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Learning Programs for Biology Education

Branches on the Tree of Life: Cnidarians

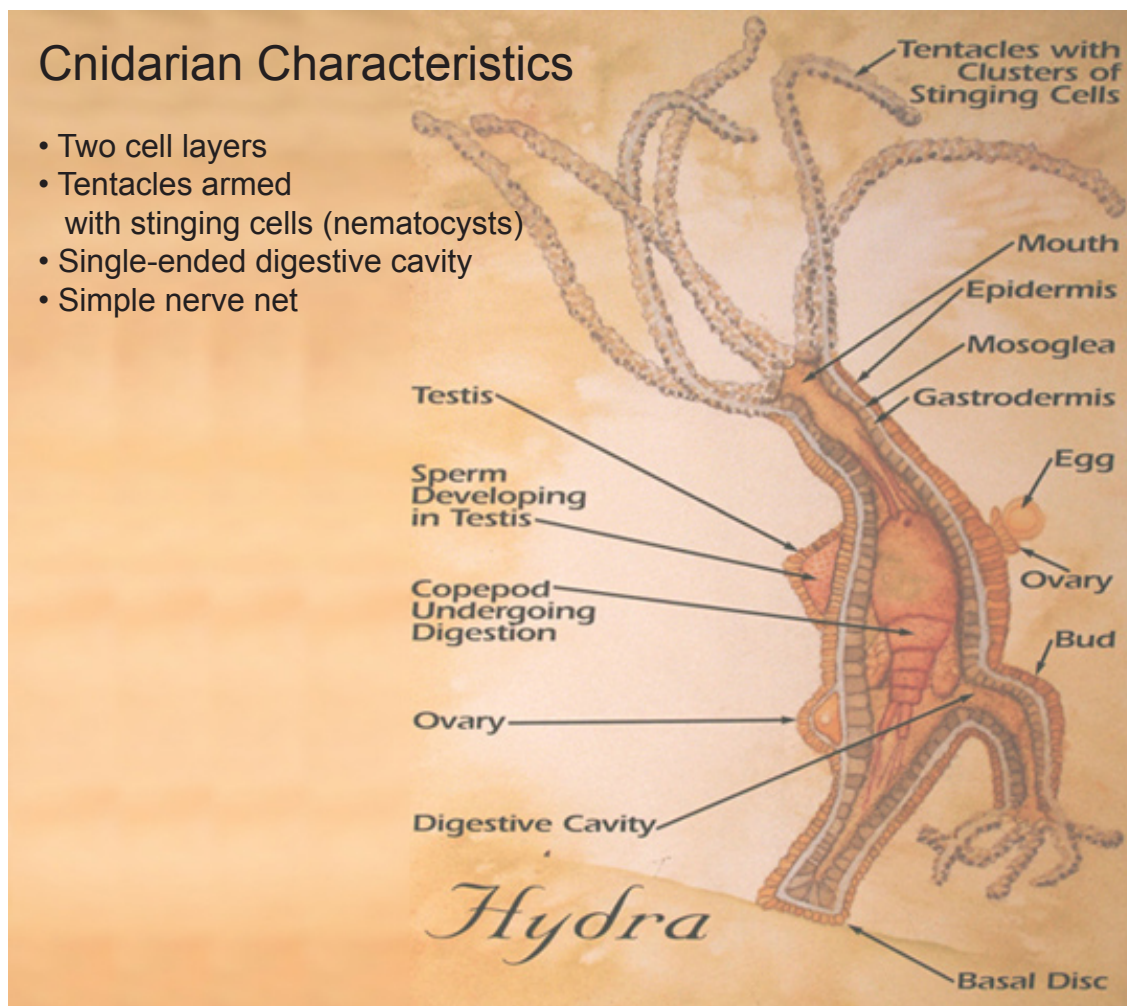
Study Guide

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Photographed by Bruce J. Russell and David Denning

Supplement to Video Program

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Cnidarians (formerly Coelenterates) make up three classes on the Tree of Life: **Hydrozoa**, **Scyphozoa**, and **Anthozoa**. As a group, cnidarians share a short list of common features, with two cell layers, tentacles armed with stinging cells, a single ended digestive cavity, and a nerve net that allows some general responses to environmental stimuli. In 1997, scientists succeeded in cloning a mammal, but cnidarians have been in the cloning business for nearly 600 million years. One of the best examples is the common freshwater Hydra.

Class *Hydrozoa*

Hydra: This common freshwater Cnidarian captures microcrustaceans, swallowing and digesting them in its sac-like gut. Two methods of digestion are used. One is primitive – engulfment of small food particles that are then digested in vacuoles located in the phagocytic cells lining the gut, the same methods used by amoebas and other phagocytic protists.

