

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.

DON'T EAT THE YELLOW ONES!

SCIENCE MOM
— JENNYBALLIF.COM —

Lichen

Symbiotic
Super-tough
Photosynthetic

And NOT a plant!

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.

THE BASIC MODEL

PHOTOSYNTHETIC ALGAE OR CYANOBACTERIA PRODUCE SUGARS AND OTHER FOOD, WHICH THEY SHARE WITH THE FUNGI.

FUNGI MAKE UP THE OUTER SHELL, PROVIDING MINERALS, WATER, AND SHELTER FOR THE ALGAE.

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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.

HERE'S A COOL FACT ABOUT A FUNGI YOU EAT:

SOME LICHENS ARE SO REGULAR IN THEIR CIRCULAR GROWTH THAT SCIENTISTS MEASURE THEIR DIAMETER TO DATE ROCKS. IT'S CALLED "LICHENOMETRY."

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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.

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.

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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.

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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.

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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.

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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.

I JUST DISCOVERED THAT LICHENS ARE ACTUALLY TWO ORGANISMS LIVING TOGETHER! FUNGUS AND ALGAE!

WHAT NONSENSE! LICHENS ARE OBVIOUSLY PLANTS.

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PLANT

CARBON	AIR
WATER	ROOTS
NITROGEN	ROOTS
OTHER NUTRIENTS	ROOTS

H₂O N P K S Ca Mg Fe

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

CO₂

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LICHEN

CARBON	AIR
WATER	AIR/RAIN
NITROGEN	AIR
OTHER NUTRIENTS	AIR

CO₂ H₂O N P K S Ca Mg Fe

lichen DON'T HAVE ROOTS

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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.

These lichens often look like miniature shrubs. The fruticose lichen *Cladonia rangiferina* is the reindeer (or caribou).

FRUTICOSE

THESE ARE EVEN MORE CATEGORIES THAN THESE! GELATINOUS, FILAMENTOUS, AND POWDERY. DIVERSE!

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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: Sledwalk *Lecladia*, which grows on cement sidewalks.

FLOIOSE

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.

MOST COMMON TYPES OF LICHEN

B

A

A

X

B

C

C

D

F

E

E

D

E

G

G

X