PHYLUM CNIDARIA

The phylum Cnidaria (formerly Coelenterata) is composed of approximately 10,000 species and is represented by fossils found in the Burgess Shale (Cambrian). Possible fossils have been identified from Precambrian rocks. Most cnidarians are near shore marine species attached to rocks, planktonic (free-floating) or form coral reefs.

Cnidarians are radially symmetrical and diploblastic, having a body wall formed from two tissue layers. They represent the simplest animals with two body layers, an outer epidermis and an inner gastrodermis. Between these layers is a non-cellular gelatinous material termed mesoglea. Although this group has a few organ systems, most of their life processes are carried out by diffusion.

There are two basic body plans. The attached, sessile polyp (hydroid) stage and the free-swimming medusa (jellyfish) stage. Many species exhibit both body plans during their life cycle leading zoologist to call this condition “alternation of generations” or “metagenesis”. Conversely, many species only exhibit either the polyp or the medusa stage.

Class: Hydrozoa

Hydrozoan species may show metagenesis or lack either the polyp or the medusa stage. This class has a large number of colonial species that undergo metagenesis, for example Obelia, Physalia (Portuguese Man-of-War) and Vellela (Jack-Sailor by the sea).

A common fresh-water form, Hydra, is often studies in zoology laboratories. Hydra can be found in streams, ponds and lakes attached to rocks and / or vegetation. They feed on small aquatic animals such as water fleas and copepods. Obtain a living Hydra from their culture and place one in a Syracuse dish partly filled with fresh-water. Keep the dish still and observe the animal as it resumes normal activity; notice the shape and the number of tentacles. Find the mouth and its conical elevation termed the hypostome. Also locate its attachment, the pedal disc, opposite the mouth.

**Figure 1.** Sketch your specimen at four, 3-minute intervals. Use arrows to indicate motion.

**Study Questions**

1. How many tentacles does your specimen have? Do all Hydra have the same number of tentacles?
2. Can your specimen change shape? How?
3. Touch a tentacle with the tip of a dissecting probe and write down its reaction.

**Figure 2.** Draw an extended Hydra 7 cm tall. Label all structures.

Using #4 objective lens of the light microscope, examine a whole mount slide of Hydra. Look for the swollen nematocytes (cnidocytes) on the tentacles and the enclosed nematocyst (a stinging structure) in each nematocyte. Make a slide from the
tentacle of the marine anthozoan, Corynactis (your instructor will help you prepare the slide). Observe this slide and watch the nematocysts discharge.

**Figure 3.** Draw a portion of a tentacle of Hydra at 100X clearly showing the cnidocytes and nematocysts.

**Figure 4.** Draw two nematocysts, one discharged and one intact. Draw at 100X or 400X. Make each cell 3 cm long (the discharged cell will include the very long projectile).

**Figure 5.** Using a prepared slide, draw a 5 cm cross-section of Hydra and label epidermis, mesoglea, gastrocoel and gastrodermis.

Locate a slide of the Obelia hydroid whole mount (W.M.) and a slide of the Obelia medusa. Using low power (40X) observe this colonial hydrozoan and the “Alternation of Generation” phenomenon.

**Study Questions**

4. What other life form might you mistake this animal for if you encountered it in nature?
5. What animal characteristic does it display?
6. Is the Obelia medusa an individual or a colony? Why?
7. Is the Obelia hydroid an individual or a colony? Why?

**Figure 6.** Draw a life-sized Obelia colony in a 3 cm circle above figure 7 (below).

**Figure 7.** Draw an enlarged (40X) Obelia hydroid colony 10 cm long and label all structures.

**Figure 8.** Draw an Obelia medusa 10 cm in diameter and label all structures.

**Class: Scyphozoa**

The medusa (jellyfish) form dominates in this class while the polyp is reduced or absent. Most jellyfish are 4-5 cm in diameter, however some reach diameters of several meters. Examples include Aurelia, and the local jellyfish, Pelagia (reaches one-half meter in diameter).

In order to differentiate between a scyphozoan medusa and a hydrozoan medusa, look carefully under the edge of the umbrella of the medusa. The hydrozoan medusa has a small shelf or velum, which the scyphozoan medusa lacks. Furthermore, hydroid medusa rarely exceeds a centimeter in diameter while scyphozoan medusae are much larger. Another distinguishing feature is the manubrium (mouth) extending passed the edge of the umbrella in the scyphozoans, and only rarely in the hydroid medusa.

**Figure 9.** Draw a scyphozoan medusa 10 cm in diameter. Label all structures.
**Class: Anthozoa**

All members of this class lack a medusa stage. The anthozoan polyp is heavier than the hydrozoan polyp and is usually attached to some surface. A local form, the sea anemone *Anthropleura*, is common in the intertidal. Corals are small sea anemones residing in a calcium carbonate (CaCO\(_3\)) cup. They form the beautiful coral reefs encountered throughout the Indo-Pacific Ocean and portions of the Atlantic Ocean. The corals found in curio shops are actually the skeletons of these amazing animals. Look closely and notice tiny holes in coral specimens that once housed a single coral polyp. Coral organism can form reefs miles long (i.e. The Great Barrier Reef of Australia). Some Southern California beaches, such as Zuma Beach, are home to other anthozoans called sea pens or sea pansies (*Renilla*). These fleshy colonies are composed of a leaf-like primary polyp with a number of secondary feeding polyps on their upper surface. In deeper waters off our coast one can find Gorgonian “corals”. These are not true corals. Their plant-like appearance is due to a horn-like organic material made of protein, not calcium carbonate. See examples in the laboratory.

**Figure 10.** Draw a sea anemone 10 cm in diameter and label all parts.