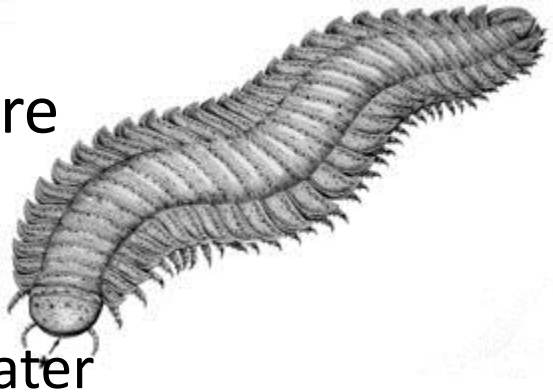
Comparing Invertebrates

Chapter 29

29-1 Invertebrate Evolution



- Earliest and most primitive animals were
  - Simple
  - Made of soft tissue
  - Absorbed nutrients from surrounding water
  - Some had photosynthetic algae living within their tissues
  - Segmented
  - Bilateral symmetry
  - Little cell/internal specialization
  - Little organization back to front
  - May have been related to jellyfish and worms but body plan distinct from anything living today

29-1 Invertebrate Evolution

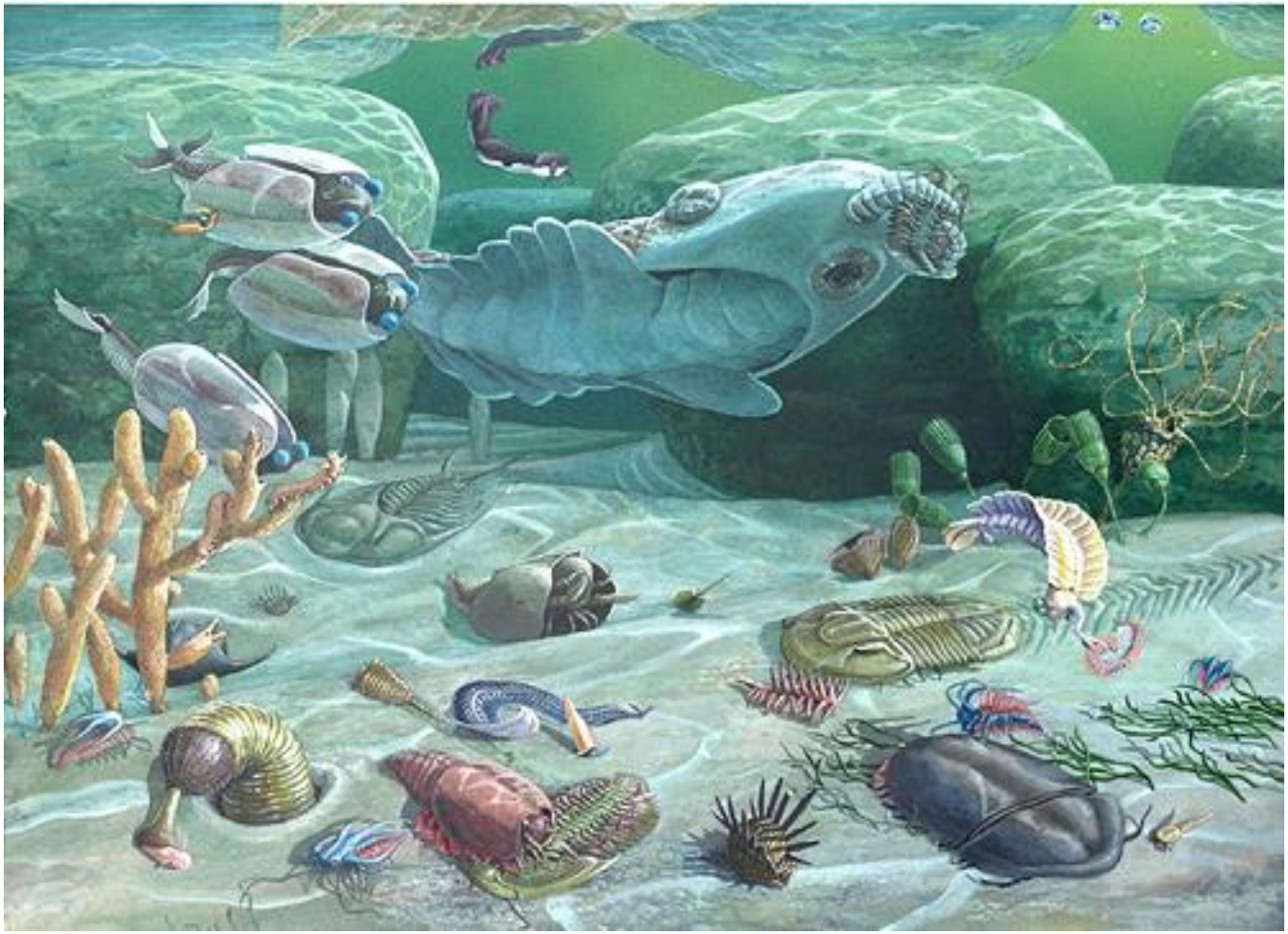
- Beginnings of invertebrate diversity
- Cambrian period-544 mya-suddenly see an abundance of diversity in fossil record-Why?
  - Shells
  - Skeletons
  - Hard body parts

