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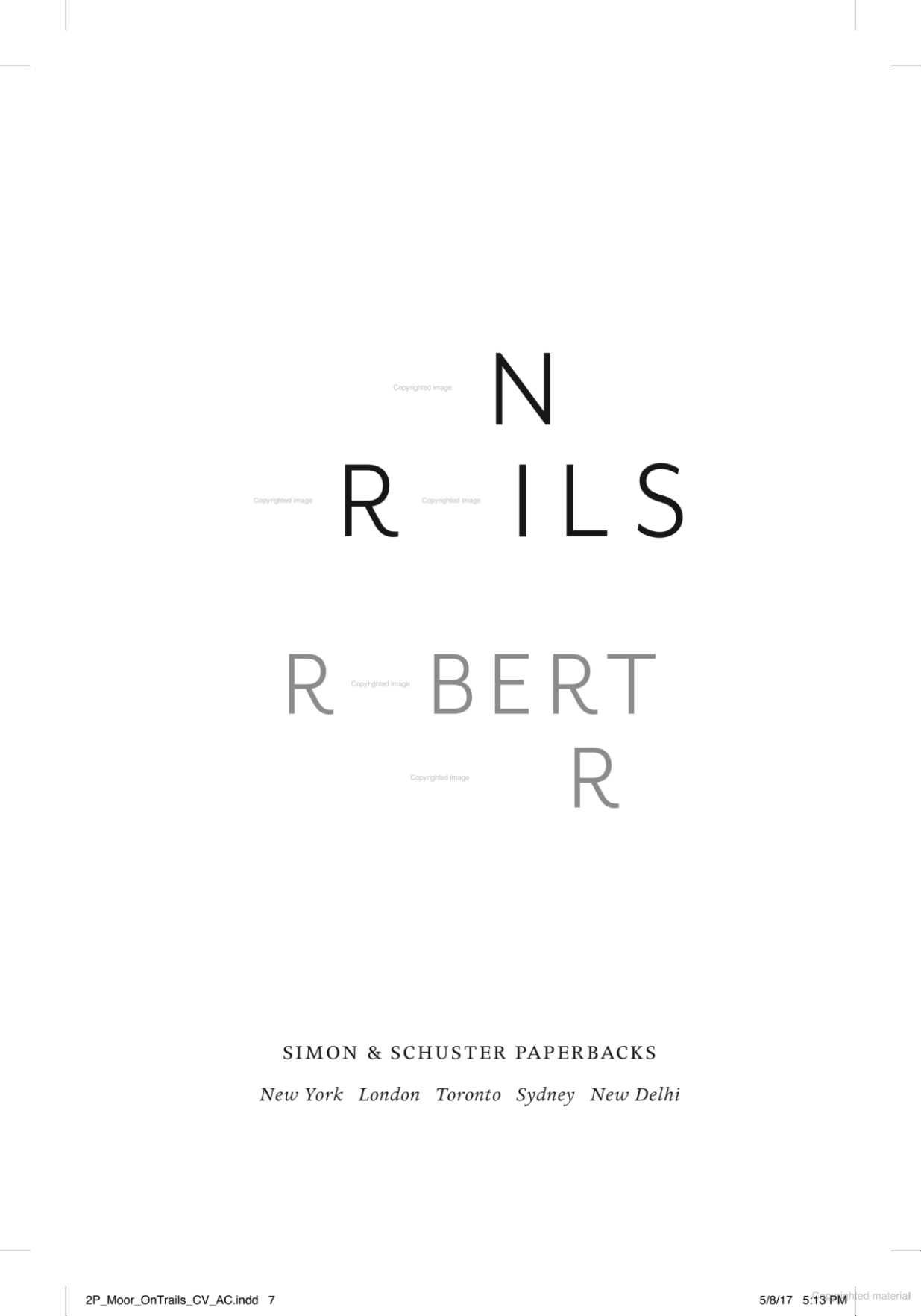

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CONTENTS

The path is made in the walking of it.

—Zhuangzi

ON TRAILS

PROLOGUE

NCE, YEARS AGO, I left home looking for a grand adventure and spent five months staring at mud. It was the spring of 2009, and I had set out to walk the full length of the Appalachian Trail from Georgia to Maine. My departure date was timed so that I would transition seamlessly from a mild southern spring to a balmy northern summer, but for some reason the warmth never arrived. It stayed cool that year, rained often. Newspapers likened it to the freak summer of 1816, when cornfields froze to their roots, pink snow fell over Italy, and a young Mary Shelley, locked up in a gloomy villa in Switzerland, began to dream of monsters. My memories of the hike consist chiefly of wet stone and black earth. The vistas from many of the mountaintops were blotted out. Shrouded in mist, rain hood up, eyes downcast, mile after mile, month after month, I had little else to do but study the trail beneath my nose with Talmudic intensity.

In his novel *The Dharma Bums*, Jack Kerouac refers to this kind of walking as "the meditation of the trail." Japhy Ryder, a character modeled after the Zen poet Gary Snyder, advises his friend to "walk along looking at the trail at your feet and don't look about and just

fall into a trance as the ground zips by." Trails are seldom looked at this intently. When hikers want to complain about a particularly rough stretch of trail, we gripe that we spent the whole day looking down at our feet. We prefer to look up, away, off into the distance. Ideally, a trail should function like a discreet aide, gracefully ushering us through the world while still preserving our sense of agency and independence. Perhaps this is why, for virtually all of literary history, trails have remained in the periphery of our gaze, down at the bottommost edge of the frame: they have been, quite literally, beneath our concern.

As hundreds—and then thousands—of miles of trail passed beneath my eyes, I began to ponder the meaning of this endless scrawl. Who created it? Why does it exist? Why, moreover, does any trail?

Even after I reached the end of the AT, these questions followed me around. Spurred on by them, and sensing in some vague way that they might lead to new intellectual ground, I began to search for the deeper meaning of trails. I spent years looking for answers, which led me to yet bigger questions: Why did animal life begin to move in the first place? How does any creature start to make sense of the world? Why do some individuals lead and others follow? How did we humans come to mold our planet into its current shape? Piece by piece, I began to cobble together a panoramic view of how pathways act as an essential guiding force on this planet: on every scale of life, from microscopic cells to herds of elephants, creatures can be found relying on trails to reduce an overwhelming array of options to a single expeditious route. Without trails, we would be lost.

My quest to find the nature of trails often proved trickier than I had expected. Modern hiking trails loudly announce their presence with brightly painted signs and blazes, but older trails are more inconspicuous. The footpaths of some ancient indigenous societies, like the Cherokee, were no more than a few inches wide. When Europeans invaded North America, they slowly widened parts of the

We walked in single file, floating through the trees like little ghosts. After an hour or two, we rose above the tree line and entered a realm of lichen-crusted rock and white mist. The trails around the mountain branched and twined. At the juncture with the Crawford Path, one of our counselors announced that we were turning onto a leg of the Appalachian Trail. His tone suggested we were meant to be impressed. I had heard that name before, but I wasn't sure what it meant. The path beneath our feet, he explained, followed the spine of the Appalachians north to Maine and south all the way to the state of Georgia, almost two thousand miles away.

