

WHAT ARE EPIPHYTES?

Epiphytes are plants that grow "piggyback" on other plants. Because epiphytes cannot get nutrients from the ground (their roots do not reach that far!), they depend on the soil particles that collect in the canopy, and they can harvest nutrients from rain and mist—that's why they grow best where the weather is very cloudy, rainy, and misty, like the cloud forest of Costa Rica. The

background photo courtesy of author;
foreground photo by Steven Holt/Aligrette Photography

I sat at the top of a tree in the rain forest of Costa Rica. Nearby, a purple and green hummingbird dipped its long beak into bright red flowers. Howler monkeys whooped in the distance. I joined them with my own excited whoop. I had just found something I had never seen before in all my trips into the treetops—Roots! Why would roots sprout in the tops of trees, a region called the canopy? Since no one had ever reported these roots before, I set out to learn all I could.

In my job I try to understand how a forest

works and how trees survive. Trees need sunlight and water, of course, but they also need nutrients, which are chemicals that help the tree live and grow. Humans need nutrients, too. We get nutrients when we eat and drink. Trees get nutrients only through their roots, which soak up nutrients from the ground. At least that is what everyone thought.

So why would roots grow in the treetops? One reason might be that in rain forests the branches of trees are often covered with

other plants called epiphytes, or plants that usually grow on top of other plants and get their nutrients and water from air. Epiphytes can be so crowded on the branches they form a mat where sticks and dead leaves build up. The epiphyte mat actually creates a second layer of soil high in the branches. I wondered if a tree that sprouts roots in the canopy, the uppermost

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TREETOP ROOTS

trunks and branches of the cloud forest are thick with epiphytes, including mosses, ferns, and orchids. They are amazing sights. Many birds, frogs, and snakes use epiphytes for food or shelter.

If you would like to learn more about epiphytes or if you have any questions about the canopy, write or send an e-mail message to "Ask Dr. Canopy." A scientist working on the canopy will get in touch with you. Write to International Canopy Network (ICAN), P.O. Box 10187, Olympia, WA 98502. e-mail: canopy@elwha.evergreen.edu.

CHALLENGE

Nalini's Bucket Busters

An important way nutrients move from trees to the forest floor is through leaf fall. Ecologists often measure the amount of nutrients reaching the ground by putting out plastic buckets in a random pattern beneath the trees. Try investigating leaf fall in your school or backyard. How many leaves do you think will fall in your bucket in one week? What other things do you think you will find in your buckets? Which trees will drop more leaves after a storm? Will you find more in your buckets putting buckets in different places for different questions. Record your findings in a journal.

Check It Out!

Climbing trees can be dangerous, so please be careful when you do it. Never climb trees alone; make sure an adult is with you.

A Scientist's Autobiography

Although I grew up close to Washington, D.C., a big city, I always loved walking in the woods of nearby parks. I especially loved climbing the eight big maple trees lining the driveway of the house in which I grew up. There was something about the feeling of being up high with the birds and the sky that felt very good.

Studying biology in school also felt very good, and I went to college to learn more about the topic. Now I study rain forests, and climbing trees is part of my job.

I remember my first day in a tropical rain forest. It was nearly dark under the lush trees and low hanging clouds. My eyes were drawn to the treetops. I wanted to climb up, out of the damp, dark stillness of the forest floor.

The tree I chose to climb, a monkey pot tree, towered over its neighbors. With techniques used by mountain climbers and cave explorers, I began to climb my first tropical rain forest tree.

Twenty-seven meters above the forest floor, I entered a different world, the treetop region known as the canopy. Around me now were wheeling birds, rustling wind, and sky. From my perch I could see far, far away. I began to yell with excitement. Questions bloomed in my brain. How do the plants survive so far from the ground? What role do the plants and animals of the canopy play in the forest? No textbook had ever answered such questions. That day changed my life: I knew I had

discovered a world I wanted to spend my life exploring and investigating.



courtesy of the author



layer of the rain forest, can tap an extra source of nutrients from the soil that collects in epiphyte mats.

To make sure what I found really were roots, I did some testing. I cut off sections of canopy "roots" and compared them to sections of below-ground roots. They looked very similar through the microscope.

But looks alone did not prove they were roots. I needed to test if these things that looked like roots really picked up water and nutrients for the tree. For this, I put chemical markers in water. Later, I found the same chemical markers in the leaves of the trees, so I knew that the treetop roots could take up water and chemical nutrients for the tree. In fact, the canopy roots were better at carrying nutrients to leaves than the below-ground roots!

I searched for canopy roots around the world, climbing tree after tree in the

rain forests of Washington State, Papua New Guinea, New Zealand, and Australia. I found more than 15 different species of trees with canopy roots. This proved that canopy roots were not just oddball growths found in one weird forest, but rather a common event in rain forests where many epiphytes grow.

This discovery and others are making scientists view the the canopy in a different way. We now know the canopy can store nutrients. The canopy is part of a greater nutrient cycle that is important for the whole forest. There are still many discoveries to be made in the treetops!



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