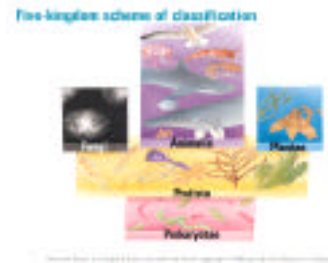


Animalia

Chapter 31

Five-Kingdom Classification

- ✓ Monera
- ✓ Protista
- ✓ Fungi
- ✓ Plantae
- ✓ Animalia



530 mya - Choanoflagellates

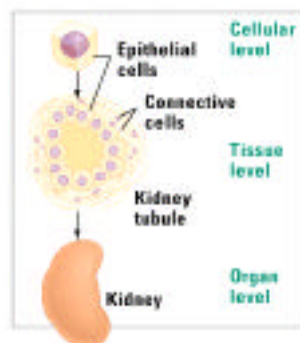
Some animals of the Burgess Shale



General features of animals

- ✓ Multicellular heterotrophs
- ✓ Eukaryotes
- ✓ Diverse in form
 - 99% are invertebrates
 - 1% are vertebrates
- ✓ No cell walls
 - Tissues
- ✓ Active movement
- ✓ Sexual reproduction
- ✓ Embryonic development

The structure of animals



Animals

- ✓ Diverse
 - Coral reefs, fishes, shelled animals, worms, sponges, sea anemones
 - A few corals reproduce asexually-budding
 - No alternation of generations - a few exceptions
 - Usually ingest their food - parasites absorb
 - No photosynthesis - harbor algae
 - Tissues - specialized groups of cells

Animals

- ✓ 4-30 million animals
 - 35 phyla
 - 40,000 vertebrate - subphylum
 - ↳ Fish, frogs, snakes, birds

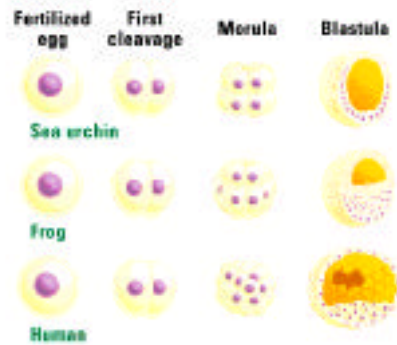
Animalia

- ✓ 2 subkingdoms
 - Parazoa
 - ↳ 5000 species
 - ↳ All are sponges
 - Eumetazoa
 - ↳ 4 million species
 - ↳ Every animal except sponges

Animal development

- ✓ Zygote - fertilization
- ✓ Cleavage
 - Increase in cell number without an increase in size
- ✓ Blastula
 - A hollow ball of cells
- ✓ Gastrula
 - Cavity -blastopore
 - Archenteron
 - Three dermal layers
 - ↳ **Endoderm**- intestines, digestive system
 - ↳ **Ectoderm**- skin, sense organs, nervous system
 - ↳ **Mesoderm**- muscle, skeleton, connective tissue