I still recall the tingle of wonder I felt upon hearing these words. The plain-looking trail beneath my feet had suddenly grown to colossal scale. It was as if I had dived down into the camp lake and discovered the slow, undulant vastness of a blue whale. Small as I felt back then, it was a thrill to grasp something so immense, if only by the very tip of its tail.

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I kept hiking. It got easier—or rather, I got tougher. My pack and boots softened until they slid into place with the dry fluidity of an old baseball glove. I learned to move nimbly beneath a heavy load and push on for hours without breaks. I also came to savor the satisfaction of dropping my pack at the end of a long day: the warm animal weight would fall coolly away, and I would rise from my burden with a weird heliated feeling, as if my toes were merely grazing the dirt.

Hiking proved to be the perfect pastime for a free-floating kid like me. My mother once gave me a leather-bound journal that was meant to have my name embossed in gold along the spine, but instead the printer erroneously engraved the words *ROBERT MOON*. The mistake was oddly fitting. Growing up, I often felt extraterrestrial. It wasn't that I was lonely or ostracized; I just never felt fully *at home*.

Before I went off to college, no one knew I was gay, and I knew no other gay people. I did my best to blend in. Each year I would dutifully put on a suit and tie for the spring formal, the cotillion, or the prom. I donned athletic uniforms, first-date uniforms, drinking-pilfered-cans-of-Old-Style-in-a-friend's-basement uniforms. All the while, though, part of me wondered: What's the point of this elaborately costumed performance we put on?

In my family I was the youngest child by nearly a decade. My parents, who were already in their forties by the time I was born, granted me an unusual amount of freedom. I could have run wild. Instead, I spent much of my time in my room reading books, which, I discovered, was like running away from home, minus the risk and parental heartache. And so, from the third grade on, I burned through books the way a chain-smoker smokes, picking up one even as I was extinguishing the last.

The book that kicked off my habit in earnest was a flimsy paperback copy of *Little House in the Big Woods*. I learned that my home, in northern Illinois, was just a few hundred miles southeast of where the book's author, Laura Ingalls Wilder, was born in 1867. However, her descriptions of the Big Woods of Wisconsin were wholly foreign to me. "As far as a man could go to the north in a day, or a week, or a whole month, there was nothing but woods," she wrote. "There were no houses. There were no roads. There were no people. There were only trees and the wild animals who had their homes among them." I was intoxicated by Ingalls's sense of isolation and self-reliance.

I don't remember how many of the Little House books I read in a row, but it was enough to require an intervention from my teacher, who gently suggested I move on to something else. In the coming years I progressed from *Little House* to *Hatchet* to *Walden* to *A Sand County Almanac* to *Pilgrim at Tinker Creek*. I enjoyed lingering over the minutiae of a life spent outdoors. During my first summer at

Pine Island, I discovered a parallel genre of wilderness adventure books: first the boyish yarns of Mark Twain and Jack London, then the alpine reveries of John Muir, the Antarctic agonies of Ernest Shackleton, and the existential odysseys of Robyn Davidson and Bruce Chatwin.

These two lineages of outdoor writers were roughly divided between those who were deeply rooted to a piece of land and those who were proudly untethered. I preferred the drifters. I held no profound connection to my land, my ancestors, my culture, my community, my gender, or my race. I was raised without religion, and without hatred of religion. My family was diffuse: my parents, two Texans living in the frigid North, were already divorced by the time I was in the first grade; not long after, my two older sisters went away to college and never moved back. A vague restlessness seemed to run in our blood.

Nine months out of every year I drifted through the halls of one academic institution after another, changing costumes, learning new dialects, faking fluency. It was only during the summers, on a series of ever-lengthening sojourns in the wilderness, that I felt wholly natural. I worked my way up from the Appalachians to the mighty Rockies, then to the Beartooths, the Winds, the snowy behemoths of the Alaska Range, and, later, high-altitude peaks ranging from Mexico to Argentina. Up there, far from etiquette or ritual, I could walk unscrutinized, unbound.

For two summers in college I took a job back at Pine Island leading kids on short hikes through the Appalachians. On trips along the AT I would occasionally bump into hikers who were attempting to walk the trail's full length in a single, mammoth, months-long effort. These "thru-hikers" were easy to spot: They introduced themselves with odd "trail names," ate ravenously, and walked with a light, lupine gait. I was intimidated by them, but also envious. They resembled the rock musicians of an idealized past—the same long hair, the same

wild beards, the same wasted physiques, the same esoteric argot, the same peripatetic lifestyle, the same faint, vain awareness of being, in a way, heroic.

I sometimes talked with these thru-hikers, plying them with chunks of cheese or handfuls of candy. I remember one old man who had hiked the whole trail in a Scottish kilt and sandals, and a young man who carried no tent, but a full feather pillow. A few of them proselytized zealously for one church or another, while others spoke of preparing for a looming ecological apocalypse. Many of the people I talked to were between jobs, between schools, or between marriages. I met soldiers returning from war and people recovering from a death in the family. Certain stock phrases were repeated. "I needed some time to clear my head," they said, or "I knew this might be my last chance." One summer during college, I told a young thru-hiker that I hoped to make an attempt someday. "Drop out," he told me flatly. "Do it now."

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I did not drop out. I was too careful for that. In 2008 I moved to New York, where I worked a series of low-paying jobs. In my free time I planned my thru-hike. I read guidebooks and online message boards, drew up tentative itineraries. Less than a year later I was ready to embark.

Unlike many people, I had no clear impetus for going on a long hike, no inciting incident. I wasn't grieving a death or recovering from drug addiction. I wasn't fleeing anything. I had never been to war. I wasn't depressed. I was maybe only a little insane. My thru-hike was not an attempt to find myself, find peace, or find God.

Perhaps, as they say, I simply needed some time to clear my head; perhaps I knew this might be my last chance. Both were mostly true, as clichés often are. I also wanted to find out what it would be like to spend months on end in the wilderness, to live in a prolonged state of

freedom. But more than that, I think I wanted to answer a challenge that had loomed over me since childhood. When I was small and frail, hiking the whole trail had seemed a herculean task. As I grew, its impossibility became precisely its appeal.

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Over the years, I had picked up some useful tips from the thru-hikers I'd met. Above all, I knew that weight was the enemy of a successful thru-hike, so I retired my trusty old pack and invested in a new ultralight one. Then I traded in my bulky tent for a hammock, bought an airy goose-down sleeping bag, and exchanged my leather boots for a pair of trail running shoes. I pared my medkit down to a few anti-diarrheal pills, some iodine swabs, a thumb-sized roll of duct tape, and a safety pin. I replaced my white gas stove with one made out of two aluminum Coke cans, which weighed practically nothing. When I crammed all of my gear into my new pack and lifted it for the first time, I was amazed and slightly terrified. It seemed too insubstantial to house, clothe, and feed a human for five months.