  - Burgess shale in Canada-most diverse and numerous fossils found anywhere
  - http://www.sciencechannel.com/tv-shows/greatest-discoveries/videos/100-greatest-discoveries-burgess-shale-discovery/

29-1 Invertebrate Evolution

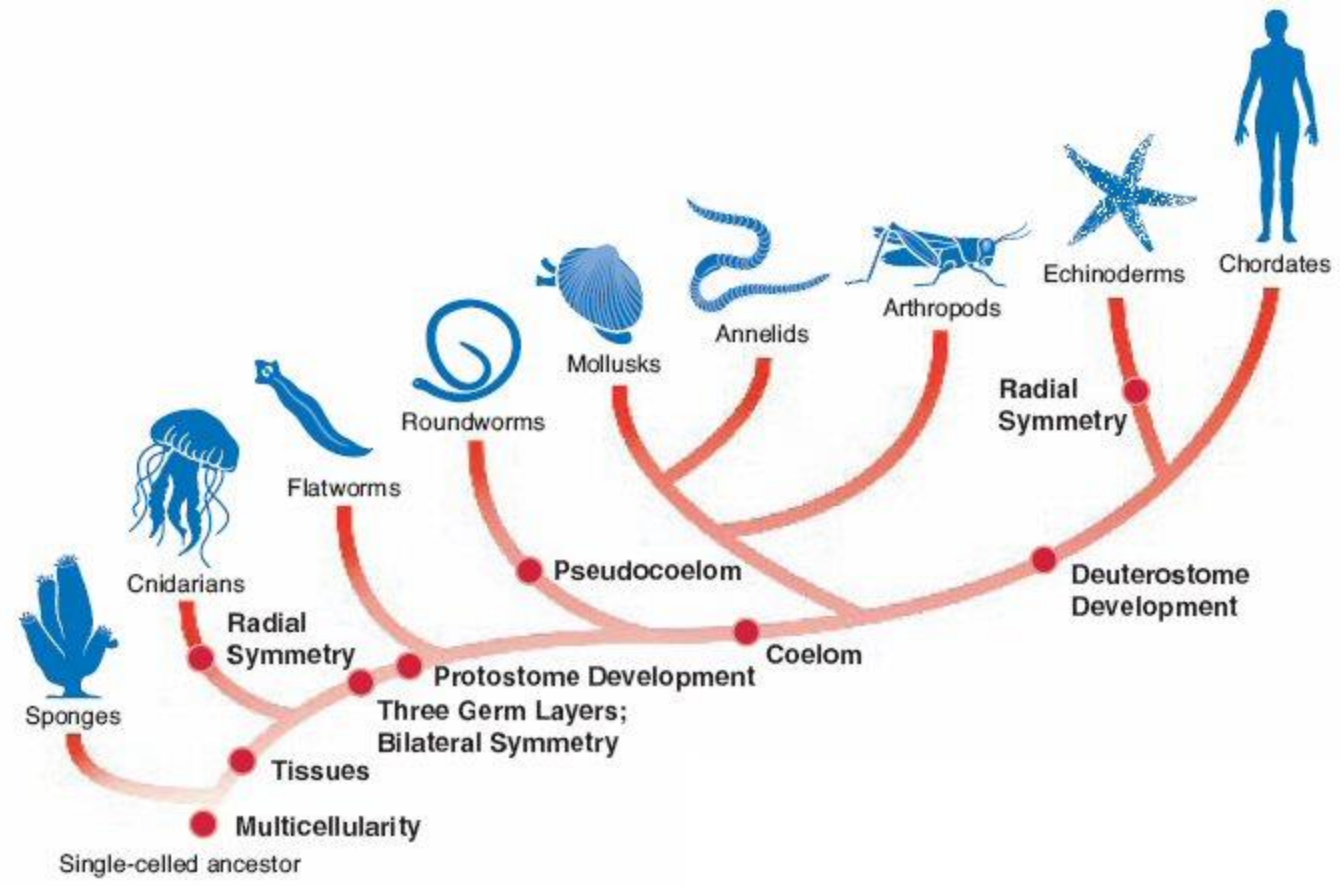
- Only a few million years later
  - Complex body plans
  - Specialized cells and tissues, organs
  - Body symmetry
  - Segmentation
  - Skeleton
  - Back and front sides
  - appendages
  - Cambrian explosion
  - Ancestors of modern phyla

