LICHENS

At first glance, lichens might look a bit like moss. But don't be fooled! Lichens are not plants. In fact, they're not just *one* organism, they're *two,* or sometimes, even *three*. Lichens are fungi growing with a species of algae or cyanobacteria, living together in a symbiotic relationship.

This dual system is remarkably hardy and adaptable. Lichens can be found in every climate and continent on Earth, from the frozen deserts of Antarctica to the tropical jungles of the Amazon.

Other scientists didn't accept his idea easily. It took years of debate (and the proof of teasing out each individual member of the lichen carefully with a microscope) before this "dual hypothesis" was accepted.

Once it was accepted, the concept was so novel and important it needed a new word. So in 1879, scientists coined the term *SYMBIOSIS*—"the living together of unlike organisms."

Symbiosis is a common concept in our modern world, and it's neat to realize that the idea and word itself can all be traced back to this one incredible organism: lichen.

In the late 1800s, a Swiss botanist named Simon Schwendener put forth the idea that lichens weren't plants, as commonly believed, but instead a dual organism of a fungus that had "enslaved" an algae.

THE BASIC MODEL

Lichen

Symbiotic
Super-tough
Photosynthetic

And NOT a plant!

It's perhaps more accurate to think of lichen as a small farm where the fungi are the farmers and the algae are the crops.

Are lichens equitable relationships where both partners are equally dependent on each other? Not exactly. They both benefit from the arrangement, but the fungus part of the lichen (the mycobiont) is definitely in control. In some types of lichen, the mycobiont can survive without any algae or cyanobacteria (photobionts). Several mycobionts can also switch which type of photobiont they are partnering with.

SURVIVAL TIP:
Many lichens are edible and some are eaten as delicacies. Be careful though, because some lichens are poisonous! Most of the poisonous ones are yellow.

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A MUSHROOM IS JUST A SMALL PART OF THE FUNGUS - THE FRUITING BODY. MOST OF THE FUNGUS IS UNDERGROUND, A MASS OF THIN STRANDS CALLED HYPHAE.

Some lichens are so regular in their circular growth that scientists measure their diameter to date rocks. It's called "lichenometry."

There are more than 15,000 species of lichen, and some of them are very long lived— thousands of years old!

Lichens can have an incredible variety of colors, from neon-yellow to orange, red, brown, gray or green. Lichens become dormant when dry, entering a state of hibernation or stasis. When they get wet, their color and shape change dramatically as the fungal filaments absorb water and the algae or cyanobacteria resume photosynthesis.

Lichens grow on bark and wood, rocks, soil, houses, underwater, even on cars or the backs of turtles! They can grow on anything that stays in the same place for a long time without moving.

They have an incredible variety of shapes, from flat round pods to antler-like tusks or thready filaments. But all lichens are relatively small, so to appreciate them, you have to get down close.

Next time you're outside, stop a moment to kneel down and peer at the rocks and logs and see what kinds of lichens you can discover.

MOST COMMON TYPES OF LICHEN

CRUSTOSE

Crust-like. Grows flat and very close to the surface or substrate. Cannot be lifted off without removing pieces of the substrate as well. One example of a crustose lichen is: Sidewalk Firedot Lichen, *Caloplaca feracissima,* which grows on cement sidewalks.

FOLIOSE

Leaf-like. These lichens have a distinct upper and lower surface. Some species are so leaf-like that they look very much like small plants. The fungal part of the lichen even grows "rootlets" that attach the lichen to its substrate.

FRUTICOSE

Tubular or bush-like. These lichens often look like miniature shrubs. The fruticose lichen *Cladonia rangiferina* is an important food for the reindeer (or caribou).

SQUAMULOSE

The edges lift up from the substrate somewhat, but the lichen doesn't have an actual "skin" or lower layer (cortex) like true foliose lichens do. Often has an almost pebble-like pattern.

Sensitive to Air Quality

Plants absorb their nutrients and minerals from the soil through their roots. Lichens absorb most of their minerals and nutrients from *the air*. This remarkable ability allows them to grow on any surface, but it also makes them very vulnerable to airborne pollutants. If there are high levels of lead, sulfur dioxide, or other toxic gasses, the lichens will be some of the first organisms to be affected.

Because of this, lichens have been used to measure and study air quality since the late 1800s.

PLANT

CARBON	AIR
WATER	ROOTS
NITROGEN	ROOTS
OTHER NUTRIENTS	ROOTS

CO_2

H_2O N P K
S Ca Mg Fe

PLANTS GET MOST OF THEIR NUTRIENTS FROM THEIR ROOTS, ESSENTIAL THINGS LIKE WATER, NITROGEN, PHOSPHORUS, POTASSIUM, SULFUR, CALCIUM, MAGNESIUM, AND IRON.

LICHEN

CARBON	AIR
WATER	AIR/RAIN
NITROGEN	AIR
OTHER NUTRIENTS	AIR

CO_2 H_2O N P K
S Ca Mg Fe

LICHEN DON'T HAVE ROOTS.

B A A X

B C Ɔ D

F E Ǝ D

Ꞙ G Ɔ X