Common development in eumetazoan embryos

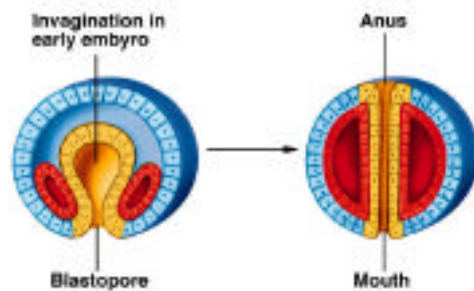


Blastopore formation

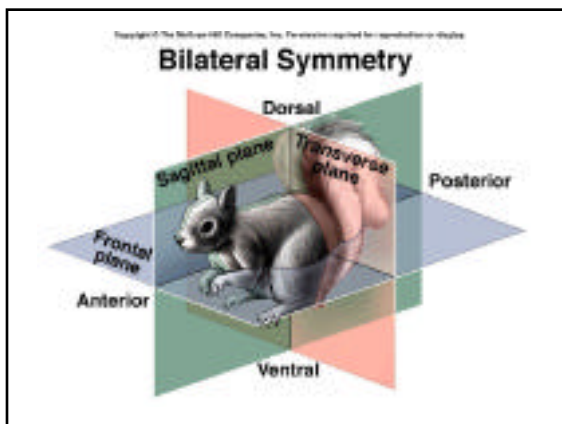
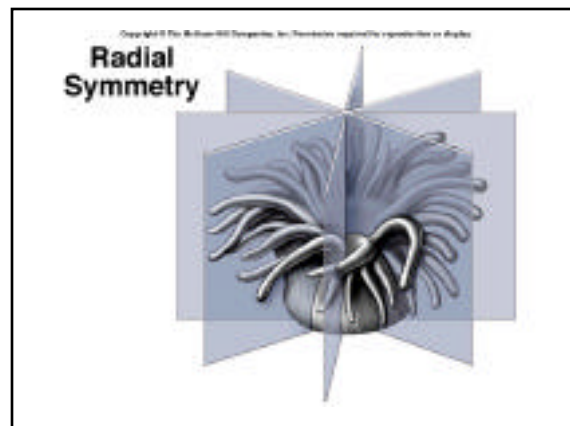
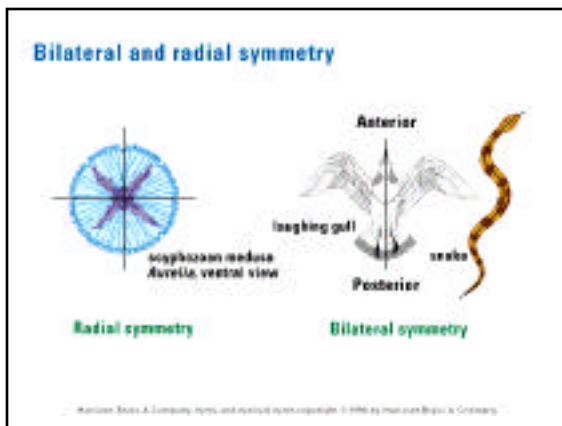
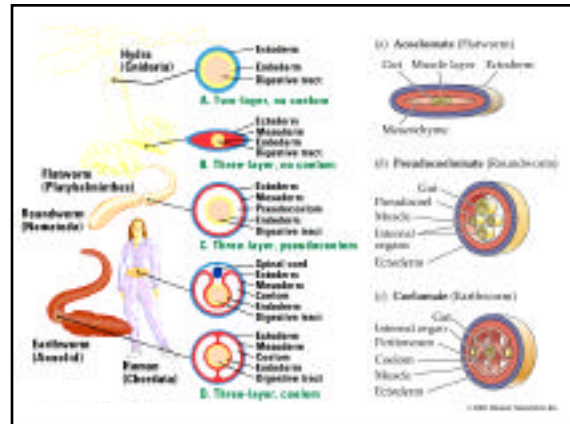
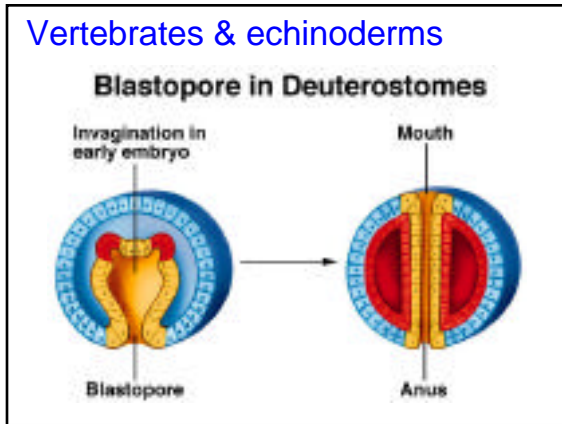