Cambrian Explosion



29-1 Invertebrate Evolution

- Modern evolutionary relationships



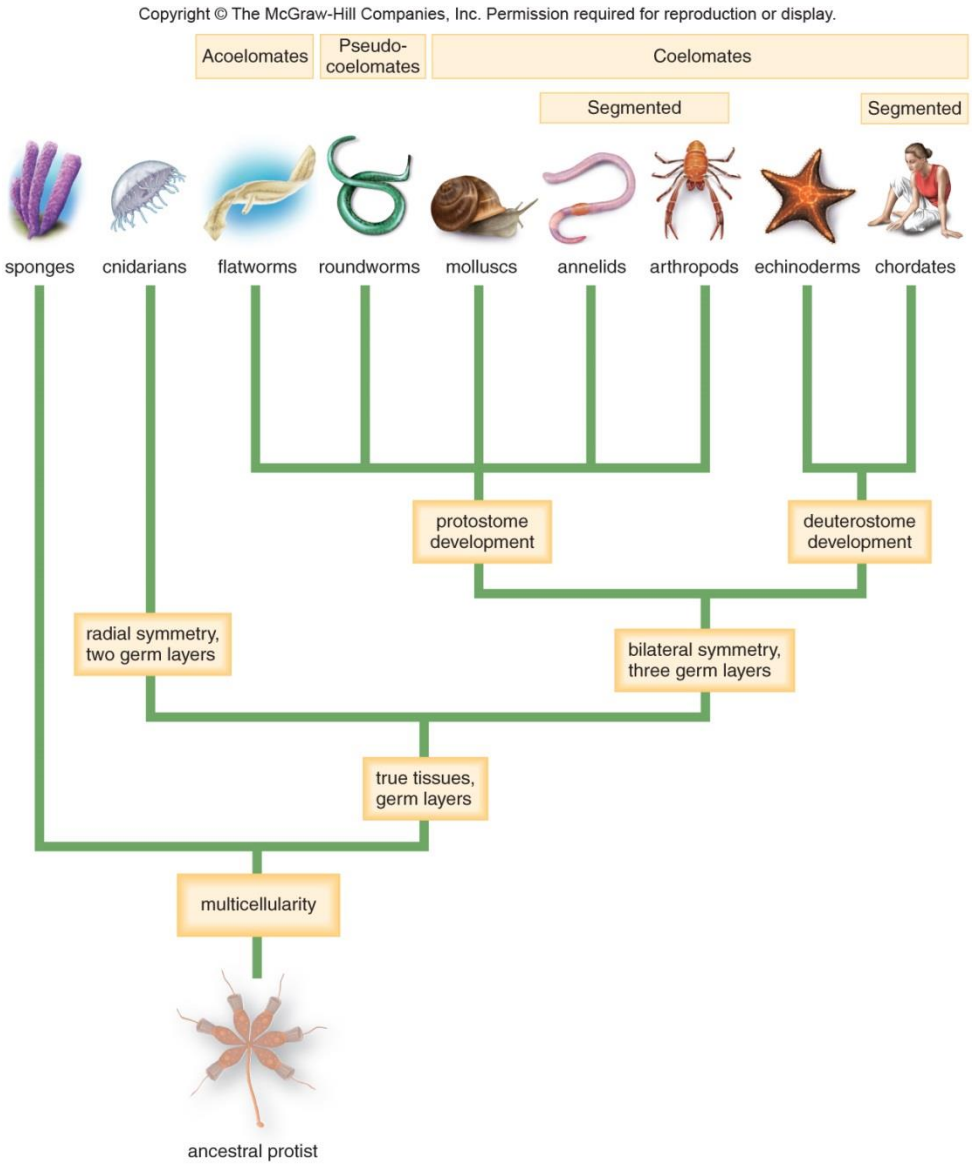
29-1 Modern Evolutionary Trends

- The appearance of each phylum in the fossil record represents the evolution of a successful and unique body plan
  - Specialized cells and tissues or organs
  - Body symmetry-radial or bilateral
  - Cephalization-concentration of sense organs and nerve cells in the front of the body-more sophisticated response to environment

