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**finding the mother tree  
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a part of:

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FINDING THE MOTHER TREE

*Uncovering the Wisdom and Intelligence of the Forest*





## Nine-hour Commute

I pulled into a turnout, slammed down the emergency brake, and grabbed my vest. I ran across the logging road, barely dodging a loaded truck that looked like a giant grasshopper backlit by late morning sun, while singing “*Woohoo*” to warn any bears should they sally along.

Adrenaline pulsed in my ears; I’d found just what I’d been looking for—a hill slope from creek to crest covered with Douglas fir of all ages. The oldest giants looked thirty-five meters in height, branches with plenty of muscle to shower seeds every few years into the shadowy beds packed with needles and humus. The youngsters sprouting from this veil looked like kids in a schoolyard: cohorts of seedlings and saplings flocking and scattering under the watchful gaze of towering teachers. From the road, the tree line seemed as complex as the Manhattan skyline.

I scrambled down the embankment of scree, paused on a knuckle of rock to load my lungs, and leapt across a ditch. A purely Douglas-fir forest perfect for creating a map of a mycorrhizal network. My first graduate student, Brendan, had published his master’s work in 2007 showing that a single mycorrhizal fungus, *Rhizopogon*, did indeed coat almost half

the root tips of Douglas-fir trees—the other half were colonized, here and elsewhere, by about sixty other fungal species—and it alone formed the major bones of a mycorrhizal skeleton. Young trees were colonized by *Rhizopogon* as were the old, and this was crucial in my quest to understand whether the network helped young Douglas fir establish under the canopy of their elders. Whether the *Rhizopogon* network was key to the continual regeneration of the forest, the ability of the forest to rejuvenate, to sustain itself no matter what. Besides, researchers had already sequenced pivotal portions of the *Rhizopogon* DNA to distinguish one fungal individual—a *genet*, of singular genetic identity, like an individual person—from another, providing a crucial element for making a map of individual fungal strands linking one tree to another. This hadn't been accomplished with other fungal species present in this forest. It was an ideal system to give me a sense, an appreciation of the extent of connectedness. Where, or so I guessed, the young firs might tap into the fungal garden of the old ones. I swished through the grass to the noisy creek and launched off the bank to land two-feet-first on the other side. “*Woohoo*, ” I called again, my voice rising above the rush of the water and reverberating more faintly off the escarpment, “*Woohoo*, *woohoo* ...”

The trees by the creek were dense and plump, and the ones at the top of the slope looked sparser and smaller. The soil would be drier there, water shedding off the granite knoll like a toboggan sweeping downslope. By comparing the architecture of the network of the dry, upper stand with this moist, lower forest, I could see if the linkages up there, where water was more precious, were denser, more plentiful, more crucial to the establishment of a seedling. Where perhaps the success of the seedlings depended on tapping into the mycelia that were flush with water raised by the taproots of the old trees from the deep granite fissures. Attaching to the mycelial networks of the elders could well be more urgent for seedlings where the soil was parched compared to where it

was damp, helping them quench their thirst and gain a foothold.

Striding along the creek, I checked the humus for bear prints. The animal trail along the water's edge had no signs of scat, but I watched for anything unusual beyond the normal shudder of leaves in the blood-dark thickets of red osier dogwood. At the first elder twenty meters in, as I headed up the hill toward the crest, saplings skirting its crown in a configuration like Nava's hula hoop, I pulled out my T-shaped increment corer to check its age, thankful the handle was orange because the leaves of the thimbleberry shrubs were big as dinner plates and could swallow anything that dropped. I fit the bit shoulder-high into a furrow of the tree's chunky bark and cored the tree to the pith, drawing out a small cross section of its striped insides.

Examining the core, my pen dotting each decade, I slowly counted her years. She was 282. I cored another dozen trees around my first one, all different heights and girths, and they ranged in age from five years to the same several centuries as she was. These forests experienced fire every few decades or so, when the summers were dry and there was plenty of fine fuel. When twigs and needles from old trees gathered on the forest floor, and blades from deep grasses senesced and dried, and thickets of new firs started to choke out the watery aspens and birches. With a single spark, patches of the forest would burn, the old trees usually surviving, the understory swept clean. If the fire scorched the floor in tandem with a good cone year, a new bunch of seeds germinated.