Snails, earthworms, arthropods

Blastopore in Protostomes

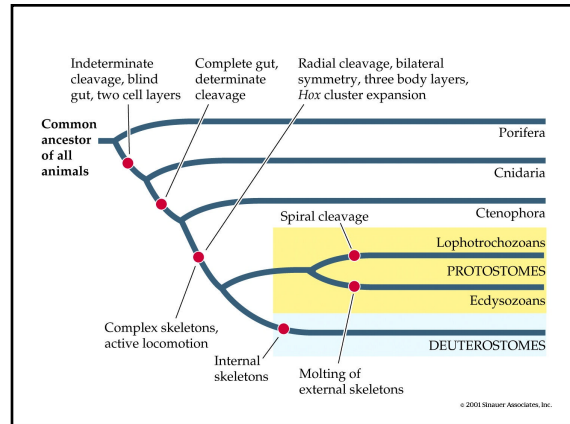
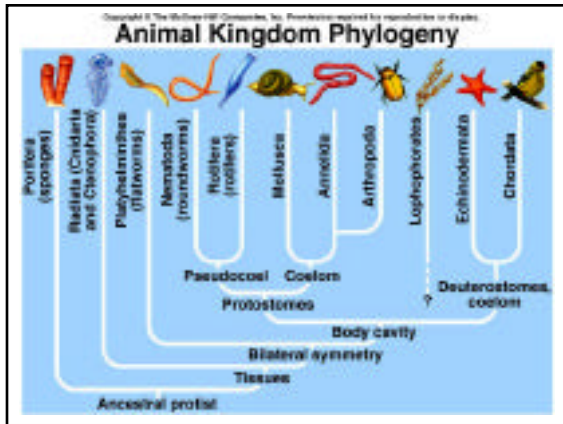


Vertebrates & echinoderms



Symmetry

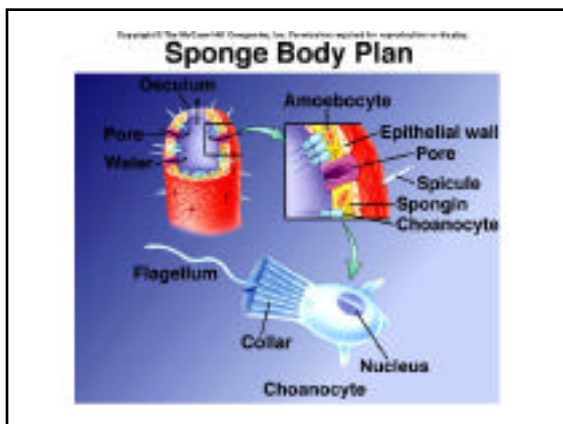
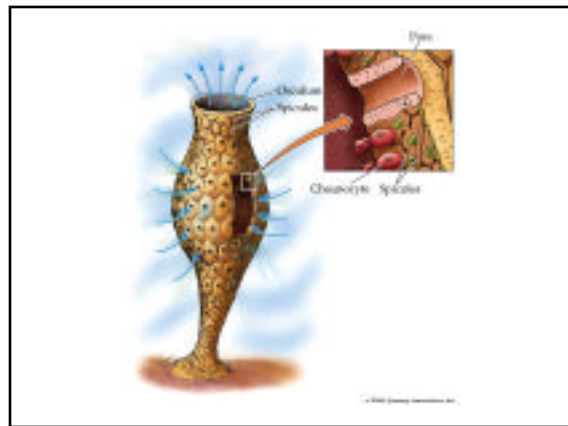
- ✓ Parazoa (sponges)
 - Non symmetrical
- ✓ Eumetazoa (jelly fish, sea anemones)
 - Radial symmetry
 - Top, bottom, but no front, back, left or right
 - Bilateral symmetry
 - Left, right, are mirror images
 - Anterior, posterior, dorsal, ventral
 - Head first



