

ALSO BY RICHARD LOUV

*Last Child in the Woods: Saving Our Children  
from Nature-Deficit Disorder*

*Fly-Fishing for Sharks: An American Journey*

*The Web of Life*

*FatherLove*

*101 Things You Can Do for Our Children's Future*

*Childhood's Future*

*America II*

# THE NATURE PRINCIPLE

---

*Human Restoration and the End of  
Nature-Deficit Disorder*



Richard Louv

*Nature-Deficit Disorder for Adults*

*Listen: there's a hell of a good universe next door; let's go.*

—E. E. Cummings

WE TRAVELED DOWN a dirt road through the melting adobe village of Puerto de Luna, New Mexico, crossed a low bridge over the shallow Pecos River and entered a valley of green chili fields held by red-rimmed sandstone bluffs. Jason, our older son, then three, was asleep in the backseat.

“Is it this turn?” I asked my wife.

“The next one,” Kathy said.

I got out of the rental car and unhooked the gate, and we drove onto the land owned by our friends Nick and Isabel Raven. They were away working in Santa Fe that year, and their farm and house were vacant. We had come to know them before Jason was born. Kathy and I had lived two summers in nearby Santa Rosa, where she had worked in a local hospital.

Now, after a stressful period of our lives, we were back for a couple of weeks. We needed this time for ourselves, and we needed it for Jason.

We entered the dusty adobe house. I inspected the room addition that I had helped Nick build during one of those summers. I turned on the electricity and the water (indoor plumbing had finally come to the Raven homestead), walked into the kitchen, and opened the faucet. A foot-long centipede leapt out of the drain, its tail whipping toward my

face. I don't know who was more startled, the centipede or me, but I was the one holding the steak knife.

Later, as Kathy and Jason took naps, I walked outside in the heat, found Nick's rusted folding chair, and set it in the shade of a tree next to the adobe. Nick and I had rested under the branches of this tree between bouts of mixing adobe mud in a pit filled with straw, sand, earth, and water. I thought about Nick, about our political arguments, about the green-chili stew that Isabel heated on a wood stove and served in tin bowls, even in the hottest hours.

Now I sat alone and looked out over the field toward a line of distant cottonwoods that rimmed the Pecos. I watched the afternoon thunderheads rise above the high desert to the east and the layers of sandstone across the river. The field of chili shivered in the sun. Above me, leaves rattled and tree limbs scratched. My eyes settled on a single cottonwood at the river, its branches and upper leaves waving in a slow rhythm above all the others. An hour, perhaps more, went by. Tension crawled up and out of me. It seemed to twist in the air above the green field. Then it was gone. And something better took its place.

Twenty-four years later, I often think about the cottonwood at the river's edge, and similar moments of inexplicable wonder, times when I received from nature just what I needed: an elusive *it* for which I have no name.

We have thought about moving to New Mexico ever since. Or rural Vermont. But we are reminded daily that *it* also occurs where we already live—and even within the densest cities, where the urban wild still exists in the most unexpected places. It can be restored or even created where we live, work, and play.

We're not alone in feeling this hunger.

ONE DAY IN SEATTLE, a woman literally grabbed my lapels and said, "Listen to me, *adults* have nature-deficit disorder, too." She was right, of course.

In 2005, in *Last Child in the Woods*, I introduced the term *nature-deficit disorder*, not as a medical diagnosis, but as a way to describe the growing gap between children and nature. After the book's publication, I heard many adults speak with heartfelt emotion, even anger, about this separation, but also about their own sense of loss.

Every day, our relationship with nature, or the lack of it, influences our lives. This has always been true. But in the twenty-first century, our survival—or thrival—will require a transformative framework for that relationship, a reunion of humans with the rest of nature.

In these pages, I describe a future shaped by what I call the Nature Principle, an amalgam of converging theories and trends as well as a reconciliation with old truths. This principle holds that a reconnection to the natural world is fundamental to human health, well-being, spirit, and survival.

Primarily a statement of philosophy, the Nature Principle is supported by a growing body of theoretical, anecdotal, and empirical research that describes the restorative power of nature—its impact on our senses and intelligence; on our physical, psychological, and spiritual health; and on the bonds of family, friendship, and the multi-species community. Illuminated by ideas and stories from good people I have met, this book asks: *What would our lives be like if our days and nights were as immersed in nature as they are in technology? How can each of us help create that life-enhancing world, not only in a hypothetical future, but right now, for our families and for ourselves?*

Our sense of urgency grows. In 2008, for the first time in history, more than half of the world's population lived in towns and cities.<sup>1</sup> The traditional ways that humans have experienced nature are vanishing, along with biodiversity.