I stuffed the tree cores inside colorful straws, sealed the ends with masking tape, and labeled each one so I could double-check the ages and measure the annual radial growth increments under a microscope at my university lab. And I could compare the growth in each year with the corresponding annual rain and temperature records. I ran my thumb across the tip of my trowel to make sure it was sharp and followed a thick root running from the base of my first old tree to

where it tapered to the width of a finger, and I sliced open the forest floor in search of rusty-brown truffles, the scabby belowground mushrooms of *Rhizopogon*. The trowel cut through the litter and fermentation layers and slit open the humus to reveal the dense grains of underlying minerals. Where the drizzles of humus and weathered clays came to rest and roots and mycorrhizas foraged for nutrients.

After half an hour, mosquitoes biting my forehead, my knees sore on twigs, I hit a truffle the size of a patisserie chocolate. It was resting smack between the humus layer and mineral horizon, and I scraped away the organic crumbs and found a beard of black fungal strands running from one end of the truffle to the old tree's roots. I followed another pulpy skein in the other direction, and it led me to a cluster of root tips that looked like white translucent pussytoes. The fine, soft brush I'd borrowed from Hannah's paint set was perfect for sweeping them clean. One root tip was especially welcoming, and I gently tugged it, like pulling a stray thread in a hem. A seedling a hand's length away shuddered slightly. I pulled again, harder, and the seedling leaned back in resistance. I looked at my old tree, then at the little seedling in the shadows. The fungus was *linking the old tree and young seedling*.

A shock of nearby boughs shivered, and a yellow butterfly flittered across the meadow. The wind shifted. I looked over at the grasses hemming the fold of trees, blades tingling. My eyes were attuned to edges where consortiums of bears and coyotes and birds linger and banter, but there was no movement.

I tracked another root from the elder and found another truffle, and another. I raised each to my nose and breathed in its musty, earthy smell of spores and mushroom and birth. I traced the black pulpy whiskers from each truffle to the riggings of roots of seedlings of all ages, and saplings too. With each unearthing, the framework unfolded—this old tree was connected to every one of the younger trees regenerated around it. Later another of my graduate students, Kevin,

would return to this patch and sequence the DNA of almost every *Rhizopogon* truffle and tree—and find that most of the trees were linked together by the *Rhizopogon* mycelium, and that the biggest, oldest trees were connected to almost all of the younger ones in their neighborhood. One tree was linked to forty-seven others, some of them twenty meters away. One tree bound to the next, and we figured the whole forest was connected—by *Rhizopogon* alone. We published these findings in 2010, followed by further details in two more papers. If we'd been able to map how the other sixty fungal species connected the firs, we surely would have found the weave much thicker, the layers deeper, the stitching even more intricate. Not to mention the arbuscular mycorrhizal fungi adding interstitial components to such a map as they possibly joined the grasses and herbs and shrubs in an independent web. And the ericoid mycorrhizal fungi linking the huckleberries in their own network, and the orchid mycorrhizas with their own too.

A squirrel's midden of seeds was piled against a moist log, so I looked up to the tree crowns for traces of the previous year's cones. Douglas fir makes cones sporadically and in synchrony with the shifts in climate over clusters of years. The seeds are dispersed in summer from yawning cones by wind or gravity, or squirrels or birds, and they germinate in the warm beds of minerals and char and partially decomposed forest floor. Burned mixed seedbeds are especially delicious for germination.

Through the corset of branches, I saw a hawk circle overhead. Solitude is rare in the forest, and I felt slightly uneasy. But the breeze lulled me, and I continued my work, using the finest tip of my Swiss Army knife to excavate a germinant no bigger than a daddy longlegs. I pulled on the collar of the exposed stem, and a radical—one of the tiny primordial roots—slid out of the old-blood humus. It looked like a shard of fine bone china, reminding me of Robyn's shinbone glaring from a ragged cut the time she fell off her tricycle and my father gathered her in his arms. This

courageous root was as vulnerable as a growing bone, and it survived by emitting biochemical signals to the fungal network hidden in the earth's mineral grains, its long threads joined to the talons of the giant trees. The mycelium of the old tree branched and signaled in response, coaxing the virgin roots to soften and grow in a herringbone and prepare for the ultimate union with it.