So I wouldn't be forced to live off an anemic diet of instant ramen and freeze-dried mashed potatoes, I began cooking heaping piles of nutritious slop (beans and brown rice, quinoa, couscous, whole wheat pasta with tomato sauce) and dehydrating them. I poured sparing amounts of olive oil and hot sauce into small plastic bottles. I filled plastic baggies with baking soda, Gold Bond, vitamins, and painkillers. I divided all of the supplies up into roughly five-day increments and packed them into fourteen cardboard boxes. Into each box, I also placed a chapbook of poetry or a heftier paperback novel that I had cut into slimmer volumes using a straight razor and packing tape.

I addressed these boxes to post offices along the trail—towns with names like Erwin, Hiawassee, Damascus, Caratunk, and (my

since, science teachers have amused their students by drawing blue spirals on sheets of paper, while termites line up and confusedly circle toward nowhere.

On my hike, when the trail veered hard to the east or west, I would often wonder whether I too wasn't being led in cruel circles. Seen in a certain light, trails represent a particularly grim form of determinism. "Man may turn which way he please, and undertake any thing whatsoever," wrote Goethe, "he will always return to the path which nature has prescribed for him." On the AT, this was certainly the case. Though I explored the surrounding woods and hitchhiked into towns, in the end I always came back to the trail. If uncertainty is the heart of adventure, I thought to myself, what kind of adventure was this?

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Northward I moved, through a gray southland spring. The trees were black scrags, the ground papered in old leaves. One morning in Tennessee, I awoke to find my hiking shoes bronzed in ice. In North Carolina, I hiked through knee-deep snow, then ankle-deep slush. The walking was hard, but then every few days, regardless of the terrain or the weather, I would experience the joy of slipping from the dark woods and ascending into the air and light.

In my second week on the trail I fell in with a tight little group of fellow thru-hikers. We happily traveled together for a few weeks. But upon reaching Virginia, I quickened my pace and lost them. Weeks or months later, whenever I slowed down or they sped up, I would bump into these friends again, as if by some miraculous coincidence. The miracle, of course, was the trail itself, which held us together in space like so many beads on a string.

Each of us adopted new trail names. Most people were given their names by fellow thru-hikers because of something they had said or done; my friend Snuggles, for example, had a habit of snuggling up

against other hikers in the lean-tos at night to keep herself warm. Others picked names in an attempt to shape new, aspirational identities for themselves. A tense silver-haired woman renamed herself Serenity, while a timid young man called himself Joe Kickass; sure enough, over time, she seemed to grow incrementally calmer, and he more audacious.

A group of jolly older women christened me Spaceman, in reference to the astral appearance of my shiny, ultralight hiking gear. The name clicked. In the trail registers—notebooks located at regular intervals along the trail, meant for recordkeeping and note sharing—I began drawing a series of comic strips. The protagonist was a spaceman who had come down to Earth and somehow found himself navigating the strange customs, odd characters, and pseudo-wildernesses of the Appalachian Trail.

Once a week or so, a group of us thru-hikers would hitchhike into town together, find a cheap motel (sometimes piling six or eight people into a single room), and spend the day showering, washing our filthy clothes, drinking beer, eating impossible quantities of greasy food, and watching bad TV—glutting ourselves, like barbarians, on the meretricious pleasures of civilization. By the next morning we would be eager to get back on the trail, where we could sweat out the gunk and savor the clean air.

I had expected the trail to be a refuge for loners like me; the sense of community that formed among us scattered thru-hikers took me by surprise, and then grew to be one of the hike's nectarine joys. We were bonded by common experience. Each of us knew how it felt to walk for weeks through hail and snow and rain. We starved; we gorged. We drank from waterfalls. In the Grayson Highlands, wild ponies licked the sweat from our legs. In the Smokies, black bears haunted our sleep. We had each faced down the same Cerberus of loneliness, boredom, and self-doubt, and we had learned that the only solution was to out-walk it.

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As I got to know my fellow thru-hikers—a motley pack of freedom seekers and nature worshipers and outright kooks—it struck me as odd that all of us had willingly confined ourselves to a single path. Most of us saw this hike as an interlude of wild freedom before we reentered the ever-tightening hedge maze of adult life. But complete freedom, it turned out, is not what a trail offers. Quite the opposite—a trail is a tactful reduction of options. The freedom of the trail is riverine, not oceanic.

To put it as simply as possible, a path is a way of making sense of the world. There are infinite ways to cross a landscape; the options are overwhelming, and pitfalls abound. The function of a path is to reduce this teeming chaos into an intelligible line. The ancient prophets and sages—most of whom lived in an era when footpaths provided the primary mode of transport—understood this fact intimately, which is why the foundational texts of nearly every major religion invoke the metaphor of the path. Zoroaster spoke often of the "paths" of enhancement, of enablement, and of enlightenment. The ancient Hindus too prescribed three *margas*, or paths, to attain spiritual liberation. Siddhārtha Gautama preached the *āryāṣṭāṅgamārga*, or the Noble Eightfold Path. The Tao literally means "the path." The Hebrew word for Jewish law, *halakhah*, means "the walking"; the Arabic word for Islamic law, *shariah*, translates to "the path to the watering hole." The Bible, too, is crisscrossed with trails: "Ask for the ancient paths, where the good way is, and walk in it, and you shall find rest for your souls," commanded the Lord to the idolaters. (Responded the idolaters: "We will not walk therein.")

There are, it is often said by the more ecumenical prophets, many paths up the mountain. So long as it helps a person navigate the world and seek out what is good, a path, by definition, has value. It is rare to run across a spiritual leader preaching that there are *no* paths to enlightenment. Some of the Zen masters came close, though even

the great Dōgen stated that meditation "is the straight path of the Buddha way." The Indian philosopher Jiddu Krishnamurti stands out in this regard. "Truth has no path," he wrote. "All authority of any kind, especially in the field of thought and understanding, is the most destructive, evil thing." Unsurprisingly, his path of pathlessness attracted fewer adherents than the reassuringly detailed instructions of Muhammad or Confucius. Lost in the howling landscapes of life, most people will choose the confinement of a path to the dizzying freedom of an unmarked wilderness.

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My spiritual path, to the extent that I had one, was the trail itself. I regarded long-distance hiking as an earthy, stripped down, American form of walking meditation. The chief virtue of the trail's confining structure is that it frees the mind up for more contemplative pursuits. The aim of my slapdash trail religion was to move smoothly, to live simply, to draw wisdom from the wild, and to calmly observe the constant flow of phenomena. Needless to say, I mostly failed. Looking back through my journal recently, I found that rather than spending my days in a state of serene observation, much of my time was given over to griping, fantasizing, worrying over logistics, and dreaming of food. Enlightened I was not. But overall I was as happy and healthy as I'd ever been.

