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FINDING THE MOTHER TREE

Discovering the Wisdom of the Forest

SUZANNE SIMARD

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Cover photograph of a young western hemlock growing in front of a western red cedar by Paul Colangelo / National Geographic Image Collection Cover design by Kelly Blair

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For my daughters,

HANNAH AND NAVA

But man is a part of nature, and his war against nature is inevitably a war against himself.

-RACHEL CARSON

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A FEW NOTES FROM THE AUTHOR

I use the British spelling "mycorrhizas" as the plural of "mycorrhiza" because it comes more naturally to me and may be easier for readers to recall or say. However, "mycorrhizae" is also frequently employed, especially in North America. Either plural is correct usage.

For names of species, I have used a mixture of Latin and common names throughout. For trees and plants, I usually refer to the common name at the species level, but for fungi I generally only provide the name of the genus.

I have changed the names of some people to protect their identity.

INTRODUCTION

CONNECTIONS

For generations, my family has made its living cutting down forests. Our survival has depended on this humble trade.

It is my legacy.

I have cut down my fair share of trees as well.

But nothing lives on our planet without death and decay. From this springs new life, and from this birth will come new death. This spiral of living taught me to become a sower of seeds too, a planter of seedlings, a keeper of saplings, a part of the cycle. The forest itself is part of much larger cycles, the building of soil and migration of species and circulation of oceans. The source of clean air and pure water and good food. There is a necessary wisdom in the give-and-take of nature—its quiet agreements and search for balance.

There is an extraordinary generosity.

Working to solve the mysteries of what made the forests tick, and how they are linked to the earth and fire and water, made me a scientist. I watched the forest, and I listened. I followed where my curiosity led me, I listened to the stories of my family and people, and I learned from the scholars. Step-by-step—puzzle by puzzle—I poured everything I had into becoming a sleuth of what it takes to heal the natural world.

I was lucky to become one of the first in the new generation of women in the logging industry, but what I found was not what I had grown up to understand. Instead I discovered vast landscapes cleared of trees, soils stripped of nature's complexity, a persistent harshness of elements, communities devoid of old trees, leaving the young ones vulnerable, and an industrial order that felt hugely, terribly misguided. The industry had declared war on those parts of the ecosystem—the leafy plants and broadleaf trees, the nibblers and gleaners and infesters—that were seen as competitors and parasites on cash crops but that I was discovering were necessary for healing the earth. The whole forest—central to my being and sense of the universe—was suffering from this disruption, and because of that, all else suffered too.

I set out on scientific expeditions to figure out where we had gone so very wrong and to unlock the mysteries of why the land mended itself when left to its own devices—as I'd seen happen when my ancestors logged with a lighter touch. Along the way, it became uncanny, almost eerie, the way my work unfolded in lockstep with my personal life, entwined as intimately as the parts of the ecosystem I was studying.

The trees soon revealed startling secrets. I discovered that they are in a web of interdependence, linked by a system of underground channels, where they perceive and connect and relate with an ancient intricacy and wisdom that can no longer be denied. I conducted hundreds of experiments, with one discovery leading to the next, and through this quest I uncovered the lessons of tree-to-tree communication, of the relationships that create a forest society. The evidence was at first highly controversial, but the science is now known to be rigorous, peer-reviewed, and widely published. It is no fairy tale, no flight of fancy, no magical unicorn, and no fiction in a Hollywood movie.

These discoveries are challenging many of the management practices that threaten the survival of our forests, especially as nature struggles to adapt to a warming world.

My queries started from a place of solemn concern for the future of our forests but grew into an intense curiosity, one clue leading to another, about how the forest was more than just a collection of trees.

In this search for the truth, the trees have shown me their perceptiveness and responsiveness, connections and conversations. What started as a legacy, and then a place of childhood home, solace, and adventure in western Canada, has grown into a fuller understanding of the intelligence of the forest and, further, an exploration of how we can regain our respect for this wisdom and heal our relationship with nature.

One of the first clues came while I was tapping into the messages that the trees were relaying back and forth through a cryptic underground fungal network. When I followed the clandestine path of the conversations, I learned that this network is pervasive through the *entire* forest floor, connecting all the trees in a constellation of tree hubs and fungal links. A crude map revealed, stunningly, that the biggest, oldest timbers are the sources of fungal connections to regenerating seedlings. Not only that, they connect to all neighbors, young and old, serving as the linchpins for a jungle of threads and synapses and nodes. I'll take you through the journey that revealed the most shocking aspect of this pattern—that it has similarities with our own human brains. In it, the old and young are perceiving, communicating, and responding to one another by emitting chemical signals. *Chemicals identical to our own neurotransmitters. Signals created by ions cascading across fungal membranes.*

The older trees are able to discern which seedlings are their own kin.

The old trees nurture the young ones and provide them food and water just as we do with our own children. It is enough to make one pause, take a deep breath, and contemplate the social nature of the forest and how this is critical for evolution. The fungal network appears to wire the trees for fitness. And more. These old trees are mothering their children.

The Mother Trees.

When Mother Trees—the majestic hubs at the center of forest communication, protection, and sentience—die, they pass their wisdom to their kin, generation after generation, sharing the knowledge of what helps and what harms, who is friend or foe, and how to adapt and survive in an ever-changing landscape. It's what all parents do.