Squatting, I peered at the radical through my hand lens and fumbled to split open the fragile root with my dirt-caked fingernails, to steal a glimpse of the fungal mycelium that might have succeeded in encasing the cortical cells.

Finishing the courtship. My nails were so blunt! I twisted around to let the sun pour on my hands, and I scoured the ragged root for signs of tallow between the cells. On invasion, the fungus envelops the root cells, forming a latticework—a Hartig net—the color of beeswax, or seawater, or rose petals. The fungus delivers nutrients, supplied by the vast mycelium of the old trees, to the seedling through this Hartig net. The seedling in return provides the fungus with its tiny but essential sum of photosynthetic carbon.

The roots of these little seedlings had been laid down well before I'd plucked them from their foundation. The old trees, rich in living, had shipped the germinants waterborne parcels of carbon and nitrogen, subsidizing the emerging radicals and cotyledons—primordial leaves—with energy and nitrogen and water. The cost of supplying the germinants was imperceptible to the elders because of their wealth—they had plenty. The trees spoke of patience, of the slow but continuous way old and young share and endure and keep on. Just as the steadiness of my girls steadied me, and I told myself I was strong enough to endure this season of separation. Besides, I'd have a sabbatical in a year, and I could make their lunches again, drumsticks and sliced cucumber and oranges cut into smiles, and I could show them how to build go-carts and plant flowers, and Nava and I could read together more, alternating turns through pages of *Mercy Watson to the Rescue*. But until that magical year, I'd

spirit across the mountains each weekend to reabsorb their lives, my motherhood like time-lapse photography.



Hannah (right, eight years old) and Kelly Rose (age ten) picking huckleberries in a clear-cut near Nelson, British Columbia, in 2006. The forest is regenerating nicely to spruce and subalpine fir. The height and charring of the stumps indicate the forest was logged in winter and the slash then burned.

Once the Hartig net was firmly embedded in the radical of the new sprouts, and the old trees were dispatching sustenance, making up for the paltry rates of photosynthesis by the cotyledons, the fungus could then grow new hyphal threads to explore the soil for water and nutrients. As the miniature crowns of the seedlings spawned new needles, they would feed the mycelium with their own photosynthetic sugars, so the fungus could travel to even more distant pores. Once on solid footing, life running as smoothly as a stock market exchange, the growing root could then support a fungal mantle—a coating—as though donning a jacket of mycelium, from

which even more fledgling hyphae could grow into the soil. The thicker the mantle and the greater the number of fungal threads the root could feed, the more extensively the mycelium could laminate the soil minerals, and the more nutrients it could acquire from the grains and transport back to the root in trade. Root begets fungus begets root begets fungus. The partners keeping a positive feedback loop until a tree is made and a cubic foot of soil is packed with a hundred miles of mycelium. A web of life like our own cardiovascular system of arteries, veins, and capillaries. I wound two of my upended seedlings into my hair and started back up the slope.

A cracking sound.

I swept the bear spray out of my holster and fingered the orange safety tab, peering toward a Saskatoon bush. Pulling back a branch, its leaves rustling, I sighed in relief. There was only a stump, its charred bark as black as fur. *Oh, boy,* I thought. *I must be tired from the early morning drive from the coast.*

I continued through the trees, ducking under the crowns of thick-barked elders, striding through grassy gaps sprinkled with seedlings, swimming through thickets of spindly saplings, the data of my graduate students churning through my mind as if in an adding machine. These young trees got their start in the shadow of the old by linking into their vast mycelium and receiving subsidies until they could build enough needles and roots to make it on their own. The Douglas-fir seeds that another of my graduate students, François, had sown around mature trees had a greater survival rate where he'd allowed them to link into old-tree fungal networks than where he'd isolated them in bags with pores allowing only molecules of water to filter through.