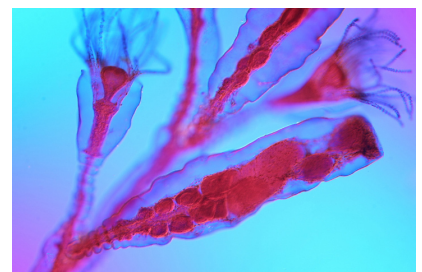
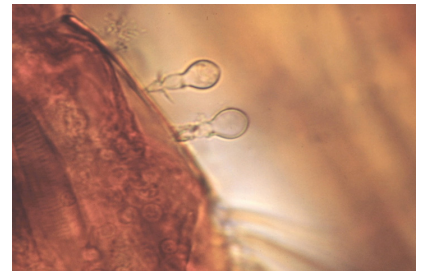
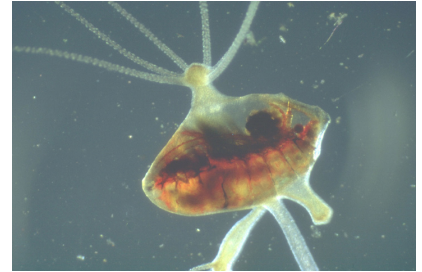
Extracellular digestion also occurs, a process initiated by enzymes produced by gland cells in the gut lining. The absorbed nutrients diffuse to the outer layer of cells without the requirement of a circulatory system. Undigested material is regurgitated through the mouth, a disadvantage of a single ended gut. With minor variations, this is the method of digestion and food transport found in all Cnidarians.

Stinging cells inject paralyzing poisons and enzymes that begin the process of digestion even before the prey is swallowed. Trigger hairs, brushed by a daphnia's antennae, fire out their darts and lashes. Note the violent response to contact shown by *Daphnia* and the red copepods used in our feeding trials. As the poisons take effect, the prey becomes less active.

The green hydra harbors symbiotic algae in its tissues. Although it receives some nutrients from its photosynthetic guests, *Chlorohydra* eats a balanced diet, gorging on microcrustaceans when available.

Budding new individuals from a few cells located on hydra's lower body is a natural form of cloning. The individuals produced are genetically identical to their parent. Sexual exchanges shuffle the Hydra population's genetic deck. Fertilized eggs withstand freezing, to produce a new hydra in Spring.

Obelia: Obelia colonies have both feeding polyps and special polyps that produce medusae--little sexual jellyfish that are released to float on the ocean currents broadcasting sperm and eggs. The fertilized eggs produce a larva that settles to become the first polyp of a new colony.



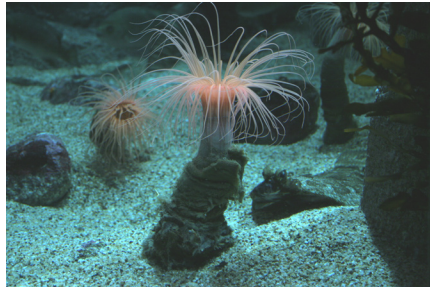
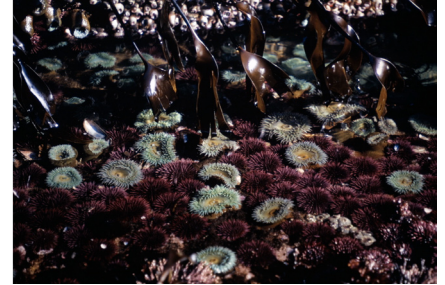
Class Scyphozoa

Most scyphozoans originate from small attached reproductive polyps. The free-swimming scyphozoan jellyfish are generally larger than hydrozoan jellyfish. Scyphozoans have a thick jelly layer and a digestive system divided into four compartments.



Class Anthozoa

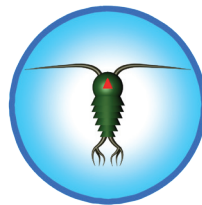
The most familiar anthozoans are sea anemones and corals. Temperate zone anemones crowd the intertidal rocks. Their powerful stinging cells can capture crabs and small fish. Cloning is practiced by the rock-covering anemone – the individuals simply pull in two until the anemone population cover the intertidal rocks.



Tropical anemones are often accompanied by small anemone fish that avoid triggering their hosts stinging cells.



Stony corals produce limy cases that build the reef. Soft corals flex, their polyps encased in a common skin. The ones shown in this program are from the coral reefs of New Guinea and Hawaii.



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