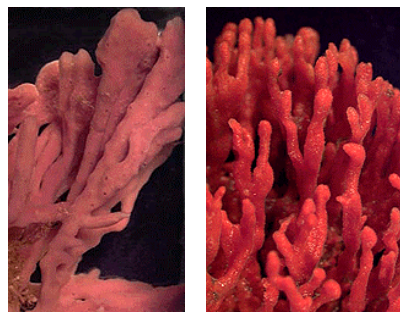
Parazoa (asymmetrical)

✓ Two phyla

- Placozoa - 2 species - large ameba with gametes
- Porifera - Sponges - 5000 species
 - ▷ Gametes, embryo, cell specialization
 - ▷ Sessile - permanently anchored
 - ▷ Full of holes - water flows through the holes
 - ▷ Flagellated cells - central cavity
 - ▷ Specialized cells capture food
 - ▷ Hermaphrodites - both male and female organs
 - ▷ No nerves coordinate a response



Sponges



Cnidarians

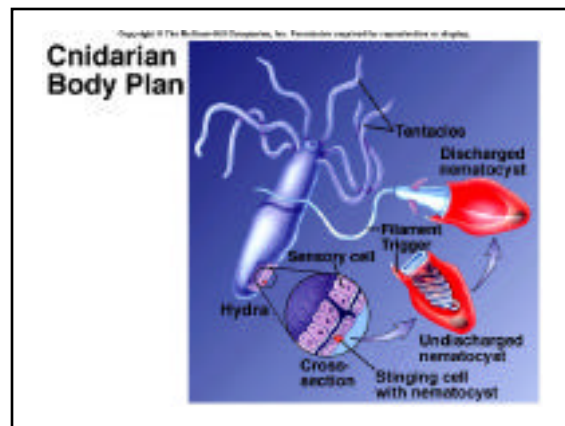
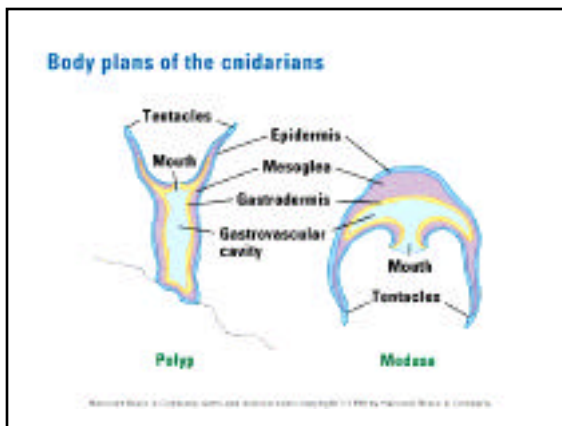
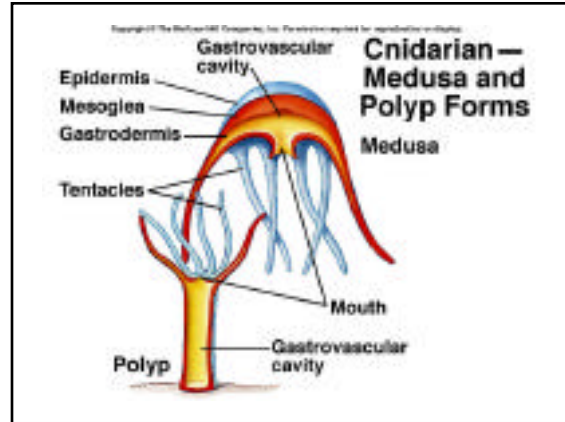
✓ Jelly fish, corals, sea anemones, hydrozoans