*The seedlings in this forest were regenerating in the network of the old trees.*

Resting on a stump, I took a long drink of water and noticed a cluster of seedlings no bigger than roofing nails. A belowground network could explain why seedlings could

survive for years, even decades, in the shadows. These old-growth forests were able to self-regenerate because the parents helped the young get on their own two feet. Eventually, the young ones would take over the tree line and reach out to others requiring a boost.

With the sun straight overhead, I double-checked the time on my BlackBerry. Nelson was still another 476 kilometers away, and to be home by midnight, I needed to leave by four p.m. Jean had urged me to buy this fancy phone—she nicknamed it my BlueBerry—and it was transforming my life, crucial now that I was so many hours on the road. I checked my email, and one of my grant proposals had been rejected. But another one, where we'd submitted looking at clear-cutting of the dry interior Douglas-fir forests and its effects on the integrity of mycorrhizal networks, was approved. *Yes!* I thought. The weeks of parsing words and budgets had paid off. I marveled at this little machine, how the Internet made me feel so connected to the world.

This forest was like the Internet too—the World Wide Web. But instead of computers linked by wires or radio waves, these trees were connected by mycorrhizal fungi. The forest seemed like a system of centers and satellites, where the old trees were the biggest communication hubs and the smaller ones the less-busy nodes, with messages transmitting back and forth through the fungal links. Back in 1997 when my article had been published in *Nature*, the journal had called it the “wood-wide web,” and that was turning out to be much more prescient than I'd imagined. All I knew back then was that birch and fir transmitted carbon back and forth through a simple weave of mycorrhizas. This forest, though, was showing me a fuller story. The old and young trees were *hubs and nodes*, interconnected by mycorrhizal fungi in a complex pattern that fueled the regeneration of the entire forest.

Wasps swarmed from a hole beside woody debris. Stung, I ran up the slope, as steep as an escalator, my cruiser vest heavy as a flak jacket, and flopped down at the crest, pressing my water bottle against a welt. The big old trees on this knoll

were spaced farther apart, and the saplings were fewer and farther between. Limited by drought. The thimbleberries and huckleberries had disappeared, replaced by the bunched long leaves of pinegrass, the bonnets of silky lupines, and the occasional soapberry shrub. The lupine and soapberry were nitrogen fixers, adding nitrogen to this slow-growing stand. Though the south-facing slope was dry, the plant community was intact, with none of the invasive weeds like the ones creeping along the roadside where I'd parked. This forest was at the northern edge of the arid Great Basin, but to the south it was mainly too dry for trees, and bunchgrasses grew instead in native prairies. These native grasslands were under pressure from exotic weed invasions, and in this case, the mycorrhizal networks were sapping them of life. Knapweeds, spread by cattle, tapped into the mycorrhizas of the grass tillers and stole phosphorus right out of their roots. Instead of the fungi of knapweed helping the grasses thrive, as they had with birch and fir, they were accelerating the decline that had begun with humans herding cattle. They did this possibly by sending the native grasses some poisons or an infection to finish the murder. Or starving them, taking over their energy, degrading the native prairie. Like the invasion of the body snatchers. Or the colonization of the Americas by Europeans.

With my increment borer I cored a handful of ancients on the knoll. The oldest was 302, the youngest 227. The largest, oldest ones were the elders of the forest. Their thick bark was scarred by flames, more pronounced than the trees in the wetter area below, because it was hotter and drier here, a magnet for lightning. This explained the wide range of ages. I checked my phone again. Two o' clock. In an hour, Don would be picking Hannah and Nava up from school.

I scraped the soil with my trowel. Just like the old trees near the creek, those on this crest were decorated with truffles and *tubercules*—clusters of mycorrhizal roots covered in a fungal rind—and golden fungal strands that ran from them like shooting stars. The trees and fungi here too

were in an intimate web. Compared to the trees down below, there were even more connections where the soil was drier and the trees more stressed. This made sense! Here on the crest, the trees invested more in mycorrhizal fungi because they needed more from them in return.

