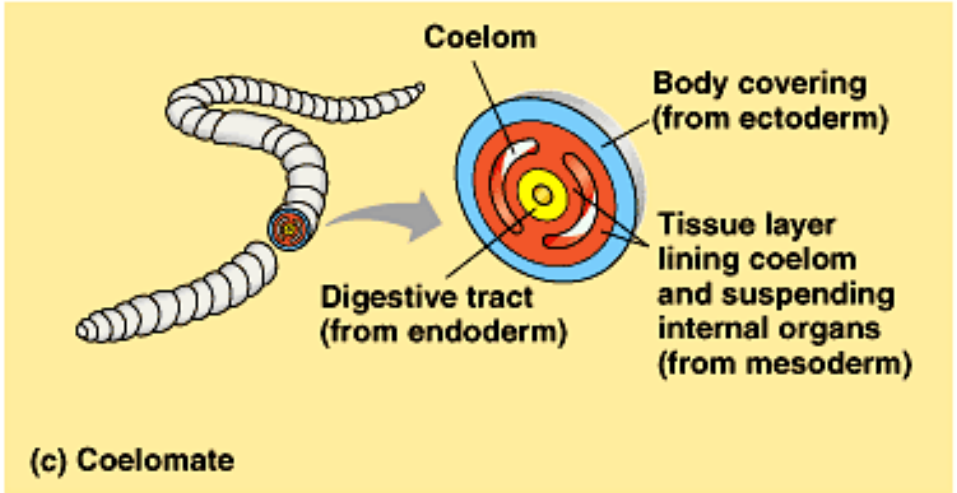




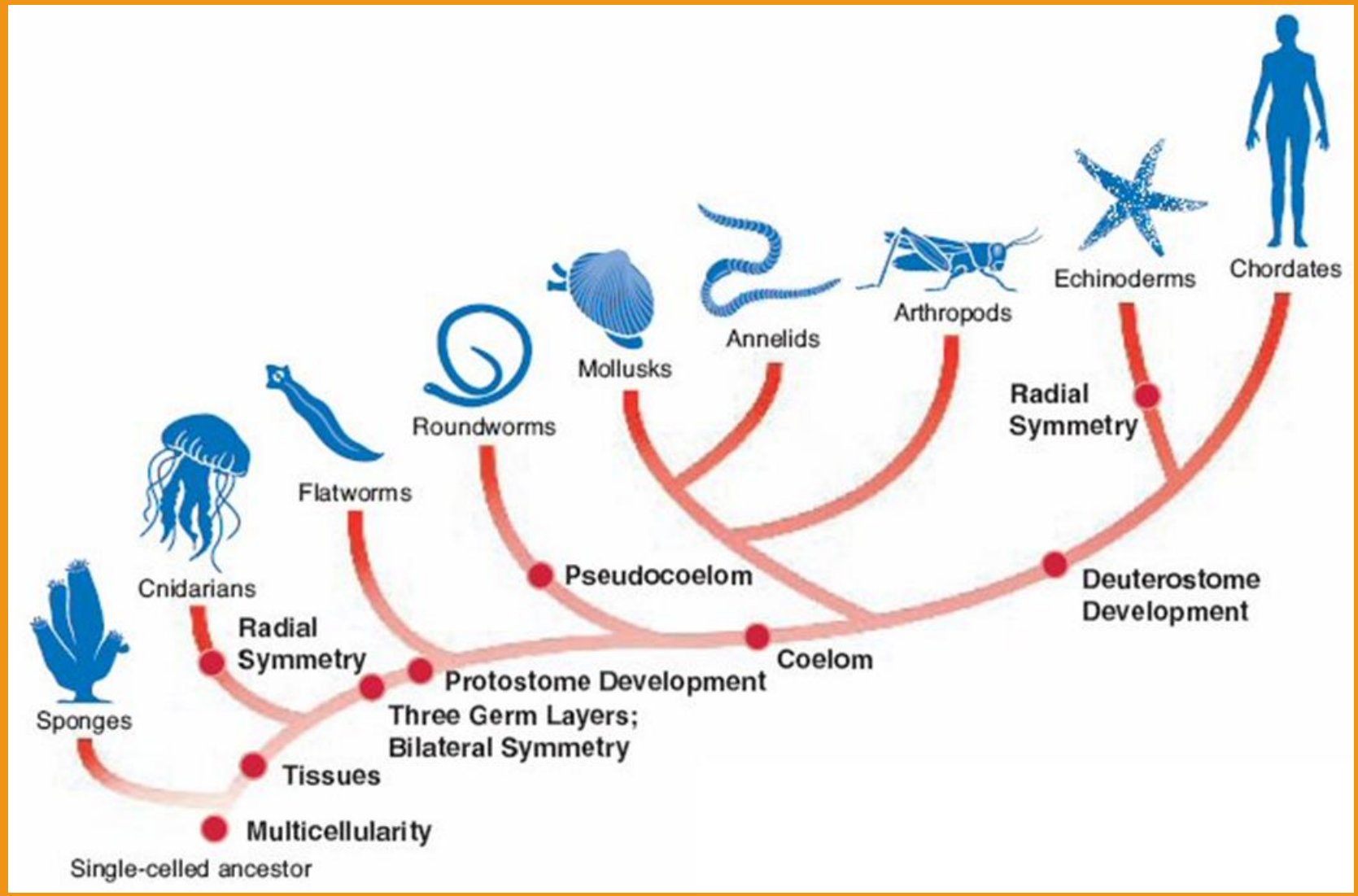
(a) Acoelomate



(b) Pseudocoelomate



(c) Coelomate


Chordates
Echinoderms
Arthropods
Annelids
Mollusks
Roundworms
Flatworms
Cnidarians
Sponges
Radial Symmetry
Pseudocoelom
Deuterostome Development
Coelom
Protostome Development
Three Germ Layers; Bilateral Symmetry
Tissues
Multicellularity
Single-celled ancestor

Comparing Invertebrates:Evolutionary Trends

- Each phylum in the fossil record represents the evolution of a successful and unique body plan.
- Features of this body plan typically change over time, leading to the formation of many new traits.

Comparing Invertebrates

	Sponges 	Cnidarians 	Flatworms 	Roundworms 
Germ Layers	Absent	Two	Three	Three
Body Symmetry	Absent	Radial	Bilateral	Bilateral
Cephalization	Absent	Absent	Present	Present
Coelom	Absent	Absent	Absent	Pseudocoelom
Early Development	———	———	Protostome	Protostome

Comparing Invertebrates

	Annelids	Mollusks	Arthropods	Echinoderms
				
Germ Layers	Three	Three	Three	Three
Body Symmetry	Bilateral	Bilateral	Bilateral	Radial (adults)
Cephalization	Present	Present	Present	Absent (adults)
Coelom	True coelom	True coelom	True coelom	True coelom
Early Development	Protostome	Protostome	Protostome	Deuterostome