Over the course of my first couple of months, my pace gradually increased, from ten miles per day up to fifteen and then twenty. I continued to accelerate as I reached the relatively low-lying ridges of Maryland, Pennsylvania, New Jersey, New York, Connecticut, and Massachusetts. By the time I crossed over into Vermont, I was covering as many as thirty miles a day. In the process, my body was being re-tooled for the task of walking. My stride lengthened. Blisters hardened to calluses. All spare fat, and a fair bit of muscle, was converted into fuel. At any given moment, one or two com-

ponents of the machine were usually begging for maintenance—a sore ankle, a chafed hip. But on the rare days when everything was running in harmony, hiking a good stretch of trail felt like gunning a supercar down an empty interstate: a perfect marriage of instrument and task.

My mind began to change, subtly, too. A legendary old hiker named Nimblewill Nomad once told me that eighty percent of aspiring Appalachian Trail thru-hikers who give up do so for mental reasons, not physical ones. "They just can't deal with the daily, the weekly, the monthly challenge of being out there in the quiet," he said. I begrudgingly learned to embrace the monastic silence of the eastern forests. Some days, after many miles, I would slip into a state of near-perfect mental clarity—serene, crystalline, thought-free. I was, as the Zen sages say, just walking.

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The trail leaves its mark upon its travelers: My legs became a map of black scrapes and leechy pink scars. Ragged holes opened up in my hiking shoes, and beneath those, in my socks, and beneath those, in my feet. My T-shirt began to dissolve from the months of friction and corrosive sweat. If I reached back, I could feel my shoulder blades pushing through the threadbare fabric like budding wings.

At the same time, I began to notice that we hikers likewise alter the trail in our passing. I first recognized our impact when climbing the steep S-shaped turns up hillsides called switchbacks. When a trail is too curvy, descending hikers tend to create shortcuts to skip the turns. I also noticed that in boggy areas, hikers would scramble for dry footing, which split the trail into multiple strands. There seemed to be a basic conflict between the rationale of the trail's architects and that of its walkers. Later, by volunteering on trail-building crews, I would learn why this is so: hikers typically seek the path of least re-

"Sarah, pull your skirt up higher. It's practically dragging in the mud!" cries the husband.
"I can't do that. My stockings are torn!" replies his wife.
"Why didn't you put a fresh pair of stockings on?" the husband asks.
"Could I know it was going to rain?"

Raskin deems this joke a failure; it lacks the logical contradiction that lies at the heart of the absurd. But it was a start. Twenty years later, the joke had been tweaked in a number of ways: the setting was moved from an unnamed location to the mythic town of Chelm, which was known to be full of fools; the sentences were sharpened; and the stockings were swapped out for an umbrella, giving the punch line a neater logical paradox. Having passed through countless mouths, the joke had grown from a clunker to a classic:

Two sages of Chelm went out for a walk. One carried an umbrella, the other didn't. Suddenly, it began to rain.
"Open your umbrella, quick!" suggested the one without an umbrella.
"It won't help," answered the other.
"What do you mean, it won't help? It will protect us from the rain."
"It's no use, the umbrella is as full of holes as a sieve."
"Then why did you take it along in the first place?"
"I didn't think it would rain!"

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One torrential afternoon on the AT, as I was hiking around Nuclear Lake, in New York, I turned a corner to discover a black bear waddling down the middle of the trail. It apparently could neither hear nor smell me amid the rain. It went on calmly snuffling along

until I clacked my trekking poles together, at which point it spun around, spotted me, and then nervously trundled off into the woods. I stopped to inspect the stubby-fingered, sharp-clawed prints it had left in the mud. Over the following weeks I began to notice other prints—mostly deer, squirrel, raccoon, and, farther north, moose—pressed into the wet trail. When I left the trail to explore the nearby woods, I was surprised to find a shadow kingdom of trails connecting parts unknown.

Humans are neither the earth's original nor its foremost trailblazers. Compared to our clumsy dirt paths, the trails of ants are downright wizardly. Many species of mammals, it turns out, are also remarkably adept trail-builders. Even the dumbest animals are experts at finding the most efficient route across a landscape. Our languages have grown to reflect this fact: In Japan, desire lines are called *kemonomichi*, or beast trails. In France, they call them *chemin de l'âne*, or donkey paths. In Holland, they say *Olifantenpad*, elephant paths. In America and England, people sometimes dub them "cow paths."

"We say the cows laid out Boston," wrote Emerson, in reference to the (probably apocryphal) belief that the city's crooked grid was the result of paving old cow paths. "Well, there are worse surveyors. Every pedestrian in our pastures has frequent occasion to thank the cows for cutting the best path through the thicket, and over the hills: and travelers and Indians know the value of a buffalo-trail, which is sure to be the easiest possible pass through the ridge." More than a hundred years later, a study from the University of Oregon has lent credence to Emerson's claim: forty cattle were pitted against a sophisticated computer program and tasked to find the most efficient path across a field. In the end, the cows outperformed the computer by more than ten percent.

Before colonization, many North American tribes followed deer and bison trails, which found the lowest passes across mountain ranges and the shallowest fords across rivers. Elephants, too, are

thought to have cleared the most expedient roads through many parts of India and Africa. Nonhuman animals achieve this efficient design not through superhuman intelligence, but through sheer persistence. They continually search for better routes, and once one is found, they adopt it. In this manner, trail networks of incredible efficiency can arise simply, organically, iteratively, without any forethought necessary.

A clever and patient observer can watch a trail sleeken in real time. The physicist Richard Feynman, for instance, witnessed this phenomenon while studying the ants that infested his home in Pasadena. One afternoon, he took note of a line of ants walking around the rim of his bathtub. Though myrmecology was far from his area of expertise, he was curious to find out why ant trails inevitably "look so straight and nice." First, he placed a lump of sugar on the far side of the bathtub and waited for hours until an ant found it. Then, as the ant carted a piece of the sugar back to its nest, Feynman picked up a colored pencil and traced the ant's return path along the bathtub. The resulting trail was "quite wiggly," full of errors.

Another ant emerged, followed the first ant's trail, and located the sugar. As it plodded back to the nest, Feynman marked its trail with a different color of pencil. But in its haste to return with its bounty, the second ant repeatedly lost the first ant's trail, cutting off many of the unnecessary curves: The second line was noticeably straighter than the first. The third line, Feynman noted, was even straighter than the second. He ultimately followed as many as ten ants with his pencils, and, as he'd expected, the last few trails he traced formed a neat line along the bathtub's edge. "It's something like sketching," he observed. "You draw a lousy line at first; then you go over it a few times and it makes a nice line after a while."

I later learned that this streamlining process extended beyond ants, or even animals. "All things optimize in nature, to some degree," an entomologist named James Danoff-Burg told me.

