



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.

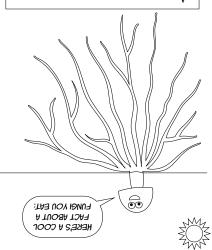
This dual system is remarkably hardy and adaptable. Lichens can be found in every climate and continent on Earth, from the frozen deserts of Antarctica to the tropical jungles of the Amazon.

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



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

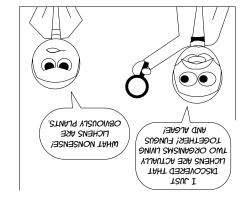
photobiont they are partnering with. can also switch which type of (photobionts). Several mycobionts without any algae or cyanobacteria of lichen, the mycobiont can survive definitely in control. In some types the lichen (the mycobiont) is arrangement, but the fungus part of exactly. They both benefit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

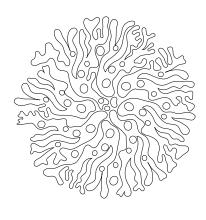
incredible organism: lichen. can all be traced back to this one realize that the idea and word itself our modern world, and it's neat to Symbiosis is a common concept in

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

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

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





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

I GROW 0.5

MILLIMETERS PER

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.



JCHEN DON'T HAVE ROOTS.

AIR CO2 H2O N P K	САRВОИ
AIR/RAIN S Ca Mg Fe	MATER
,/ ЯІА	ИІТВОБЕЙ
AIA 27	ОТНЕК ИПТКІЕИ



ЯІА	САКВОИ
ROOTS	МАТЕR
ROOTS	ИІТВОСЕИ
ROOTS	ОТНЕК ИОТВІЕИТЅ

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

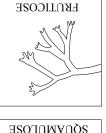
of the first organisms to be affected. toxic gasses, the lichens will be some levels of lead, sulfur dioxide, or other airborne pollutants. If there are high makes them very vulnerable to to grow on any surface, but it also This remarkable ability allows them minerals and nutrients from the air. roots.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

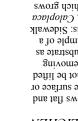
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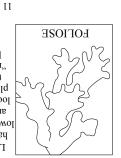
the reindeer (or caribou). an important food for รเ ขนางอโารินทง ทานอททา The fruticose lichen like miniature shrubs. These lichens often look Tubular or bush-like.

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





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



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



WOSL COWWON LKEES OF LICHEN

\mathbf{B}	A		
B			D
F	E	E	b
E	G		