• 4 classes

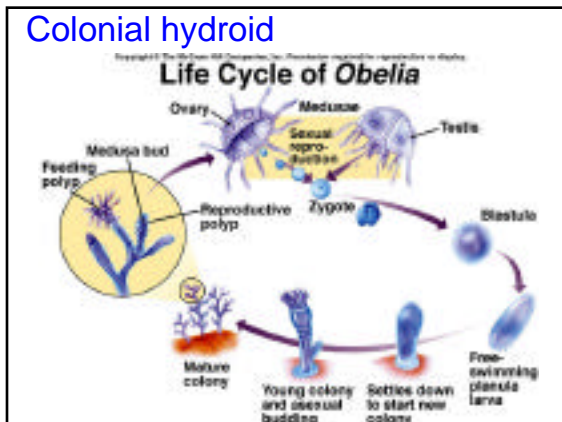
- ↳ Hydrozoa - Portuguese Man 'O' war - neurotoxin
- ↳ Scyphozoa - Jelly fish
- ↳ Anthozoa - corals & sea anemones
- ↳ Cubozoa - ?recently discovered?

• 2 plans

- Polyps - cylinders - sessile
- Medusae - bells - float free
- ↳ Tentacles to capture food
- ↳ Many start out free swimming - sessile as adults
- ↳ Mesoglea - jelly like material between two cell layers
- ↳ Cnidocytes - barbed spears - **nematocysts**



Colonial hydroid



Cnidarians (Jelly fish)



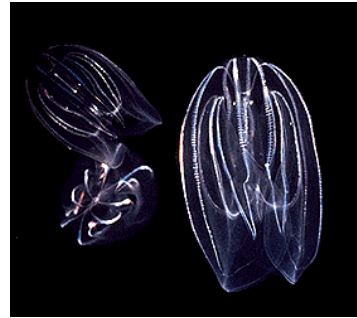
Ctenophores

- ✓ Comb jellies
- ✓ Similar cnidarians
 - Developed a complete gut
 - Food enters through the mouth
 - Waste exits through two anal pores
- ✓ 8 combslike rows of ctenes
 - Fused cilia
 - Lack nematocysts

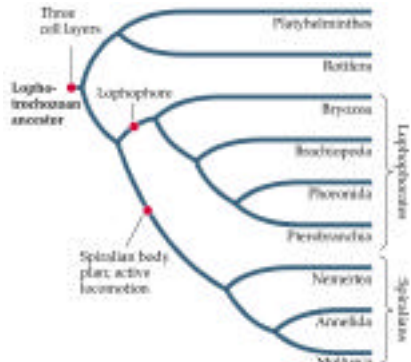
Ctenophores

- ✓ Comb jellies
- ✓ 90 species
- ✓ Move by rows of cilia
- ✓ 8 combslike rows of ctenes
 - Fused cilia
 - Lack nematocysts
- ✓ Similar to cnidarians
 - Developed a complete gut
 - Food enters through the mouth
 - Waste exits through two anal pores

Ctenophores (Comb jellies)