Intrigued, I asked him if there was a good book I could read on optimization.

"Sure," he said. "It's called *The Origin of Species* by Charles Darwin."

Evolution, he explained, is a form of long-term, genetic optimization; the same process of trial and error takes place. And, as Darwin showed, in the great universal act of streamlining, even the errors are essential. If some ants weren't error-prone, the ant trail would never straighten out. The scouts may be the genius architects who blaze the trails, but any rogue worker can be the one who stumbles upon a shortcut. Everyone optimizes, whether we are pioneering or perpetuating, making rules or breaking them, succeeding or screwing up.

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After three and a half months I reached the base of Mount Washington in New Hampshire. I climbed it via the Crawford Path, the same trail I had hiked when I was ten. In rapid succession I pieced together a half-dozen peaks that I'd climbed at different times in the past decade: the Presidentials, Old Speck, Sugarloaf, Baldpate, the Bigelows. The order of the mountains sometimes surprised me; it was as if someone had opened my childhood photo album and rearranged my memories. The mountains also seemed smaller than I remembered. Hikes that had taken days when I was a kid now took only hours. It was an eerie sensation—that same uncanny, gargantuan feeling you get from revisiting your old kindergarten.

Any feeling of mastery I harbored was mingled with feelings of humility. I had hiked two thousand miles, but I could never have gotten there on my own. My route had been carved out by scores of volunteer trail-builders and a continuous flow of prior walkers.

I often felt this way on the trail: I was able to hold both one

notion and its direct opposite in my mind at the same time. Paths, in their very structure, foster this way of thinking. They blear the divide between wilderness and civilization, leaders and followers, self and other, old and new, natural and artificial. It is fitting that in Mahayana Buddhism, the image of the Middle *Path*—and not some other metaphor—is used as a symbol of dissolving all dualities. The only binary that ultimately matters to a trail is the one between use and disuse—the continual, communal process of making sense, and the slow entropic process by which it is unmade.

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On August 15, almost five months to the day after I had started out from Springer Mountain, I reached the summit of Mount Katahdin in Maine. Far below, in every direction, were green forests and blue lakes and islands of green forest within the blue of the lakes. After what felt like months of steady rain, the skies had finally cleared. I could feel the dampness baking from my bones. I had at last reached the trail's end.

In the center of the peak was an iconic wooden sign announcing the trail's northern terminus. It had the air of a shrine. Groups of day hikers hung back from it, forming a respectful half-circle, while a handful of thru-hikers approached it, one by one, with looks of reverence and tamped expectation. Each hiker had a moment alone with the sign, posed for a photograph to commemorate the occasion—some exuberant, some somber—and then moved on, allowing the next hiker to approach.

When my turn came, I walked up to the sign, laid my hands on it, and kissed its wind-scoured surface. The moment held a certain surreal quality; I already had imagined it a thousand times. My friends and I popped a bottle of cheap champagne, which we shook and sprayed in fanning arcs into the air. When we finally took a sip, the

maximize their collective intelligence. In the third chapter, we follow the trails of four-legged mammals like elephants, sheep, deer, and gazelles, to learn how they manage to navigate immense territories, and how our efforts to hunt, herd, and study them have shaped our development as a species. Chapter four chronicles how ancient human societies stitched together their landscapes with networks of footpaths, which then became tightly interwoven with the vital cultural threads of language, lore, and memory. In the fifth chapter, we unearth the winding origins of the Appalachian Trail, and other modern hiking trails like it, which stretch back centuries to Europeans' colonization of the Americas. In the sixth and final chapter, we trace the longest hiking trail in the world from Maine to Morocco, and we discuss how trails and technology—having combined to create our modern transportation system and communication network—connect us in previously unimaginable ways.

As a writer and a walker, I am limited by my experience, my background, and my place in history. If this book strikes some readers as too Americentric, or too anthropocentric, I beg their forgiveness; I am, after all, just one American human, doing my best to make sense of a deceptively complex topic. It is also important to note that although the structure of this book is loosely spatial and chronological—moving from the tiny and ancient to the huge and futuristic—this book is not what philosophers call a teleology, a succession of rungs leading up to an ultimate goal. I am not so foolish as to believe that trails have been evolving for hundreds of millions of years only to culminate in the hiking paths of the twenty-first century. I urge readers to avoid interpreting this book's structure as a ladder leading upward, but to instead regard it as a trail winding from the dim horizon of the past to the wide foreground of our present circumstances. Our history is one of many paths we might have taken, but it was the one we took.

Trails can be found in virtually every part of this vast, strange, mercurial, partly tamed, but still shockingly wild world of ours. Throughout the history of life on Earth, we have created pathways to guide our journeys, transmit messages, refine complexity, and preserve wisdom. At the same time, trails have shaped our bodies, sculpted our landscapes, and transformed our cultures. In the maze of the modern world, the wisdom of trails is as essential as ever, and with the growth of ever-more labyrinthine technological networks, it will only become more so. To deftly navigate this world, we will need to understand how we make trails, and how trails make us.

CHAPTER 1

It is impossible to fully appreciate the value of a trail until you have been forced to walk through the wilderness without one. There is a practical reason why, for more than a thousand years, after the fall of Rome and before the rise of Romanticism, little was more abhorrent to the European mind than the prospect of a "pathless" or "tangled" wilderness. Dante famously described the feeling of finding oneself in a "wild, harsh and impenetrable" forest without a path as "scarcely less bitter than death."

Five hundred years later, a Romantic like Lord Byron could proclaim that there is "a pleasure in the pathless woods," but only once the wilds of Western Europe had been tamed and caged. By that point, the true "pathless wilderness" was believed to exist only on other continents, like North America, where the phrase was still being used well into the nineteenth century.* The American wilder-

* This, despite the fact that the land had been webbed with native footpaths since long before white people arrived.

ness came to symbolize an inhospitable and far-off land, cold, cruel, and uncivilized. At the Boston Railroad Jubilee in 1851, the politician Edward Everett described the land between Boston and Canada as a "horrible wilderness, rivers and lakes unspanned by human art, pathless swamps, dismal forests that it made the flesh creep to enter . . ."

Pathless wildernesses still exist in the modern world, and at least some have retained their power to elicit dread. I have visited one such place. It lay on the northern rim of a glacial fjord called Western Brook Pond, on the island of Newfoundland, in Canada's easternmost province. If you want to be taught (however harshly) the blessing of a well-marked trail, go there.

To cross the fjord's Stygian waters, I had to hire a ferryboat. Aboard the ferry, the captain explained that the water below the boat was so pure (in a hydrologist's terms, so ultraoligotrophic) that it bordered on nonexistence; he said it played havoc with the sensors in modern water pumps because the water couldn't even carry an electrical current.