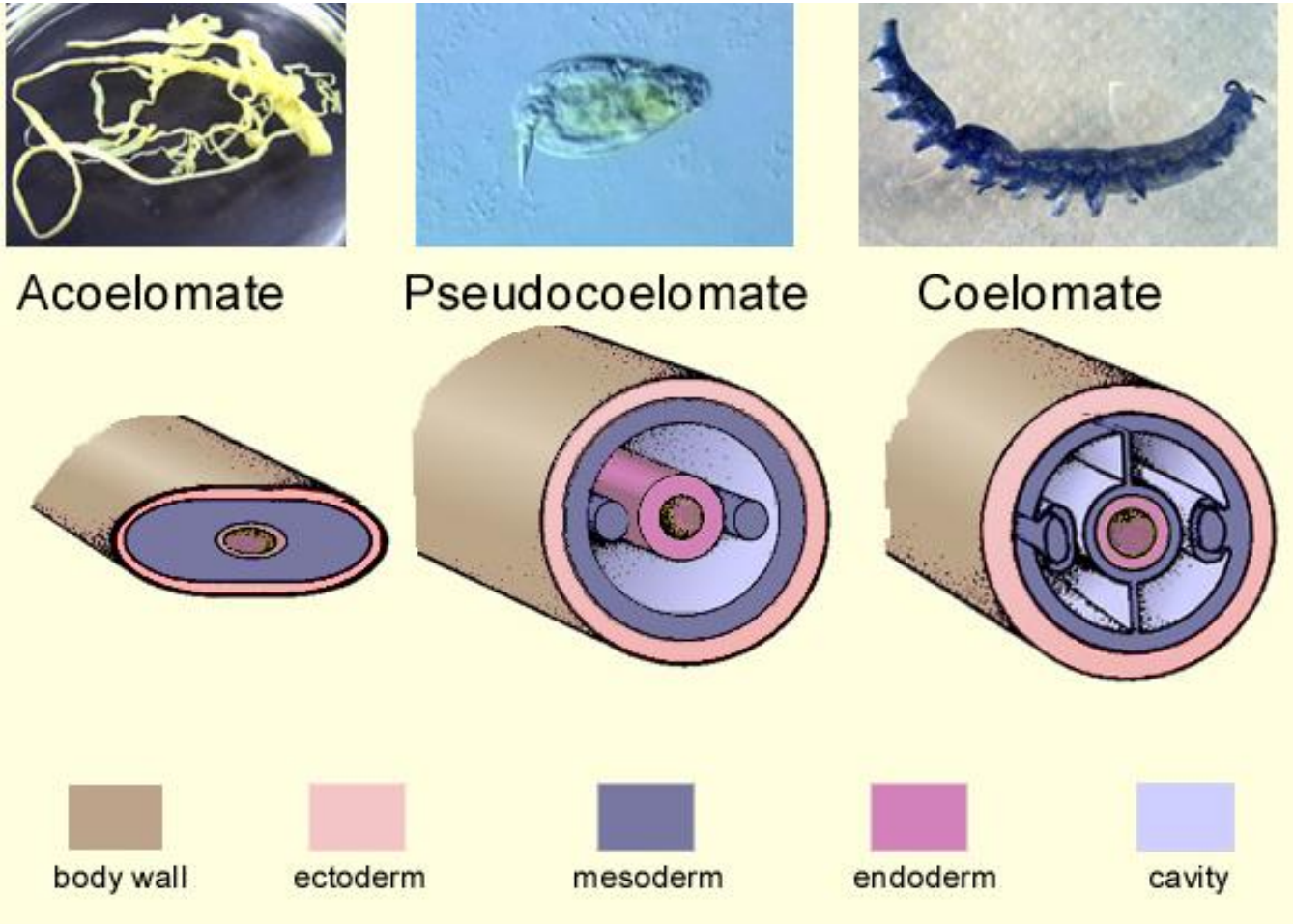
29-1 Modern Evolutionary Trends

- Segmentation-specialization of each segment, allows for increased body size without requiring new genetic information
- Coelum formation-body cavity between the germ layers lined with mesoderm
- Early development
  - Protosomes-opening of blastula becomes mouth
  - Deutersomes-opening of blastula becomes anus

29-1 Modern Evolutionary Trends



29-1 Modern Evolutionary Trends



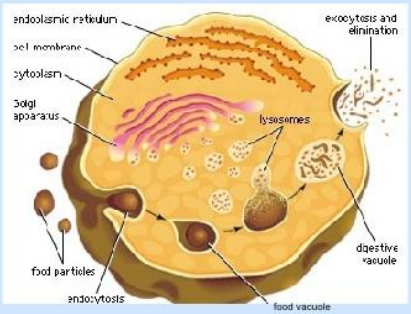
29-2 Structure and Function

- Feeding and Digestion
- Simple animals break down food using intracellular digestion-sponges
- More complex organisms do it through extracellular digestion(digestive tract)-worms, Cnidarians (jellyfish)
- Some complex organisms ingest food and expel waste through same opening (flatworms), some have a one way digestive tract (roundworms, grasshoppers, etc)

