Animal Diversity III: Mollusca, Echinodermata, etc.

Objectives:

- Be able to recognize specimens from the main groups of Mollusca and Echinodermata.
- Be able to distinguish between the bilateral symmetry of a bivalve and that of a brachiopod.
- Be able to recognize the major anatomical features of gastropods, bivalves, and cephalopods.

PHYLUM Bryozoa

This phylum and the next have a ciliated feeding organ called a **lophophore**. The Bryozoa are small animals that live in colonies. They are sometimes called "moss animals".

PHYLUM Brachiopoda

Brachiopods have a lophophore and also a two-part shell. The two valves of the shell are unequal in size and somewhat different in shape; the axis of symmetry passes through the middle of each valve. Most brachiopods are sessile, rooted to the bottom by means of a stalk.

PHYLUM Mollusca

The Mollusca are the "insects of the sea" in terms of diversity. The classes Bivalvia and Gastropoda show great disparity of shell shapes and sizes, and even lack of a shell in some cases. Molluscs play an important ecological role in marine ecosystems and, like insects on land, occupy almost every conceivable niche in the sea and many in freshwater habitats and also on land.

All molluscs have a shell-secreting organ or **mantle,** and most also have a shell. The hind end of the mantle is withdrawn to form a **mantle cavity** which is considered the hallmark trait that defines the phylum as a monophyletic group. Primitive molluscs have a toothed scraping organ, the **radula,** that allows them to feed off algae that cling to rocky surfaces. Primitive molluscs also have a muscular **foot** on which they can slowly creep forward.

In this lab, you will study the most important classes of molluscs and dissect a squid. Make sure that you study all the interesting morphological features that will help you study for the lab quiz!

CLASS Polyplacophora (chitons)

Look at the multiple plates forming the outer shell, which gives the group its name. Which internal organ secretes the shell? All chitons use their radula to eat algae.

CLASS Gastropoda (snails and slugs)

This is the largest and most diverse group of molluscs. Pay special attention to the torsion (coiling) of the shell. All gastropods use their radula as a feeding organ; some also use the radula to burrow.

CLASS Bivalvia (clams)

Look at the two valves. Notice that the plane of bilateral symmetry passes between the valves. Compare this with the preserved brachiopods (Phylum Brachiopoda), whose plane of symmetry bisects each valve down the middle. Bivalves have a wedge-shaped foot that assists them in burrowing; the older name for the bivalves is Pelecypoda, which means "hatchet-foot."

CLASS Cephalopoda (squids, octopus, and nautiloids)

The foot in these molluscs is located in the head region (the name Cephalopoda means "head-foot") and has become subdivided into a series of **tentacles** that surround the mouth. The mantle cavity in these molluscs has been folded beneath the head to form a **siphon** with a nozzle-like opening that faces forward. All living species share an unusual escape behavior: an **ink gland** secretes a dark inky fluid into the siphon, from which it forcefully squirts forward. This action propels the animal backward, in an unexpected direction, and simultaneously confuses any predator by releasing a cloud of ink that holds the predator's attention until the mollusc escapes.

Nautiloids all have a shell. They were once a large and diverse group, but only the one living genus *Nautilus* (the chambered nautilus) remains. Examine the chambered shell of *Nautilus*. The animal lives in the outermost chamber only; the earlier chambers are filled with a gas (about 98% N_2) that help it float at a controlled depth.

Ammonoids were extinct cephalopods related to the nautiloids. Some of them had enormous coiled shells, up to a meter or more in diameter.

Octopoids, including both octopuses and squids, have lost their shells (except for one squid species, the cuttlefish, that has a diamond-shaped remnant, the "cuttlebone", just under its dorsal surface).

If a demonstration is available showing the internal organs of a squid, examine the following:

Tentacles or "arms": The long ones are used mostly for locomotion by "rowing".
The shorter ones are used mostly for seizing and manipulating food.
How many of each can you count?
Eye: Fairly large, built similar to vertebrate eyes in overall construction.
Siphon (Mantle cavity), with its nozzle-like opening.
Gills, located within the mantle cavity or siphon.
Ink gland, opening into the mantle cavity, capable of squirting out a dense cloud of dark material that confuses predators during the squid's "escape" defense.
Gonad (testis or ovary).
Nidamental (egg-laying) gland (in females only).

PHYLUM Echinodermata

The Echinodermata are deuterostomes, meaning that the embryonic blastopore develops into the animal's hind end, near the anus, and the mouth forms at the other end as a secondary structure (deuterostome means "second mouth"). All vertebrates are also deuterostomes.

Except for a few very early fossil forms, all Echinodermata have evolved a complex pattern of development in which the bilaterally symmetrical larva develops into an adult with a five-fold pattern of radial symmetry.

SUBPHYLUM Crinozoa (attached, sessile echinoderms with an upward-facing mouth):

CLASS Crinoidea (and several related extinct classes)

Crinoids are sessile echinoderms attached to the bottom by a stalk. In Paleozoic times, with was once a flourishing and diverse group, but only a few species, called "sea lilies," remain today. The body of a crinoid resembles an upside-down starfish.

SUBPHYLUM Asterozoa (free-moving echinoderms with flattened, star-shaped bodies):

CLASS Asteroidea (sea stars, also called starfish)

These familiar sea creatures are predators that move about with five radial arms. The arms touch one another at their base of attachment to the central disk. Examine the suction-like tube feet that are used in both locomotion and feeding.

CLASS Ophiuroidea (brittle stars)

These deep-sea echinoderms have thinner arms that are separated from one another at their base of attachment to the central disk.

SUBPHYLUM Echinozoa (free-moving echinoderms with globular bodies):

CLASS Holothuroidea (sea cucumbers):

These soft-bodied animals usually live on the sea bottom, taking in loose sediment and filtering nutrients out of it. Find the part of the animal that shows the five-fold radial symmetry.

CLASS Echinoidea (sea urchins and sand dollars):

These are also bottom-dwelling filter-feeders, but they are protected by a shell. Examine a sea urchin. Look for the five-fold radial symmetry pattern. The sand dollar is basically a very flat relative.