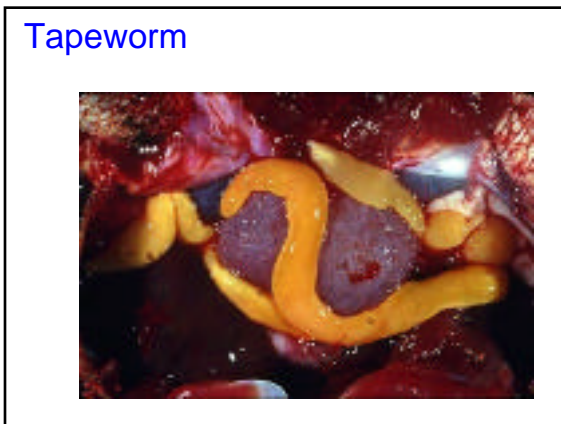
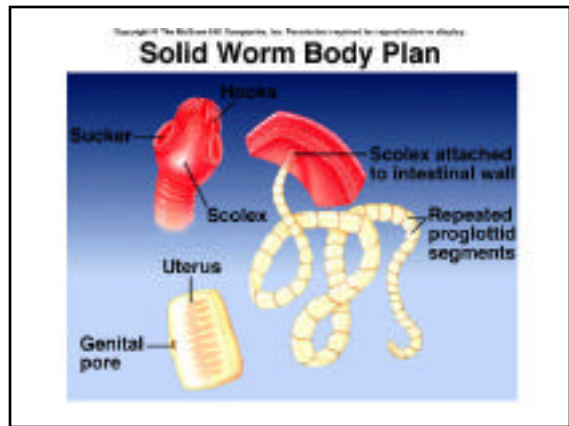
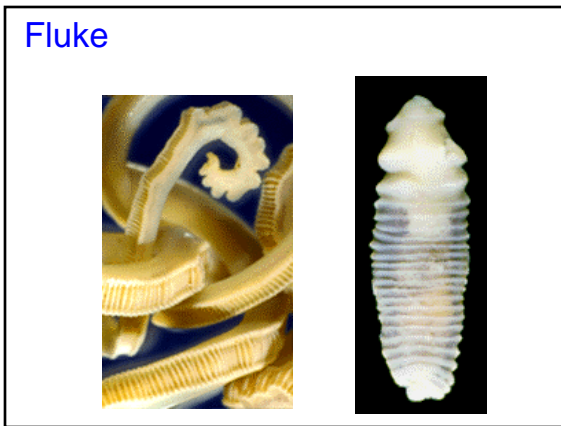
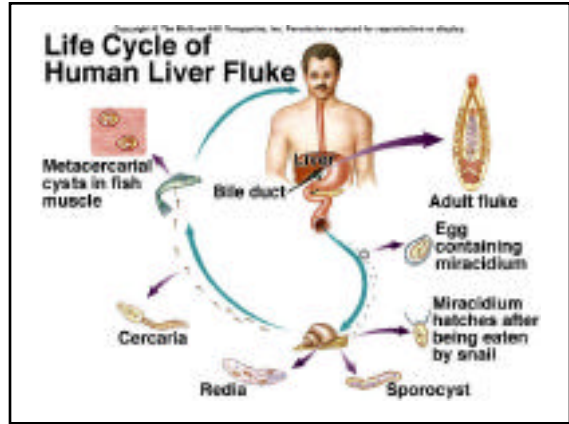
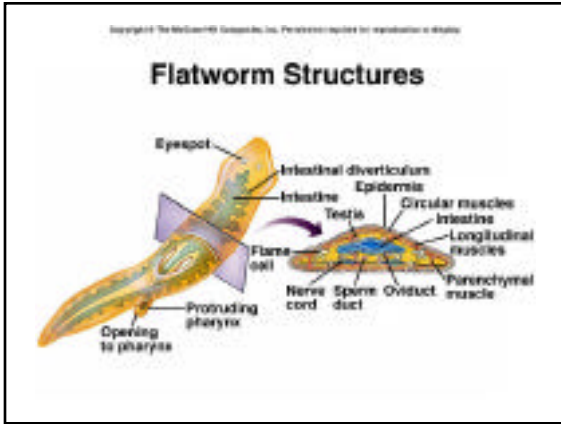


Lophotrochozoans



(Acoelomates) Platyhelminthes

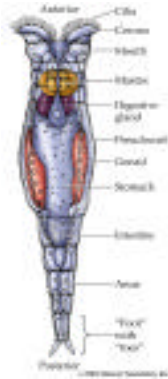
- ✓ Flatworms
- ✓ Bilateral symmetry
- ✓ 12,000 species
- ✓ 3 classes
 - **Turbellaria** - free living flat worms (*Planaria*)
 - **Trematoda** - flukes (host by hook or sucker)
 - **Cestoda** - tapeworms - no digestive system, absorbs nutrients, scolex for attachment, proglottids (segments) 10 meter long
- Move by beating cilia
 - Head, sac-like gut (not one way), 3 germ layers, true organs, no body cavity (acoelomate)
 - Hermaphroditic
 - No circulatory system - flat - distance is small
 - Asexual reproduction by fission and sexual