I leaned against the oldest tree, at least twenty-five meters tall with branches like the ribs of a whale. Seedlings were germinating in a crescent along the northern dripline of the tree, their needles stretched like spider legs, and I excavated one with my knife. Fungal threads streamed off the end of its roots, and I felt intoxicated, already forgetting the wasp sting. I pressed the seedling and its woolen mycorrhizas between the pages of my notebook so I could look more closely at home. But I already knew; these little seedlings were linked into the network of the old trees, receiving enough water to get them through the driest days of summer. My students and I had already learned that the deep-rooted trees brought water up to the soil surface at night by hydraulic lift and shared it with shallow-rooted plants, helping the archipelago stay whole during prolonged drought.

Without such an attachment, death of a seedling in the hot August days can be nearly immediate, needles turning red and the collars of their stems wounded with burns, leaving not a trace by snowfall. For these young recruits, small resource gains in moments of vulnerability make the difference between life and death, two sides of the dealer's card. But once their roots and mycorrhizas reach the labyrinth of russet pores, where water clings in films to soil particles, they ratchet up their game and grow a foundation. A root system like that, unfettered in its opportunity, was far more resilient than the chunky pistons grown in Styrofoam tubes in the nursery, where the seedlings intended for plantations were so stuffed with water and nutrients they couldn't—didn't need to—sprout adequate roots to partner with fungi to connect with the soil. Their thick needles needed streams of water under the hot August sun, but their roots continued

to grow as though imprisoned, unable to reach the old trees for help when the soil cracked in the dry clear-cuts.

I walked from the northern crescent of seedlings back to the old tree, the ground directly underneath its canopy bare even of grass. Not a seedling grew here. Its crown was so dense that it intercepted most of the precipitation and sun, and its roots were so thick that they took up most of the nutrients and water. But François would later find there was a sweet spot, a donut, at the dripline, the fringe of the crown, where the water dripped off the outermost needles, where some seedlings flourished. Not too close to be starved by the needs of the old tree, and not too far away for the grasses in the intervening meadows to rob them of what they required.

I ducked under the opposite edge of the old tree's crown—facing south, where the sun beat down—and gazed down the slope rolling into scree. It was so hot and dry on this side that not even a network could save a seedling from burning up. In the extremes—such as a desert—even the fungus could fail to bring life to a tree. An old log lay on the angle of repose, poised to roll over broken stones, and chunks of heartwood were newly exposed, beetles and ants flowing in lines with white fungi in their clutches. Claw marks. Bear, I thought, from at least a few days before. Douglas-fir seedlings cascaded off the north side of the log, where there was a sliver of shade along its length, and they spilled onto the forest floor. The scrap of advantage from the shade meant a little less water lost, a slightly thicker film coating the soil pores, the difference between survival or not. I wondered if the white fans of mycelium were linked to the old tree and helped keep the wood moist. These seedlings were alive, I figured, only because the fungi were importing water from somewhere.

Skin burning, I returned to the shade and checked the wasp sting. I should show my girls how to make a poultice of baking soda. I sat and leaned back against the old tree nurturing that crescent of seedlings through the mycorrhizal

network, the needles of the young quivering in the afternoon air.

The old trees were the mothers of the forest.

The hubs were *Mother Trees*.

Well, mother *and* father trees, since each Douglas-fir tree has male pollen cones and female seed cones.

But ... it felt like mothering to me. With the elders tending to the young. Yes, that's it. *Mother Trees. Mother Trees connect the forest.*

This Mother Tree was the central hub that the saplings and seedlings nested around, with threads of different fungal species, of different colors and weights, linking them, layer upon layer, in a strong, complex web. I pulled out a pencil and notebook. I made a map: Mother Trees, saplings, seedlings. Lines sketched between them. Emerging from my drawing was a pattern like a neural network, like the neurons in our brains, with some nodes more highly linked than others.