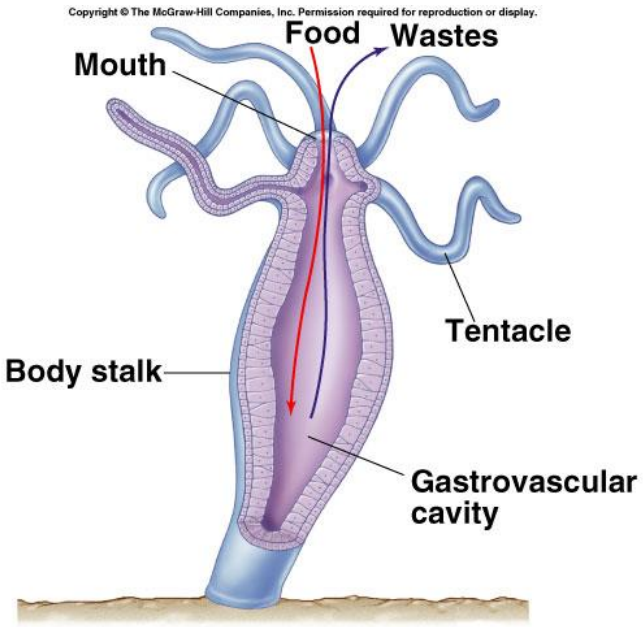
Intra- vs Extracellular digestion

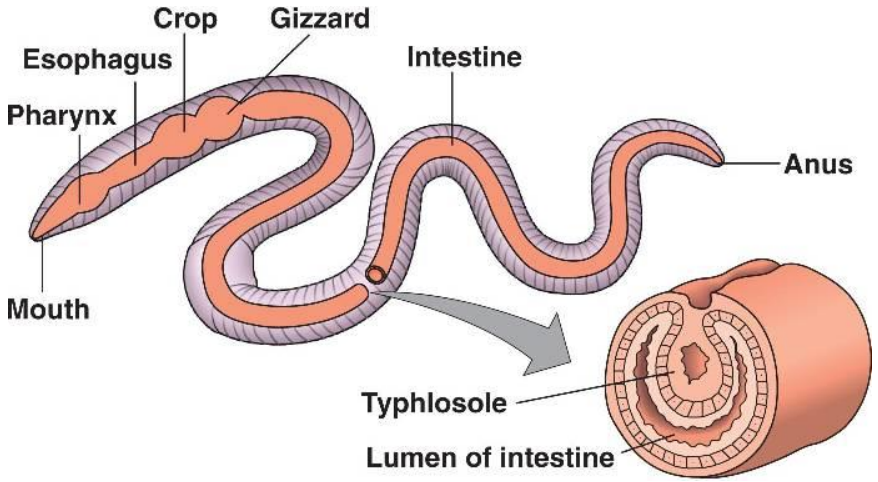
Intracellular Digestion

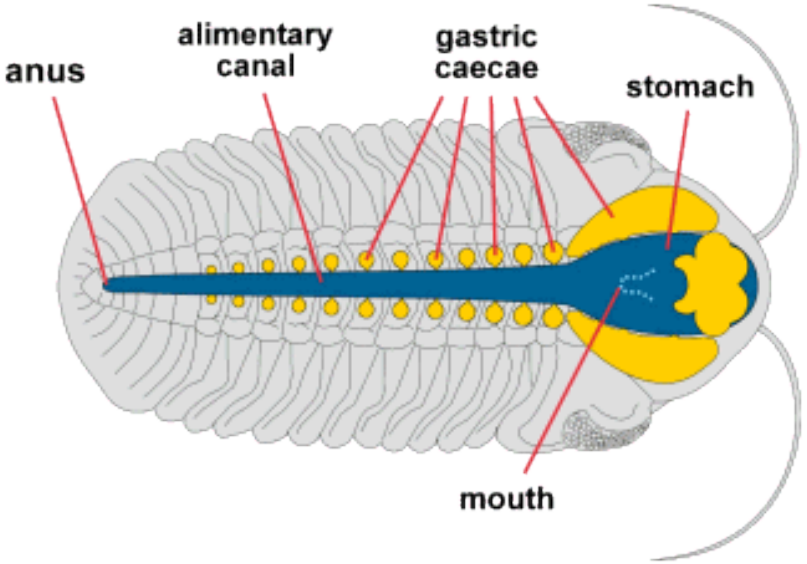
- Food particles are taken in by endocytosis and digested inside of food vacuoles
- Occurs safely within a compartment that is enclosed by a membrane



