

Lesson: Diatoms



Diatoms are phototropic unicellular algae having two valves containing silicon compounds that are among the most common organisms in the ocean. These single-celled protists usually float and drift near the ocean surface, though many diatoms also live in deeper waters. Because they depend on sunlight for photosynthesis, diatoms generally live in the upper 200 meters of oceans. They are part of the ocean's community of plankton. All free floating unicellular algae are commonly called **phytoplankton**. They are responsible for about 25 % of the world's net primary production. Moreover, diatom cell walls also exhibit very exciting properties from the physical point of view: they are extremely stable and they may act as photonic (detection and modulation of light) crystals. Click on these links to become aware of several facts about the diatoms:

- <http://www.stormbefore.com/diatoms.htm>
- <http://www.ucmp.berkeley.edu/chromista/bacillariophyta.html>

Diatom Miscellany

There are more than 25,000 species of diatoms, most of which inhabit the cold waters of the world. They are classified in phylum Chrysophyta, which means "golden algae." Diatoms exhibit great variety in their shapes. Click on this link to view several different diatom representatives.

- <http://images.google.com/images?q=diatoms&oe=utf-8&rls=org.mozilla:en-US:official&client=firefox-a&safe=active&um=1&ie=UTF-8&sa=N&hl=en&tab=wi>

View ten different slides. Later you will be asked to sketch and label two of your selections.

Diatoms are, in fact, classified according to their shape. Round diatoms are called centric diatoms, and pen-shaped diatoms are called pennate diatoms. Diatoms are mainly known for the intricate geometries and spectacular patterns of their silica-based cell walls. An outstanding feature of diatoms is that their food storage takes the form of oil droplets. This feature aids survival, because diatoms that float close to the water's surface can absorb more energy from sunlight.

How does an organism with such a hard, silicon shell reproduce? Diatoms reproduce both sexually and asexually. During asexual reproduction, the parent cell divides to form two new cells. The two halves of a diatom's shell normally overlap, making the diatom resemble a box with a lid. Each half is called a frustule, when a diatom reproduces, its two halves separate. Frustules are held together by an organic substance that allows

groups of diatoms to form chains. These chains are actually colonies of individual diatoms.

When a diatom loses the frustule it becomes an auxospore. An auxospore can be either male or female. During sexual reproduction, a male auxospore produces sperm. The sperm swims to and enters the female diatom, where it unites with an egg nucleus. The fertilized egg cell develops into a mature diatom, completing the sexual reproductive cycle. This is important in our study of marine biology because its one of the first examples of sexual reproduction among unicellular organisms.

When diatoms die they sink from the top to the bottom of the ocean, and as they are sinking, phosphorus is being transported in the form of intracellular polyphosphate. This is how phosphorus is being biogeochemically cycled in the deep ocean. Furthermore, diatomaceous earth comes from fossilized deposits diatoms having built up on the ocean floor since prehistoric times. Diatomaceous earth is a naturally occurring siliceous sedimentary mineral compound from microscopic skeletal remains of diatoms. The living material inside the diatom's shell decays, but the silicon cell walls remain. The shells accumulate on the ocean floor. Over time, these deposits form layers that may be hundreds of meters thick. Since diatoms are porous, diatomaceous earth makes an excellent filtering material for all kinds of water filters. Recently diatomaceous earth has been used in homes to repel insects.

Almost all animals in the sea ultimately depend on diatoms as a source of food. Diatoms are found at the bottom of the ocean's food chain. Zooplankton's primary food source, are populations of diatoms. Shellfish filter diatoms by passing ocean water through their gills. Tiny fish feed on these filtering animals and they in turn are eaten by larger predators, including man.

Diatoms also can create a harmful algal bloom (**HAB**) that produces toxins which are detrimental to plants and animals. A diatom bloom can kill fish and other aquatic life by decreasing sunlight available to the water and by using up all of the available oxygen in the water, but a harmful algal bloom specifically produces harmful toxins. A sudden increase in the diatom population may occur from time to time in shallow coastal waters. An increase in nutrients can cause diatom growth and reproduction to increase dramatically into a bloom. Sometimes something may change in the environment so that certain diatoms can out compete the other algae for resources. This environmental change can be related to the water quality, temperature, nutrients, sunlight, or other factors. Free-floating diatoms can be collected from seawater by use of a plankton net. Click on the link below and read the article on plankton nets.

- <http://www.coml.org/edu/tech/collect/planktonnets.htm>

The plankton net can be pulled through shallow water, alongside a pier, or towed behind a moving boat. The plankton get caught in the mesh of the nylon net, and Make their way into the collecting jar at the bottom of the net. A researcher can take a few drops from the collecting jar and view these specimen samples in a microscope.