On the far side of the fjord, the captain dropped me and four other hikers off at the base of a long ravine, where a series of animal trails led through a dense fern jungle and up a granite cliff face bisected by a waterfall. This was my first hiking trip since returning home from the Appalachian Trail. I felt strong; my pack was light. Weaving through the tall ferns, I quickly passed the other hikers. At the top of the ravine I found a vast green tableland. The trail I had been following vanished altogether. Soaked in sweat from the hike up, I took a moment to rest, my feet dangling over the cliff's edge. At the ragged western edge of the tableland, it abruptly dropped hundreds of feet to the fjord's indigo water.

I sat and watched as the other hikers wound their way up the ravine. Once they had reached the top, the other four hikers all headed south, along a more scenic route. Watching them go, laboring beneath their heavy packs, I felt a swell of confidence. I rose, map

and lay back down to sleep. But as I turned back to my sleeping bag, I noticed the purple stripe was finely veined with lightning. It was not clear sky, I realized, but a massive storm cloud stretching from one end of the horizon to the other. It let out a soft digestive growl.

Within the space of a half hour, the storm cloud rushed overhead. The air was crazed with rain. Fearing a lightning strike, I scrambled out of my sleeping bag, out from under my tarp, and down to the lowest point I could find. There I crouched on my sleeping mat on the balls of my feet, hands over my head, shaking and drenched, as delicate strings of light detonated all around me.

For the better part of an hour, awash in mounting waves of tympanic rumble, I had time to reconsider the merits of hiking. Stripped of its Romantic finery, the wild ceased to inspire; only a gauzy scrim separated sublimity and horror. Jacques Cartier, upon visiting this island in 1534, declared that he was "inclined to believe that this is the land God gave to Cain." He was right. It was a dark and pestilential place. The apparent beauty was only a ruse to lure you into its flytrap maw. I vowed to myself that if I made it out of this alive, I would never hike again.

Upon seeing the Earth's true brutality unmasked, authors throughout history have expressed a similar sense of disillusionment, even betrayal. In his semiautobiographical short story "The Open Boat," Stephen Crane captured the chilling moment when a shipwreck victim realizes that nature is "indifferent, flatly indifferent." Annie Dillard—after watching a giant water bug gruesomely devour a frog—grapples with the possibility that "the universe that suckled us is a monster that does not care if we live or die." Goethe went one step further, calling the universe "a fearful monster, forever devouring its own offspring." Kant, Nietzsche, and Thoreau all describe nature not as a mother, but as a "stepmother"—a winking reference to the wicked villainesses of German lore.

The English writer Aldous Huxley came to this realization while

walking through the wilds of Borneo. Being fussy about his lodgings and terrified of cannibals, Huxley preferred to stick to "the Beaten Track." But one day eleven miles outside of Sandakan, the paved road he was traveling along abruptly ended, and he was forced to trek through the jungle. "The inside of Jonah's whale could scarcely have been hotter, darker or damper," he wrote. Lost in that mute, hot twilight, even the cries of birds startled him, which he imagined to be the whistles of devilish natives. "It was with a feeling of the profoundest relief that I emerged again from the green gullet of the jungle and climbed into the waiting car. . . . I thanked God for steam-rollers and Henry Ford."

Back home, Huxley drew from this experience to compose a series of audacious attacks against the Romantic love of wilderness. The worship of nature, he wrote, is "a modern, artificial, and somewhat precarious invention of refined minds." Byron and Wordsworth could only rhapsodize about their love of nature because the English countryside had already been "enslaved to man." In the tropics, he observed, where forests dripped with venom and vines, Romantic poets were notably absent. Tropical peoples knew something Englishmen didn't. "Nature," Huxley wrote, "is always alien and inhuman, and occasionally diabolic." And he meant *always*: Even in the gentle woods of Westermain, the Romantics were naive in assuming that the environment was humane, that it would not callously snuff out their lives with a bolt of lightning or a sudden cold snap. After three days amid the Tuckamore, I was inclined to agree.

Once the rain had ceased, I shook the water from my tarp, packed my things, and began walking to get warm. I found myself looking with new admiration upon the Tuckamore, which looked unfazed by the storm—nourished, even. Those rugged little trees were perfectly fitted to their niche, sculpted by the wind, deeply rooted to their land. I, meanwhile, was a perpetual wanderer, ill-equipped, maladapted, and lost.

Three hours later, after a few more harrowing misadventures (ravines descended in vain; waterfalls tenuously traversed), I found my

way to the endpoint of the unmarked wilderness, where a large pyramidal pile of rocks marked the beginning of the trail back down to Snug Harbour. I whooped and hollered, awash in the same relief Huxley felt upon spotting his chauffeur. The trail, however rough, would return me to the human realm. Delivered from chaos, I promptly forgot my former terror, fell in love with the earth anew, and once again desired to walk every inch of it.

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I had not traveled to Newfoundland to be mauled by trees. The hike was a mere diversion, a side trip. My ultimate destination was a yet more baffling and inaccessible wilderness: the distant past. I was making my way to a rocky outcropping on the island's southeast corner, where I hoped to find the oldest trails on earth.

These fossil trails, which are roughly 565 million years old, date back to the dimmest dawn of animal life. Now fossilized and faint, each one is roughly a centimeter wide, like a fingertip's errant brush across the surface of a drying clay pot. I had read all about them, but I wanted to touch them, to trace their runnels like a blind man. I hoped that encountering them up close would resolve a question I've long harbored, like an old thorn: Why do we, as animals, uproot ourselves rather than maintaining the stately fixity of trees? Why do we venture into places where we were not born and do not belong? Why do we press forward into the unknown?

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The world's oldest trails were discovered one afternoon in 2008 by an Oxford researcher named Alex Liu. He and his research assistant were scouting for new fossil sites out on a rocky promontory called Mistaken Point, where a series of well-known fossil beds overlook the North Atlantic. Bordering one surface, Liu noticed, was a small shelf of mudstone that bore a red patina. The red was rust—an

oxidized form of iron pyrite, which commonly appears in local Precambrian fossil beds. They scrambled down the bluff to inspect it. There, Liu spotted what many other paleontologists before him had somehow missed: a series of sinuous traces thought to be left behind by organisms of the Ediacaran biota, the planet's earliest known forms of animal life.

The ancient Ediacarans, which likely went extinct around 541 million years ago, were exceedingly odd creatures. Soft-bodied and largely immobile, mouth-less and anus-less, some were shaped like discs, others like quilted mattresses, others like fronds. One unfortunate type is often described as looking like a bag of mud.

We can envision them only dimly. Paleontologists don't know what color they were, how long they lived, what they ate, or how they reproduced. We do not know why they began to crawl—perhaps they were hunting for food, fleeing a mysterious predator, or doing something else entirely. Despite all these uncertainties, what Liu's trails undoubtedly suggest is that 565 million years ago, a living thing did something virtually unprecedented on this planet—it shivered, swelled, reached forth, scrunched up, and in doing so, at an imperceptibly slow pace, began to move across the sea floor, leaving a trail behind it.