Digestive systems



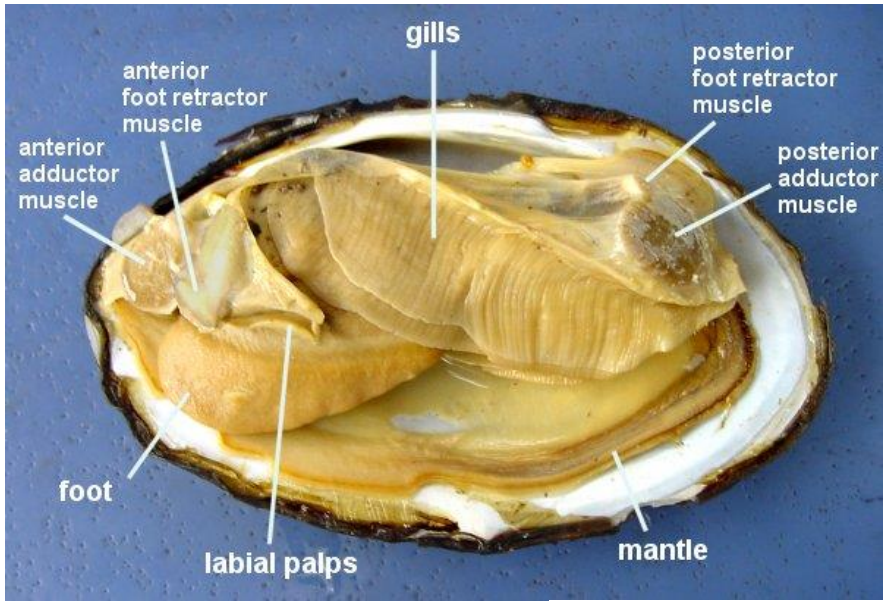


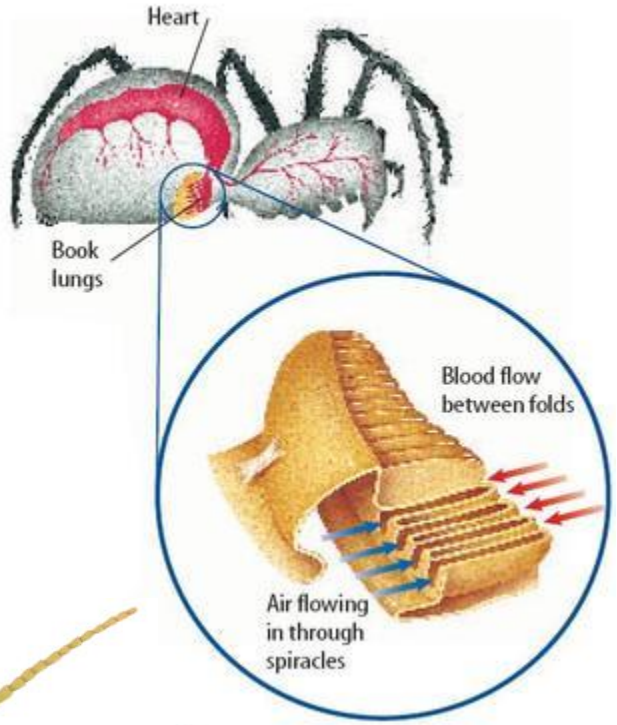


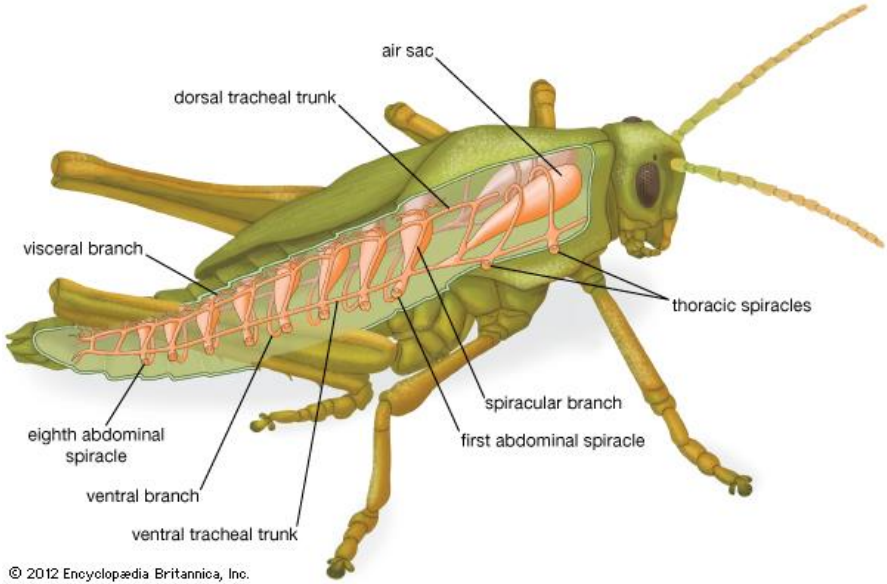
29-2 Structure and Function

- Respiration
- Organs must have large surface area and be moist (for diffusion)
- Aquatic animals naturally have moist surfaces
- Some small animals respire through skin(worms)
- For larger organisms, gills (aquatic animals), mantle cavity (snail), book lungs (spiders), spiracles (insects)
- All involve diffusion of gases

