

**Topic:** Animal Diversity I: Invertebrates

**Reading:** Chapter 23

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**Main concepts:**

- The key features of organisms in Kingdom Animalia:
    - Multicellular
    - Heterotrophic (must consume other organisms for energy and materials)
    - Reproduce mostly by sexual reproduction.
    - No cell walls (all living things have cell membranes; only some have cell walls).
    - Most are motile at some stage in their lives.
  - Major separation among animals based on early embryonic development:
    - Protostomes: in the first fold of the embryonic disc into a tube, the “head” end seals first. These organisms develop a body cavity from the space between the body wall and the digestive cavity.
    - Deuterostomes: in the first fold of the embryonic disc into a tube, the “tail” end seals first. These organisms develop a body cavity as an outgrowth of the digestive cavity. Chordates (including vertebrates) and Echinoderms are deuterostomes.
  - Evolutionary trends in animals:
    - Development of organized tissues: this separated sponges from other animals (some taxonomists question whether sponges should be grouped with animals at all).
    - Development of bilateral symmetry: the development of a definite “head” end later led the way to a brain and specialized sense organs.
    - Development of organs: tissues organized into organs allowed for specialization of various life functions within certain organs.
    - Development of lined body cavities: this allows compartmentalization of the body cavity.
  - Major invertebrate phyla (there are many other phyla, including the Ctenophorans and many worm-like organisms):
    - Porifera (Sponges): a collection of specialized cells that function together as a single organism. Sponges lack true tissues and organs. Feed by filter-feeding. A true organism or a colony of cells?
    - Cnidaria (jellyfish, anemones, hydras, corals): radially symmetric organisms with true organized tissues but no well-developed organs. A nerve net allows environmental responses. Most cnidarians have cnidocytes, stinging cells that shoot out a poisonous, barbed filament. Two basic forms: polyp (tentacles pointing up) or medusa (tentacles pointing down).
    - Platyhelminthes (Flatworms): Have digestive organs, but lack specialized respiratory and circulatory organs. Flatworms exchange gases through their skin, so they must be flat to allow diffusion to reach all tissues. Parasitic flatworms, such as tapeworms, may have a reduced or absent digestive system, relying on the digestive system of the host to deliver nutrients.
    - Annelida (Segmented worms): Well-developed organs and organ systems, including a closed circulatory system and a primitive brain. Has a fully-lined body cavity. Segmentation allows genetic efficiency: a segment plan can be slightly modified to carry out different functions in different segments. Includes earthworms, leeches, and many marine worms.
    - Mollusca (snails, clams, etc.): Organisms that feature a large muscular foot and usually have mantle that secretes a shell. Includes. Well-developed organs and systems, but an open circulatory system. Includes gastropods (snails, slugs), bivalves (clams, oysters, etc.), cephalopods (squids, octopi, nautilus). Octopi are the most intelligent of all invertebrates, with an intelligence that rivals several vertebrate groups.
    - Arthropoda (insects, crustaceans, arachnids, etc.): Possibly the most abundant animals on the planet (rivaled in sheer numbers only by the nematodes). Characterized by an exoskeleton composed of chitin (a carbohydrate), segmented bodies, jointed legs, well-developed sensory organs, an open circulatory system.
    - Nematoda (round worms): unsegmented worms with organ systems but no respiratory or circulatory systems, skin covered with a cuticle, and a developed nervous system. Extremely abundant. Many are soil dwellers, some are marine or freshwater organisms, and some are parasites.
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- Echinodermata (sea urchins, sea stars): Radially symmetric organisms with a lined body cavity, a water vascular system with abundant tube feet, and many have an exoskeleton.

### Common misconceptions:

- Many people have a limited concept of “animal,” thinking only of mammals. The Animal Kingdom includes a wide range of multicellular motile heterotrophs. Some are large and visible; some are microscopic.

### Reading notes:

- List the characteristics that all members of the animal kingdom share.
- Make a table of the phyla listed in above and their major characteristics. List examples of organisms from each phylum.
- Describe a coelom, and the differences between a true coelom, a pseudocoelom, and organisms with no coelom.
- Distinguish between protostomes and deuterostomes.
- Describe the differences between bilateral and radial symmetry, and list examples of organisms showing each.
- Examine figure 23-1 showing the phylogeny of animals. List the features that mark branch points on the tree, and describe why these features are important.

### Useful websites:

- “[The Phyla of Kingdom Animalia](http://www.abdn.ac.uk/~nhi708/classify/animalia/index.html)” (<http://www.abdn.ac.uk/~nhi708/classify/animalia/index.html>) lists all of the current phyla in this kingdom, and includes links with pictures and information on each. (In this treatment, the arthropods have been split into separate phyla.)
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