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To reach the fossil trails at Mistaken Point, I flew to the town of Deer Lake and hitchhiked some seven hundred miles, taking a slow circuitous route that touched almost every corner of the island. Along the way I hiked mountains, swam in rivers, tasted icebergs, camped out, and slept on strangers' couches. Newfoundland is ideal for bumming around; it has one of the lowest homicide rates in the world, the people are generally congenial, and everyone seems to own a big automobile. Car ride by car ride, I made my way down to the island's southeastern tip.

However, when I finally arrived at the park entrance, I was turned away. A vigilant park ranger forbade me to see the trails because I had failed to acquire the proper permits. Their location, I learned, was a matter of great secrecy due to the rise of so-called "paleo-pirates," who had been known to carve out the more notable fossils and sell them to collectors.

Undeterred, I returned the following year—armed, this time, with the proper clearance. A saintly couple I had met the year before graciously offered to pick me up at the airport and give me a ride down to Trepassey, a town nicknamed the "Harbor of the Dead," because its foggy waters had been the site of many shipwrecks. There, at an unprepossessing restaurant in the Trepassey Motel, I finally met with Alex Liu.

Having only read about him in press clippings, I imagined Liu as I did all paleontologists: gray at the temples, a pair of Savile Row spectacles perched on his nose, and behind them, the deep-creased eyes of a man who spends his days peering at small things lit by a harsh sun. But when Liu appeared in the doorway of the restaurant, I was surprised to discover a fresh-faced, raven-haired young man, not yet thirty, with a shy smile. Beside him were his two research assistants: Joe Stewart, who had the shorn head and handsomely punched-up physiognomy of a rugby player, and Jack Matthews, the youngest member of the group, whom I seemed to have caught in a brief hiatus in his metamorphosis from a mischievous boy into a kooky, brilliant, snowy-haired professor.

We shook hands, sat down, and ordered a round of beer and plates of fried fish. They ate heartily. Because money was tight, the team spent two out of every three nights in tents set up in an abandoned trailer park and the third night here at the motel to shower up and wash their clothes. Journalism, they assured me, was not the only field with dwindling resources. Each year, said Liu, university and government budgets for the dusty science of paleontology grew stin-

from a worldwide glaciation event known as "Snowball Earth" (or, more recently, "Slushball Earth"). If that pioneering Ediacaran could see, it would have discovered an underwater desert patchily carpeted with gelatin. Here and there it might have spotted other, nonmobile Ediacarans, which resembled fleshy leaves, many-tendriled sea anemones, or low, round blobs: a whole world populated by brainless, jelly-quivering do-nothings.

The mystery Liu was trying to unravel—regarding the origins of animal movement—is central to solving the larger mystery of how that alien planet transformed into the natural world we all know. Muscular locomotion could have allowed animals to graze on the beefsteak-like bacterial mats and to attack other stationary organisms. The invention of violence might then have kicked off a biological arms race, prompting organisms to evolve hard shells and sharp teeth, the shields and swords that characterize the Cambrian fossil record. This hardening of animal bodies eventually led to the rise of trilobites and tyrannosaurs and Eocene-era Egyptian elephants—and us.

Before the discovery of Ediacaran fossils, and even for a while afterward, many prominent scientists argued that complex life began at the dawn of the Cambrian era. Looked at from a certain angle, the fossil record seemed to support this theory. Around 530 million years ago, like a symphony warming up, the fossil record began teeming with a cacophony of different fossil types. Further back than that was nothing: silence. Some scientists, like Roderick Murchison, a geologist and devout Christian, believed that this lack of evidence was geologic proof of a biblical genesis. ("And God said, 'Let the water teem with living creatures . . .' ")

Charles Darwin cautioned against this interpretation, writing in *On the Origin of Species* that, "We should not forget that only a small portion of the world is known with accuracy." He saw the entire geologic record as a history book stretching across multiple volumes. "Of this history we possess the last volume alone, relating only to two

or three countries," he wrote. "Of this volume, only here and there a short chapter has been preserved; and of each page, only here and there a few lines."

The truth, it now seems clear, is that Precambrian animals had existed in great numbers, but, being soft-bodied, had not lent themselves to fossilization. They crop up exceedingly rarely, in places like Mistaken Point, where the geologic conditions were just right.

After our dinner at the Trepassey Motel, once our plates had been taken away and dessert politely declined, Liu mentioned that another big question he has yet to answer is why the Ediacaran fossils of Newfoundland are so unusually well preserved. He suspected the Mistaken Point assemblage was smothered in a Pompeii-like flow of volcanic ash and impressed into the bacterial mats on the seafloor. He would have liked to test this hypothesis in a lab, but it had proved tricky, because he would need fresh volcanic ash.

Fortunately, Liu's girlfriend, Emma, was a volcanologist.

"Have you got Emma running around with a bucket to collect you some ash?" Stewart asked, grinning.

"I've asked her if she would," Liu nodded, sincerely. "She was in Montserrat, in the Caribbean, last summer, and that's exactly the right type of ash. But it didn't erupt."

Stewart laughed. "You may be the only man on the planet," he said, "who, when his girlfriend goes to the Caribbean, hopes the volcanoes will erupt."

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Around our second round of beers, the scientists' conversation turned to the topic of humans. They noted that research into the origins of life provokes an irrational vitriol in many people. Liu mentioned that one of his supervisors, upon publishing a paper about a fifty-million-year-old monkey fossil he had discovered, soon began receiving death threats from creationists. I was reminded of a similar story I'd heard

from a former tour guide in New Hampshire. During one of her bus tours, she had mentioned to a group of children that the granite cliffs visible through their windows were some two hundred million years old. The students' chaperone jumped up and wrenched the microphone from the guide's hand to assure the children that what she'd *meant* to say was that the rocks were two *thousand* years old. Covering the microphone, the chaperone explained to the tour guide that it was their church's teaching that the universe was created by God only six thousand years ago. She asked the tour guide to, in the future, please be a bit more respectful of people's differing belief systems.

Liu wryly remarked that he would have little trouble disproving such an assertion.

"But you can't," Stewart said. "Because whatever evidence you put in front of them, they're going to say it's the devil deceiving you."

These words pinged around in my head as I bid them goodnight and started off down the darkened road to the town's beach, where I planned to camp for the night. A deceitful demon: the very same one Descartes summoned in 1641. How, the great cogitator had asked, do we know that what we see is not a pure hallucination, perpetrated upon us by a malignant, godlike figure? How do we know that what we perceive is really the world?

Aldous Huxley, having never forgotten the horror of his "stroll in the belly of the vegetable monster" in Borneo, went on to expand his prickly view of the wilderness into a kind of broad Kantian skepticism about the capacity of humans to ever directly experience reality. He cast the world-in-itself as a place of "labyrinthine flux and complexity," which we are able to navigate only through imagination and invention. "The human mind cannot deal with the universe directly," he wrote, "nor even with its own immediate intuitions of the universe. Whenever it is a question of thinking about the world or of practically modifying it, men can only work on a symbolic plan of the universe, only a simplified, two-dimensional map of things

abstracted by the mind out of the complex and multifarious reality of immediate intuition."