Respiration in invertebrates

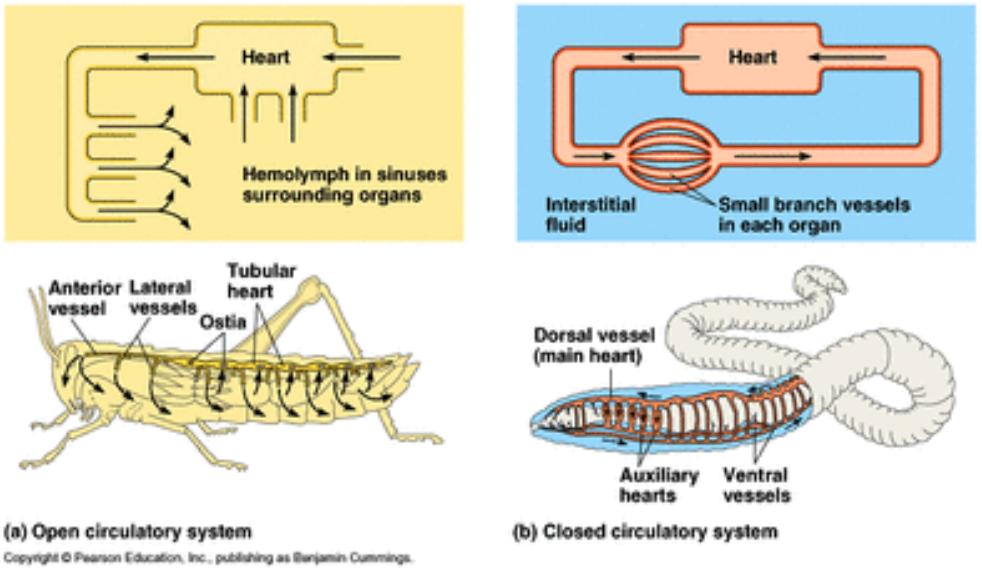






29-2 Structure and Function

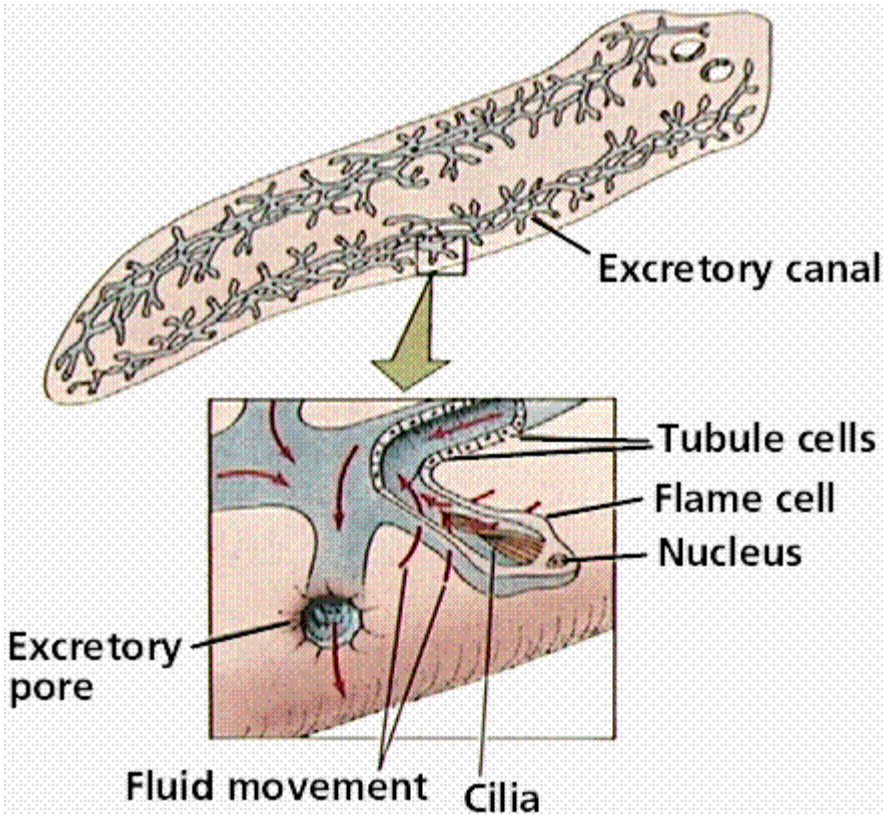
- Circulation
- One or more hearts
- Open (blood only partially contained within blood vessels) or closed circulatory system

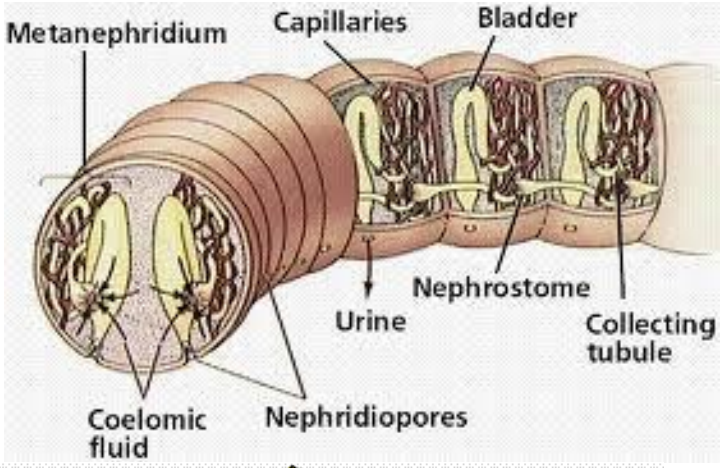


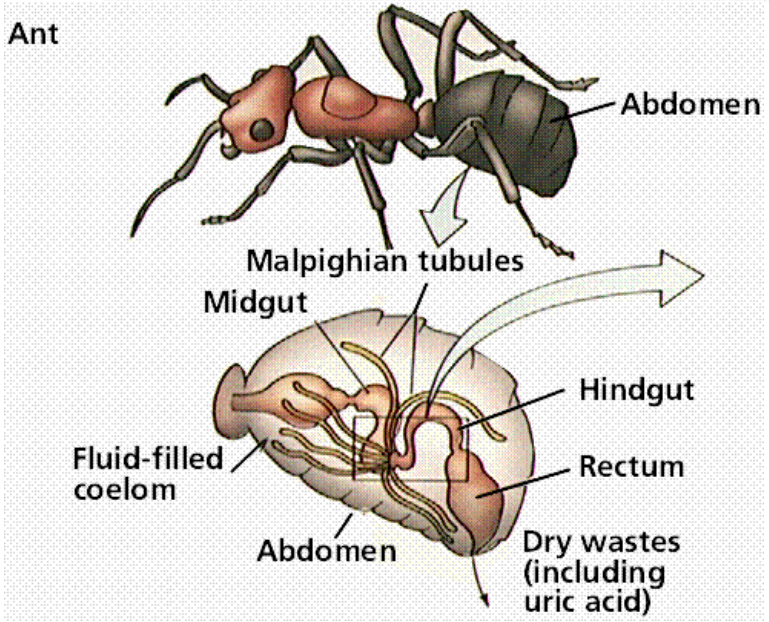
29-2 Structure and Function

- Excretion
- Rids body of waste and maintains water levels in tissues
- Diffusion of ammonia in aquatic invertebrates(sponges, jellyfish, roundworms)
- Terrestrial inverts must maintain water and get rid of ammonia. Convert it to urea and eliminate in urine
  - Nephridia (mollusks)
  - Malphigian tubes (insects, spiders)