How is it possible for them to send warning signals, recognition messages, and safety dispatches as rapidly as telephone calls? How do they help one another through distress and sickness? Why do they have humanlike behaviors, and why do they work like civil societies?

After a lifetime as a forest detective, my perception of the woods has been turned upside down. With each new revelation, I am more deeply embedded in the forest. The scientific evidence is impossible to ignore: the forest is wired for wisdom, sentience, and healing.

This is not a book about how we can save the trees.

This is a book about how the trees might save us.

GHOSTS IN THE FOREST

I was alone in grizzly country, freezing in the June snow. Twenty years old and green, I was working a seasonal job for a logging company in the rugged Lillooet Mountain Range of western Canada.

The forest was shadowed and deathly quiet. And from where I stood, full of ghosts. One was floating straight toward me. I opened my mouth to scream, but no sound emerged. My heart lodged in my throat as I tried to summon my rationality—and then I laughed.

The ghost was just heavy fog rolling through, its tendrils encircling the tree trunks. No apparitions, only the solid timbers of my industry. The trees were *just trees*. And yet Canadian forests always felt haunted to me, especially by my ancestors, the ones who'd defended the land or conquered it, who came to cut, burn, and farm the trees.

It seems the forest always remembers.

Even when we'd like it to forget our transgressions.

It was midafternoon already. Mist crept through the clusters of subalpine firs, coating them with a sheen. Light-refracting droplets held entire worlds. Branches burst with emerald new growth over a fleece of jade needles. Such a marvel, the tenacity of the buds to surge with life every spring, to greet the lengthening days and warming weather with exuberance, no matter what hardships were brought by winter. Buds encoded to unfold with primordial leaves in tune with the fairness of previous summers. I touched some feathery needles, comforted by their softness. Their stomata—the tiny holes that draw in carbon dioxide to join with water to make sugar and pure oxygen—pumped fresh air for me to gulp. Nestled against the towering, hardworking elders were teenaged saplings, and leaning into them were even younger seedlings, all huddling as families do in the cold. The spires of the wrinkled old firs stretched skyward, sheltering the rest. The way my mother and father, grandmothers and grandfathers protected me. Goodness knows, I'd needed as much care as a seedling, given that I was always getting into trouble. When I was twelve, I'd crawled along a sweeper tree leaning over the Shuswap River to see how far out I could go. I tried to retreat but slipped and fell into the current. Grampa Henry jumped into his hand-built riverboat and grabbed my shirt collar right before I would have disappeared into the rapids.

Snow lay deeper than a grave nine months of the year here in the mountains. The trees far outmatched me, their DNA forged so they'd thrive despite the extremes of an inland climate that would chew me up and spit me out. I tapped a limb of an elder to show gratitude for its hovering over vulnerable offspring and nestled a fallen cone in the crook of a branch.

I pulled my hat over my ears while stepping off the logging road and waded deeper into the forest through the snow. Despite it being only a few hours before darkness, I paused at a log, a casualty of saws that had cleared the road right-of-way. The pale round face of its cut end showed age rings as fine as eyelashes. The blond-colored earlywood, the spring cells plump with water, were edged by dark-brown cells of latewood formed in August when the sun is high and drought settles in. I counted the rings, marking each decade with a pencil-the tree was a couple hundred years old. Over twice the number of years my own family had lived in these forests. How had the trees weathered the changing cycles of growth and dormancy, and how did this compare to the joys and hardships my family had endured in a fraction of the time? Some rings were wider, having grown plenty in rainy years, or perhaps in sunny years after a neighboring tree blew over, and others were almost too narrow to see, having grown slowly during a drought, a cold summer, or some other stress. These trees persisted through climatic upheavals, suffocating competition, and ravaging fire, insect, or wind disruptions, far eclipsing the colonialism, world wars, and the dozen or so prime ministers my family had lived through. They were ancestors to my ancestors.



Camping at Shuswap Lake near Sicamous, British Columbia, 1966. Left to right: Kelly, three; Robyn, seven; and Mum, Ellen June, twenty-nine; I'm five. We arrived in our 1962 Ford Meteor after barely escaping a rockslide on the Trans-Canada Highway; rocks flew down the mountain straight through the car window and landed on Mum's lap.

A chattering squirrel ran along the log, warning me away from his cache of seeds at the base of the stump. I was the first woman to work for the logging company, an outfit that was part of a rough, dangerous business starting to open its doors to the occasional female student. The first day on the job, a few weeks back, I'd visited a clear-cut—a complete felling of trees in a thirty-hectare patch—with my boss, Ted, to check that some new seedlings had been planted according to government rules. He knew how a tree should and should not be planted, and his low-key approach kept workers going through their exhaustion. Ted had been patient with my embarrassment at not knowing a J-root from a deep plug, but I'd watched and listened. Soon enough, I was entrusted with the job of assessing established plantations—seedlings put in to replace harvested trees. I wasn't about to screw up.



Temperate rain forest typical of Mum's and Dad's childhood homes in British Columbia

Today's plantation awaited me beyond this old forest. The company had chopped down a large parcel of velvety old subalpine firs and planted prickly needled spruce seedlings this last spring. My task was to check the progress of those new growths. I hadn't been able to take the logging road into the clear-cut because it had been washed out—a gift, since I could detour past