Lively Lichens

Average Program Length: 1 hour
Meeting Location: Ballast Point
Total material list:

--Lichen diagram (Park Provided)
--Photo of Foliose lichen (Park Provided)
--Park map (Park Provided)
--Blank paper and pencils/pens/colors

Activities by Scout Level

Girl Scouts

Daisies and Brownies- pick at least 1 of the steps below
Juniors and Cadettes- pick at least 2 of the steps below
Seniors and Ambassadors-pick at least 3 of the steps below

Boy Scouts

Lions, Tigers, Wolves, and Bears- pick at least 1 of the steps below
Webelos, Scout Rank, and Tenderfoot- pick at least 2 of the steps below
Second Class, First Class, Star Scouts, Life Scouts, and Eagle Scouts-pick at least 3 of the steps below

Background

Lichens are living organisms, but they are not a single species. Lichens are mostly composed of fungi, and are combined with photosynthetic partner (usually algae, but sometimes cyanobacteria).At Cabrillo, we have foliose lichens (somewhat leaf-like, composed of lobes).

Fungi are decomposers, feeding themselves by degrading plant or animal matter. The fungal world is incredibly diverse, from yeasts to molds to mushrooms. The fungus member of a lichen is usually a mushroom in the sac fungus family (ascomycetes).

Algae are single-celled organisms that make their own food through the sunlight-driven process called photosynthesis. In photosynthesis, algae capture solar energy, using it to combine carbon dioxide (from the atmosphere) and water into sugars. Common examples of algae are the green film inside a fish tank, "pond scum" and seaweeds. Algae require ample water and so are restricted to watery habitats.

Freddy and Alice's "Marriage on the Rocks" tale is a classic way of describing the symbiotic partnership within lichens, unique "dual organisms" composed of fungus and algae. It goes as follows:

Once there was a fine carpenter named Freddy Fungus, and he could build a home using any material. But Freddy was helpless when it came to feeding himself, because he couldn't cook. Then along came chef Alice Algae, who could whip up fabulous food right out of thin air. But alas, Alice needed a home. When Freddy and Alice met they took an immediate lichen to each other. And although their marriage was sometimes on the rocks, they lived symbiotically ever after.

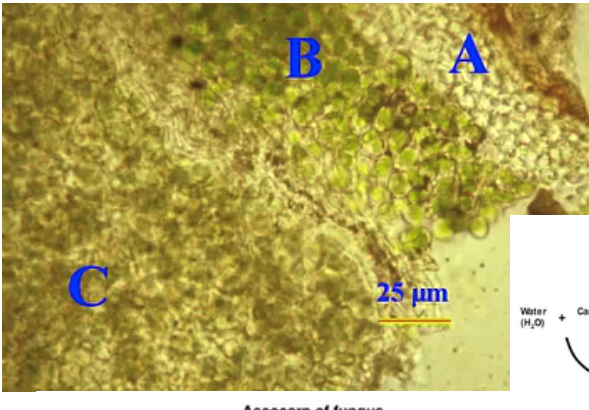
Lichens are in a *symbiotic relationship.* Symbiosis occurs when two organisms are living close together and are interacting with each other. It is different from regular interactions between species, because in a symbiotic relationship, the two species in the relationship live together. Many organisms are involved in symbiotic relationships because this interaction provides benefits to both species.

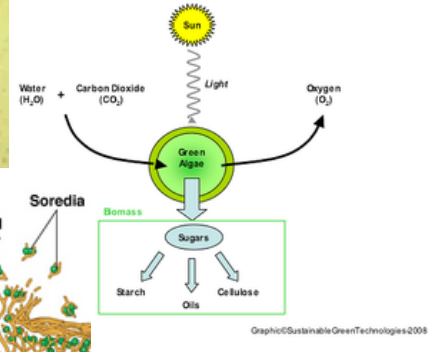
In lichens, the fungi offer protection with stronger cell walls and with filaments, the algae offers food through photosynthesis.

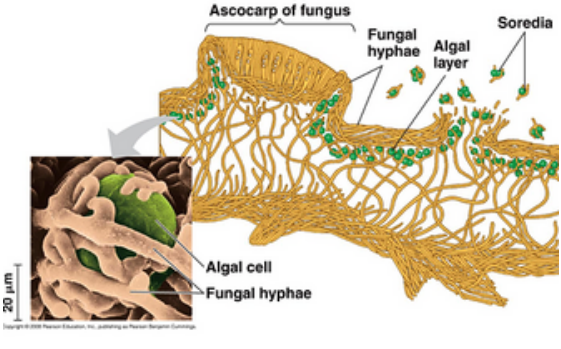
The composition in the *cell walls* make fungi stronger than algae. The cell walls are made up of either Chitin (stronger wall on fungi) or Cellulose (weaker wall on algae). Chitin may be described as cellulose with one hydroxyl group on each monomer substituted with an acetyl amine group. This allows for increased hydrogen bonding between adjacent polymers, giving the chitin-polymer matrix increased strength.

The ability to undergo photosynthesis make algae helpful to the fungi. Photosynthesis is the process by which algae (and plants) use the energy from sunlight to produce sugar, which cellular respiration converts into ATP, the "fuel" used by all living things. The algae uses 6 water molecules and 6 carbon dioxide molecules and turns it into a glucose (sugar) molecule and 6 oxygen molecules. People and animals can eat the plants to get the sugar energy, and we can breath in the oxygen (in the process of respiration). We breath out carbon dioxide, that the plants can breath in, and the cycle continues.

In a lichen, fungus tissues form a tough, protective body laced with algae (or sometimes photosynthetic bacteria). The fungus receives food from the algae, and within the fungus, the algae receives protection from drying and damage. Lichens survive and thrive where fungus or algae alone cannot. Requiring only rainwater and air, they can occupy harsh habitats: bare rock, tree trunks, desert sands, concrete, even window glass! During droughts, lichens enter dormancy and dehydrate to 2 percent of their optimal moisture level. Once the rains return, lichens revitalize and resume their slow growth (1-2 millimeters/year).







Program Activities

1. Using a map and the photos of the foliose lichens, go out into the park and look for our lichen species. Locate the spot you found them on a map. Then, return to the visitor center with your map and turn it in to the staff member at the desk.

2. Draw the photosynthesis/respiration cycle using any plants and animals of your choice.

3. Research examples of other symbiotic relationships. Can you think of any other species that have a symbiotic relationship at Cabrillo National Monument?