- ### Flukes and Tapeworms are parasites
- ✓ What make them adapted for a parasitic life
 - Rapid reproduction
 - Distinct stages that allow passage and dispersal through more than one host
 - Organs for attachment to their hosts
 - Specialized digestion (tapeworms absorption)
 - Reduced sense organs

Rotifera (Rotifers)

- ✓ Bilaterally symmetrical pseudocoelomates
- ✓ Cilia around the head - sweeps in food
- ✓ Fresh water
- ✓ Sexes are separate
- ✓ Parthenogenesis in many species



Nemertea (ribbon worms)

- ✓ 750 species in sea, fresh water or tropics
- ✓ Proboscis can be venomous
- ✓ Tidal mudflats
- ✓ Non-hermaphroditic
- ✓ Two-ended digestive tract, one way gut
- ✓ Circulatory system, no heart
- ✓ Nervous system, organs

Nemertea (ribbon worms)



Annelida (earthworms)

- ✓ Land or water 1 mm to 3 m
- ✓ Metamere - identical sections
- ✓ Nephridia (kidney like organs)
- ✓ Closed circulatory system - larger vessels serve as a heart
- ✓ No gills or lungs - gases diffuse through tissue

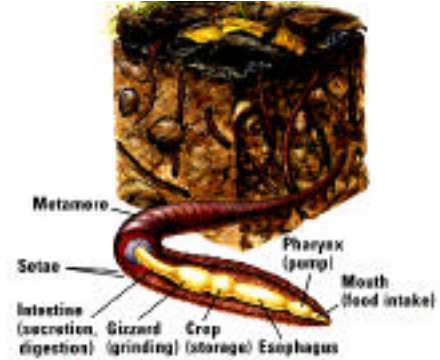
Annelida (earthworms)

- ✓ Three classes
 - Polychaetes - Free living bristle worms - mostly marine
 - Parapodia - leglike paddles
 - Setae - bundles of bristles on the parapodia
 - Separate male and female sexes
 - Oligochaetes - earthworm and related forms
 - No parapodia
 - Few setae
 - Hermaphrodites
 - Hirundinea - leeches (blood suckers)
 - No segmentation
 - Hermaphrodites
 - Sucker on each end
 - Vestimentiferans - thermal vents

Polychaete



Annalida (earthworms)



Protostome coelomates

- ✓ Internal body cavity outside the digestive tract
- ✓ Advantages of a coelom
 - Free muscle movement
 - Hydrostatic skeleton for muscle movement
 - Protective place for the production of sperm and ova

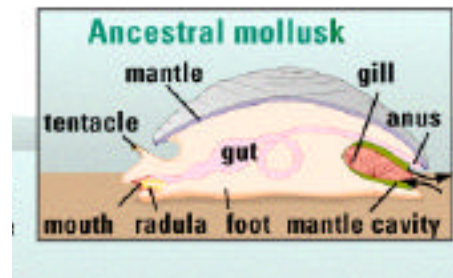
Mollusca

- ✓ Body plan
 - Visceral mass (internal body organs)
 - Foot (muscular extension of the body-sensing, grabbing, creeping, and digging)
 - Mantle (dorsal area that usually has a shell)
 - Contain either gills or lungs
 - Operculum (protective flap - trap door)
 - Radula - rasping tongue
 - Nephridia (kidney-like structure)
 - Open or closed circulatory system, heart, gills
 - Land snails - fertilization is internal, other is external
 - Most have male and females separate
 - Some change sexes

Mollusca

- ✓ Three classes
 - Bivalves
 - Clams, oysters, scallops, mussels
 - Gastropods
 - Snails, conches, abalone, and slugs
 - Cephalopods
 - nautilus, squids, cuttlefish, and octopods
 - Several tentacles (former foot)
 - = Squid 10
 - = Octopus 8

Ancestral mollusk



Cephalopod



Bivalve and Gastropod