Invertebrate excretory systems



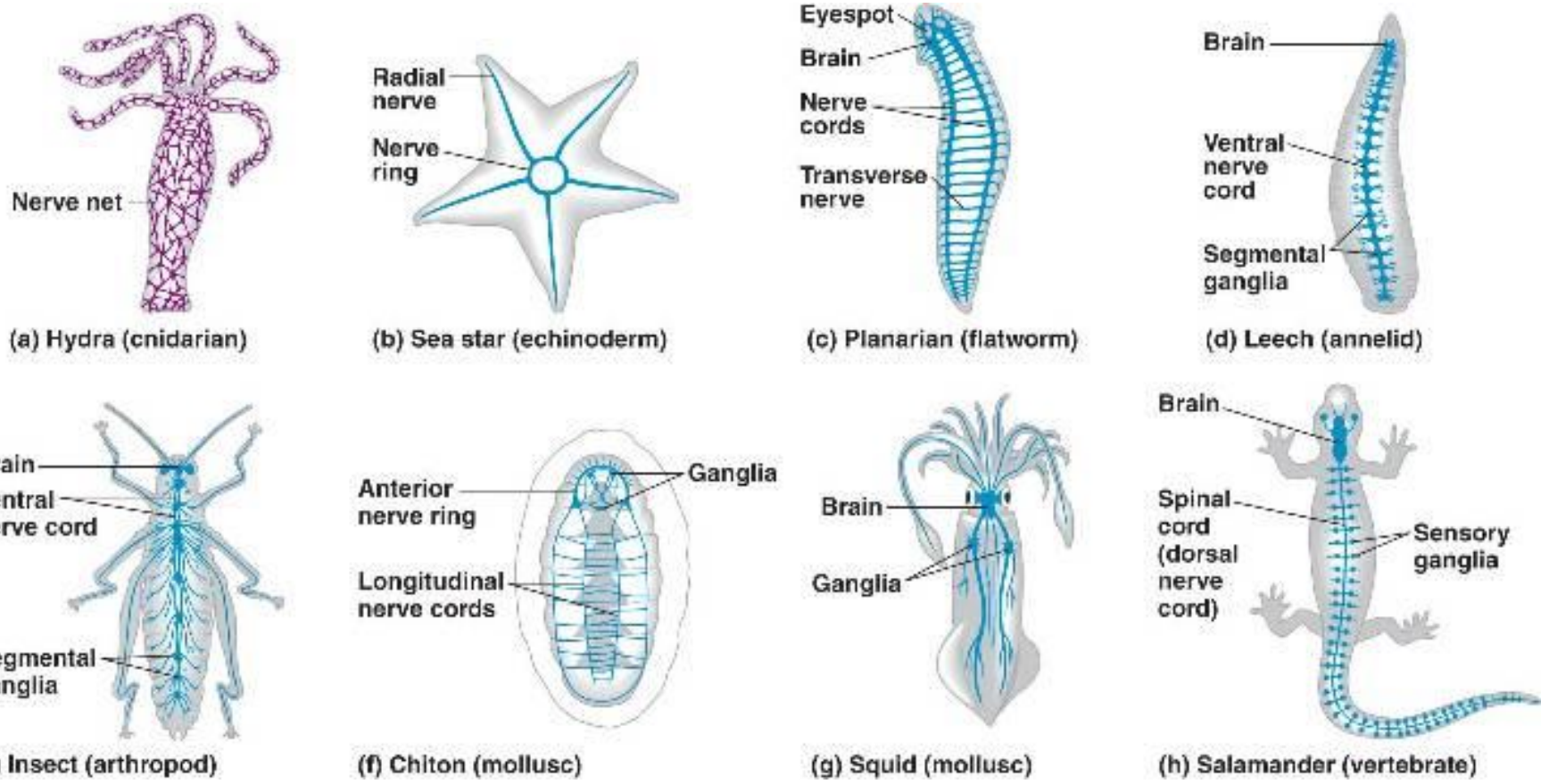




29-2 Structure and Function

- Response
- Three trends in NS development
- Centralization-nerve cells are centralized and not spread out like a net
- Cephalization-concentration of nerve cells in one end of the body
- Specialization-specialized sense organs for light, sound, chemicals, electricity, movement

Invertebrate nervous systems



29-2 Structure and Function

- Movement and support
- Most animals use muscles to move
- Muscles move organisms by contraction
- Usually work with skeletal system
  - Hydrostatic-muscles surround a fluid filled opening, when muscles contract animal changes shape
  - Exoskeleton-hard body covering made of chitin, arthropods,muscles bend and straighten exoskeleton at joints
  - Endoskeleton-calcified plate, echinoderms and sea stars

Invertebrate skeletons

Three types of skeletons in animals:

1. Hydrostatic

3. Endoskeletons

2. Exoskeletons

29-2 Structure and Function

- Reproduction
- Mostly sexual, but many may also reproduce asexually
- Asexual-allows rapid reproduction, can take advantage of favorable conditions
  - Fragmentation
  - Budding
- Sexual maintains genetic variation
  - Seperate sexes or hermaphroditic
  - External and internal fertilization

Invertebrate reproduction