Traditional classification based on body plans

- 4 main morphological and developmental features used
  1. Presence or absence of different tissue types
  2. Type of body symmetry
  3. Presence or absence of a true body cavity
  4. Patterns of embryonic development

Parazoa – Phylum Porifera

- Sponges
- Loosely organized and lack tissues
- Multicellular with several types of cells
- 8,000 species, mostly marine
- No apparent symmetry
- Adults sessile, larvae free-swimming
- Water drawn through pores (ostia) into spongocoel
- Flows out through osculum
- Choanocytes line spongocoel
  - Trap and eat small particles and plankton
- Mesohyl between choanocytes and epithelial cells
  - Amoebocytes absorb food from choanocytes, digest it, and carry to other cells
  - Spicules (skeletal fibers) or spongin

- Reproduce
  - Sexually
    - Most hermaphrodites producing eggs and sperm
    - Gametes are derived from amoebocytes or choanocytes
  - Asexually
    - Small fragment or bud may detach and form a new sponge

Radiata – Phylums Cnidaria and Ctenophora

- Radial symmetry
- Mostly marine
- Only 2 embryonic germ layers
  - Diploblastic
  - Ectoderm and endoderm
  - Mesoglea connects layers
Phylum Cnidaria

- First clade with true tissues
- Gastrovascular cavity for extracellular digestion
  - Allows ingestion of larger food particles
  - Advance over sponge’s intracellular digestion
- True nerve cells arranged in nerve net
  - No central control organ

Phylum Ctenophora

- Comb jellies
- Less than 100 species- all marine and look like jellyfish
- Eight rows of cilia on surface beat for propulsion
- 2 long tentacles without stinging cells
- Colloblasts secrete sticky substance
- First complete gut – mouth and anus
- Hermaphrodite
- Bioluminescent
Lophotrochozoa

- Flatworms, rotifers, lophophorates, mollusks and annelids
- Traditionally, bilaterally symmetrical animals split into those with no coelom (platyhelminthes), pseudocoleomate (nematodes and rotifers) and remaining coelomate phyla
- Molecular data suggests a different grouping with the deuterostomes separate and the protostomes divided into the Lophotrochozoa (Platyhelminthes, Rotifera, Lophophorata, Mollusca and Annelida) and the Ecdysozoa

Phylum Platyhelminthes

- Flatworms
- Lack a specialized respiratory or circulatory system to transport gases
- Respire by diffusion
- Among first animals with active predatory lifestyle
- Bilaterally symmetrical with a head

- First with 3 embryonic germ layers – triploblastic
- Mesoderm key innovation – led to more sophisticated organs
- Acoelomate – lacking fluid-filled cavity
Digestive system incomplete
Distinct excretory system with protonephridia and flame cells
Light sensitive eyespots or ocelli
Cerebral ganglia receive input
Retain nerve net with beginning of more centralized nervous system
Sexual or asexual reproduction
  □ Most hermaphroditic but do not self fertilize

4 classes
- Turbellaria – Free-living, *Planaria*
- Monogenea – Fish flukes
- Cestoda – Tapeworms, parasitic
  □ 2 separate host species in life cycle
- Trematoda – Flukes, parasitic
  □ More complex life cycle with multiple hosts
  □ Chinese liver fluke, *Clonorchis sinensis*
  □ Blood flukes, *Schistosoma* spp., most common parasitic trematode infecting humans

Lophophorata
- 3 closely related phyla
  - Phoronida, Bryozoa, Brachiopoda
  - All possess a lophophore – ciliary feeding device that also functions in respiration
  - True coelom
Phylum Mollusca

- Over 100,000 species
- Soft body with, in many species, protective external shell
- Body has 3 parts
  - Foot, visceral mass and mantle
- Coelom confined to small area around heart
- Open circulatory system
- Metanephridia
- Radula – unique tongue-like organ

- Most shells complex 3 layered and secreted by mantle
- Separate sexes although some hermaphroditic
- External fertilization – some internal (key to snails colonizing land)
- Trocophore larvae develops into veliger with rudimentary foot, shell and mantle
- 8 classes with 4 common
  - Polyplacophorans, gastropods, bivalves and cephalopods
Polyplacophorans – chitons
Gastropods – snails, slugs and nudibranchs
- Largest class, shells can be reduced or lost, most marine or freshwater but some colonized land
Bivalves – clams, mussels, oysters
Cephalopods – octopuses, squids, nautiluses
- Most morphologically complex, fast-swimming marine predators, closed circulatory system
- Beaklike jaw, only nautilus has external shell, some have foot modified into muscular siphon for propulsion

Phylum Annelida
- Rings are distinct segments separated by a septum
- Segmentation has advantages
  1. Repetition of components provides backup
  2. Coelom acts as hydrostatic skeleton
  3. Permits specialization

Double transport system
- Circulatory system and coelomic fluid carries nutrients, wastes and respiratory gases

Digestive system complete and unsegmented
- Sexual reproduction involves 2 individuals (sometimes separate sexes, others hermaphroditic) with internal fertilization
- Asexual reproduction by fission
- 15,000 species
- All annelids except leeches have setae on each segment
2 classes

- Polychaeta – marine worms
  - Most species rich, many long setae

- Clitellata
  - Subclass Oligochaeta – terrestrial and freshwater worms (earthworms)
    - Role in conditioning soil through castings
  - Subclass Hirudinea – leeches
    - Primarily freshwater, hirudin (anticoagulant), may be used in reattachment surgeries, generally external parasites