*Holy smokes.*

If the mycorrhizal network is a facsimile of a neural network, the molecules moving among trees were like neurotransmitters. The signals between the trees could be as sharp as the electrochemical impulses between neurons, the brain chemistry that allows us to think and communicate. Is it possible that the trees are as perceptive of their neighbors as we are of our own thoughts and moods? Even more, are the social interactions between trees as influential on their shared reality as that of two people engaged in conversation? Can trees discern as quickly as we can? Can they continuously gauge, adjust, and regulate based on their signals and interactions, just as we do? Just from the inflection of the way Don says "Suze," and from his brief glances, I comprehend his meaning. Maybe trees relate to one another as delicately, with such attunement. Signaling as precisely as the neurons in our brains do, to make sense of the world. I scribbled quick calculations based on our isotope work. It occurred to me that the amount of carbon

transferred relative to nitrogen was strikingly similar to their respective quantities in molecules of an amino acid called glutamate. We hadn't exactly sought in our experiments to trace glutamate's carbon-nitrogen movements, but other researchers had verified that the amino acid itself did move through mycorrhizal networks.

I did a fast search on my BlackBerry. Glutamate was the most abundant neurotransmitter in the human brain, and it set the stage for other neurotransmitters to develop. It was even more abundant than serotonin, whose carbon-to-nitrogen ratio was only slightly greater.

The hawk arced around the hill next to mine, now joined by two others, casting their shadows across the scree-pocked forest. How similar could the mycorrhizal network *really* be to a neural network? Sure, the pattern of the network and the molecules transmitting from node to node through the links might be similar. But what about the existence of the synapse; isn't that crucial to signaling in a neural network? This could also be important in a tree detecting whether its neighbors were stressed or healthy. Just as neurotransmitters pass signals across the synaptic cleft from one neuron to another in our brains, signals might also diffuse across a synapse between interfacing fungal and plant membranes in a mycorrhiza.

*Could information be transmitted across synapses in mycorrhizal networks, the same way it happens in our brains?* Amino acids, water, hormones, defense signals, allelochemicals (poisons), and other metabolites were already known to cross the synapse between the fungal and plant membranes. Any molecules arriving by way of the mycorrhizal network from another tree might also be transmitted through the synapse.

Maybe I was onto something: *both neural networks and mycorrhizal networks transmit information molecules across synapses.* Molecules move not just through the cross walls of adjacent plant cells and the end pores of back-to-back fungal cells, but also across synapses at the apices of different

plant roots, or different mycorrhizas. Chemicals are released into these synapses, and the information must then be transported along an electrochemical source-sink gradient from fungal-root tip to fungal-root tip, similar to the workings of a nervous system. The same basic processes, it seemed to me, were occurring in the mycorrhizal fungal network as in our neural networks. Giving us that flash of brilliance when we solve a problem, or make an important decision, or align our relationships. Maybe from both networks emerge connection, communication, and cohesion.

It was already accepted widely that plants use their neural-like physiology to perceive their environment. Their leaves, stems, and roots sense and comprehend their surroundings, then alter their physiology—their growth, ability to forage for nutrients, photosynthetic rates, and closure rates of stomata for saving water. The fungal hyphae, too, perceive their environment and alter their architecture and physiology. Like parents and children, my girls and Don and me, adapting to change, aligning to learn new things, figuring out how to endure. I'd be home tonight. *Mothering*.

The Latin verb *intelligere* means to comprehend or perceive. *Intelligence*.

The mycorrhizal networks could have the signature of intelligence.

At the hub of the neural network in the forest were the Mother Trees, as central to the lives of the smaller trees as I was to Hannah and Nava's well-being.

It was getting on, so I got up, sorry to leave the bark warm against my back. But I was breathless with elation, high on my thoughts, and I felt a kinship with the Mother Trees, grateful for accepting me and giving me these insights. I walked to the top of the knoll, remembering a small route out to the main haul road, and I followed a deer trail heading roughly in its direction. The thick fungal strands of the tough *Rhizopogon* truffles and the fine mycelial fans of the fragile *Wilcoxina* mushrooms, and the hundreds of other fungal species in this old forest, had unique structures and

abilities to acquire, transport, and transmit. Their long threads reached for treasure, their tendril fingers wrapped around the prizes. The information chemicals must transmit through these fungal highways along the various routes. Following the source-sink gradients between rich and poor.