Huxley believed that knowledge, even when empirically proven, is only ever a map, never a view of the territory itself. But perhaps it is not so stark as that: perhaps knowledge is more like a trail—a hybrid of map and territory, artifice and nature—wending through a vast landscape. While science may provide a more reliable route to certain answers than, say, a creation myth, it remains narrow; it can reduce the environment to a navigable line, but it cannot encompass it. To a fervent believer in the scientific method, this thought can be unsettling. Great mysteries surround us all, like beasts slinking silently through the night—their presence can be intuited, or imagined, but never fully illuminated.

Paranoia blew gently on my neck as I combed the beach for a suitable place to set up my tent that night. I became convinced that wherever I chose to sleep, local troublemakers would decide to harass me during the night. I feared that in the town's eyes I was seen as a homeless person, a foreign body to be expunged.

I erected the tent on a flat spot close to the road, but the headlights of each passing car swept over the tent, setting it aglow like a paper lantern. I could hear the cars' passengers speaking in parabolas of intelligibility as they bent past. A few remarked on the oddity of my impromptu campsite, so I picked up the tent and moved it farther down the beach, where it was darker. In the long headlights of those cars, my shadow resembled that of a giant carrying an igloo.

At first I selected the flattest spot I could find, but I realized that I was squarely in the path of a set of 4x4 tracks coming from a nearby house. Later in the night, I would hear drunk teenagers speeding down that same path where I might have slept. Beer bottles tinkled onto the sand. At least one rider, a girl, spotted my encampment and said, "Oh, weird, there's a tent down there." I envisioned these antibodies gathering unseen around the tent, smiling, fingers to their lips.

As I lay awake, listening for the faint crunch of approaching footsteps, I thought back to something mentioned by one of the drivers I'd met while hitchhiking down to Mistaken Point. As she drove south along the coast, she had pointed to the hills to the west and told me that, not long ago, the countryside of Newfoundland was believed to be crisscrossed with "fairy paths." Even now, she said, people occasionally reported seeing small blobs of light floating down these trails.

A fear of fairies traditionally prevented Newfoundlanders from building their houses over old paths. According to Barbara Gaye Rieti's exhaustive folk history *Newfoundland Fairy Traditions*, those who obstructed fairy paths often heard strange sounds in the night, which, in at least one documented case, induced a nervous breakdown. Worse horrors still were visited upon their children; parents would return from some chore to find their baby missing, or lying paralyzed in its crib, or sitting open-mouthed with pain, its head grotesquely enlarged. Sometimes, instead of a baby, they would find a very small, very old person sitting upright in the bassinet, its hair whitened and its fingernails grown long and curled. In one especially nasty tale, a girl in St. John's made the mistake of walking across a lane that ghosts frequented at night. As she crossed, she felt something smack the side of her head, which left a bruise. Back home, the bruise worsened and became infected. "A few days later," Rieti wrote, "the infection broke and pieces of old cloth, rusty nails, needles, and bits of rock and clay were all taken from her face."

As we had cruised south, the driver recounted stories of her family's encounters with ghosts, fairies, white ladies, goblins, gypsies, and angels. She described in detail a time when a ghost or an angel—she and her husband quibbled over which it was—enveloped her in its arms and prevented her from being struck by a car while she was walking down a snowy road at night. Afterward, she sensed that the angel was following her home. When her dog rushed out of the house to greet her, it trotted right past her and stood at the end of

minerals are magnetically attracted at different strengths, so some of them get picked up. In the last stage, you use a horrible, nasty chemical called methylene iodide, which is a 'heavy liquid,' in that it's a lot denser than water but has the same viscosity, which means that things that would normally sink in water float in it. And because zircon is particularly dense, it sinks while everything else floats up. Then I pipe that up and squirt it onto a piece of filter paper. You dry this piece of paper out, after spending three days bashing this rock to buggery, and then you put it under the microscope and you *pray* that there's something under there."

He sighed like a man playing a game with terrible odds, but one he nevertheless enjoyed. "So I might start with a rock sample half as big as my backpack and end up with maybe forty zircon crystals so small that you can't see them." The crystals would then be worn down with a strong acid, then measured to determine how much of the zircon's uranium had decayed into lead, which would give an indication of its age, give or take a few hundred thousand years.

A few hours later we made our way over to the area's most famous fossil bed, the blandly named D Surface, which cantilevers out high over the ocean. Before we stepped out onto the bedding plane, we removed our shoes and put on polyester booties to protect the fossils from erosion. It felt like a ritual act, as if we were stepping into a temple.

The rock was huge and flat and intricately patterned, like the floor of a mosque. After visiting a lesser bedding plane, in which I often had to squint and tilt my head to make out what was fossil and what was figment, the profusion and sharpness of the fossils on D Surface were astounding. The Pigeon Cove surface had held about fifty fossils; this one held 1,500. They were everywhere, a vast fossilized garden of fronds and blobs and spirals, some larger than a large hand.

Of course, it was not an actual garden; plants would not appear in the fossil record for another two hundred million years. For some

philosopher Karl Popper, is that in the competition for funding and fame, any false research will be falsified, and only the strongest theories will survive. However, an unfortunate side effect of this dynamic is what Martin Brasier called the MOFAOTYOF ("My Oldest Fossils Are Older Than Your Oldest Fossils") principle: "The tendency among all scientists, and certainly among all journalists, is to make their scientific claims as strong as they possibly can from the limited amount of material available." Bold conjectures are an integral part of healthy science, just as one initially underbids when negotiating at a flea market so as to eventually reach a fair price. But this tendency to exaggerate can prove dangerous, especially when the results trickle out to the general public, who, not understanding that falsification is a necessary part of the game, can develop a jaundiced view of any and all new scientific claims.

When I spoke to Brasier over the phone in 2013, he told me that the uncertainty inherent in this field of research was its appeal: He believed pure science is to be found on the edge of the darkness. "Karl Popper would have said that astrophysics and paleontology are not real science because you can't go out and sample it," he told me. "I think absolutely the opposite. I think this is actually where science is. It's trying to guess what lies over the hill and map terra incognita. When people come in and colonize, that's just technology." Brasier believed a scientist was, at heart, an explorer.

One of the strange side effects of working at the edge of the known universe, as Liu does, is that the more you learn, the more uncertain things become. As I talked with Liu and his team, I was constantly unlearning old assumptions I had held; even basic, bedrock knowledge began to disintegrate. What, for example, is the definition of movement? (Does floating count, or must one propel oneself? If so, with what kinds of tissues?) Is "animal" a clear-cut category, or a fuzzy-edged one? What, moreover, does it mean to be a living thing at all?