Douglas fir Mother Tree

My little trail joined another, like a frayed thread joining a rope. I knew the networks were complex, with thick cords like freeways amid a gauze of fine hyphae that behaved like secondary routes. The thick cords themselves consisted of many simple hyphae that had twined together, forming an

outer rind around a space. Information chemicals could travel through these cords like water through a pipeline.

The main trail widened, and after a few more curves, the small road would lie ahead. The thick pipelines of fungal species like *Rhizopogon* were designed for long-distance communication, and the fine mycelial fans of fungal species like *Wilcoxina* must be adept at rapid response. Able to transmit chemicals swiftly to trigger fast growth and change. When Grannie Winnie was diagnosed with Alzheimer's, I'd read about what makes our brains either plastic or rigid. Maybe the long-distance *Rhizopogon* were analogous to the strong links in our brains arising from repetition, pruning, and regression, giving us long-term memory. Maybe the finer *Wilcoxina* hyphae, which grew faster and more abundantly, helped the mycorrhizal networks adapt to new opportunities, not unlike our own rapid, flexible responses to new situations, which Grannie was losing.

Grannie Winnie still had long-term memory. She knew she had to put on clothes; she just couldn't remember how many shirts to wear when it got hot, or whether to clip her bra in front or behind. Just as *Rhizopogon* strands deal with long-distance transport of solutions, Grannie's memory about wearing clothes came from lifelong brain pathways. But her ability to adjust quickly, and her short-term memory, were dwindling with the loss of new synapses, as if she were losing connections analogous to the ones created by the mycelial *Wilcoxina* fans for trees.

The thick complex strands running out from the Mother Trees must be capable of efficient, high-volume transfer to the regenerating seedlings. The finer spreading mycelia must help the new germinants modify to accommodate pressing, rapid needs, such as how to find a new pool of water on a particularly hot day. Pulsing, active, adaptive in providing for the growing plants, like fluid intelligence.

The new grant would eventually show us that the complex mycorrhizal network unraveled into chaos with clear-cutting. With the Mother Trees gone, a forest would lose its gravitas.

But within a few years, as seedlings grew into saplings, the new forest would slowly reorganize into another network. Without the pull of the Mother Trees, though, the new forest network might never be the same. Especially with widespread clear-cutting and climate change. The carbon in the trees, and the other half in the soil and mycelium and roots, might vaporize into thin air. Compounding climate change. Then what?

Wasn' t this the most important question of our lives?

I reached a colossal tree, a rampart, her branches thick right to the ground and as big as trees themselves. Her large size and old age were magnificent compared to her neighbors. She looked like the mother of all Mother Trees. What foresters call a "wolf tree"—far older, bigger, and with a much wider crown than the others, a lone survivor of previous calamities. She had lived through centuries of ground fires that others had—at one time or another—succumbed to. I waded through squalls of seedlings to get to the fringe of her crown and picked up a cone perhaps clipped by a squirrel, its bracts dusted in white spores. Her life had started when the Secwepemc people cared for this land, long before the Europeans came, when the Native people regularly lit fires to create habitat for game, or to stimulate growth of valuable native plants, or to clear routes for trading with neighboring nations, and they' d kept the fuels low so the flames were never intense enough to have burned off her thick bark completely. I was sure if I cored her, her rings would be calloused with char every twenty years or so, like the stripes of a zebra. I was struck by her endurance, her rhythm that spanned centuries. It was a matter of survival, not a choice, not an indulgence. Light glanced off her bark, incandescent, the sun dropping.

Brilliance.

I returned to the trail, telling myself to publish my thoughts on Mother Trees as soon as I could, and I rounded the last corner before the road.

On the edge of the path, only two meters away, were two cubs the size of teddy bears, staring through the purple larkspurs and pink lady-slipper orchids. One was brown, the other black, and they looked at me politely. Behind them wearing a black fur coat was their mama. She growled, and they darted into the huckleberries and birches, leaving me stunned. Alone, untouched.

I hurried onto the little road and raced to the main haulway, wondering if they' d been with me all day.

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notes:



*ily cere- cahiers* is a collection of texts (fragments). it is a branch of the collective *it is part of an ensemble*. these texts function as starting points for dialogues within our practice. we also love to share them with guests and visitors of our projects.

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