At the same time, our culture's faith in technological immersion seems to have no limits, and we drift ever deeper into a sea of circuitry. We consume breathtaking media accounts of the creation of synthetic life, combining bacteria with human DNA; of microscopic machines

designed to enter our bodies to fight biological invaders or to move in deadly clouds across the battlefields of war; of computer-augmented reality; of futuristic houses in which we are surrounded by simulated reality transmitted from every wall. We even hear talk of the “transhuman” or “posthuman” era in which people are optimally enhanced by technology, or of a “postbiological universe” where, as NASA’s Steven Dick puts it, “the majority of intelligent life has evolved beyond flesh and blood intelligence.”<sup>2</sup>

This book is not an argument against these concepts or their proponents—at least not the ones who are devoted to the ethical use of technology to expand human capacities.<sup>3</sup> But it does make the case that we’re getting ahead of ourselves. We have yet to fully realize, or even adequately study, the enhancement of human capacities through the power of nature. In a report praising higher-tech classrooms, one educator quotes Abraham Lincoln: “The dogmas of the quiet past are inadequate to the stormy present. The occasion is piled high with difficulty, and we must rise with the occasion. As our case is new, so we must think anew and act anew.” That we should; but in the twenty-first century, ironically, an outsized faith in technology—a turning away from nature—may well be the outdated dogma of our time.

In contrast, the Nature Principle suggests that, in an age of rapid environmental, economic, and social transformation, the future will belong to the nature-smart—those individuals, families, businesses, and political leaders who develop a deeper understanding of nature, and who balance the virtual with the real.

In 2010, *Avatar* became the most-watched film in history. The success had less to do with the movie’s advanced 3-D technology than with the hunger it tapped—our instinctive knowledge that the endangered human species is paying an awful price as it loses touch with nature. Describing the core message of the movie, the film’s maker, James Cameron, said: “It asks questions about our relationship with each other, from culture to culture, and our relationship with the natural world at a time of nature-deficit disorder.” This collective disorder

threatens our health, our spirit, our economy, and our future stewardship of the environment. Yet, despite what seem prohibitive odds, transformative change is possible. The loss that we feel, this truth that we already know, sets the stage for a new age of nature. In fact, because of the environmental challenges we face today, we may be—we had better be—entering the most creative period in human history, a time defined by a goal that builds on and extends a century of environmentalism, which includes but goes beyond sustainability to the re-naturing of everyday life.

Seven overlapping precepts, based on the transformative powers of nature, can reshape our lives now and in the future. Together they form a singular force:

- The more high-tech our lives become, the more nature we need to achieve **natural balance**.
- The mind/body/nature connection, also called **vitamin N** (for nature), will enhance physical and mental health.
- Utilizing both technology *and* nature experience will increase our intelligence, creative thinking, and productivity, giving birth to the **hybrid mind**.
- **Human/nature social capital** will enrich and redefine community to include all living things.
- In the new **purposeful place**, natural history will be as important as human history to regional and personal identity.
- Through **biophilic design**, our homes, workplaces, neighborhoods, and towns will not only conserve watts, but also produce human energy.
- In relationship with nature, the **high-performance human** will conserve and *create* natural habitat—and new economic potential—where we live, learn, work, and play.

Young, old, or in between, we can reap extraordinary benefits by connecting—or reconnecting—to nature. For the jaded and weary among us, the outdoor world can expand our senses and reignite a sense of awe

and wonder not felt since we were children; it can support better health, enhanced creativity, new careers and business opportunities, and act as a bonding agent for families and communities. Nature can help us feel fully alive.

In these pages, which offer a sampling of the emerging research, I have not knowingly excluded any studies that would dispute my central thesis. But I do hope this book will raise useful questions for future inquiry. I should add: my view is not based solely on science, but also on the long human experience of nature, on the stories of everyday people, and on my own reflection.

The skeptic will say the nature prescription is problematic, given our quickening destruction of nature, and the skeptic will be right. The natural world's benefits to our cognition and health will be irrelevant if we continue to destroy the nature around us. However, that destruction is assured without a human reconnection to nature. This is why the Nature Principle is about conservation, but also about restoring nature while we restore ourselves; about creating new natural habitats where they once were or never were, in our homes, workplaces, schools, neighborhoods, cities, suburbs, and farms. It's about the power of living in nature — not *with* it, but *in* it. The twenty-first century will be the century of human restoration in the natural world.

Martin Luther King Jr. often said that any movement — any culture — will fail if it cannot paint a picture of a world that people will want to go to. The first brushstrokes are already visible.

This book is about the people creating that world, in their daily lives and beyond, and about how you can, too.

PART ONE

## Nature Neurons

*Intelligence, Creativity, and the Hybrid Mind*



*The lover of nature is he whose inward and outward senses  
are still truly adjusted to each other.*

—Ralph Waldo Emerson

*The natural world is not only a set of constraints  
but of contexts within which we can more fully realize our dreams.*

—Paul Shepard

## Singing for Bears

*Discovering the Full Use of the Senses*

*There's another world, and it's in this one.*

—Susan Casey, “The Devil’s Teeth”

**A**S A SPECIES, we are most animated when our days and nights on Earth are touched by the natural world. We can find immeasurable joy in the birth of a child, a great work of art, or falling in love. But all of life is rooted in nature, and a separation from that wider world desensitizes and diminishes our bodies and spirits. Reconnecting to nature, nearby and far, opens new doors to health, creativity, and wonder. It is never too late.

My younger son, Matthew, then twenty, and I were hiking upstream on Alaska’s Kodiak Island. Joe Solakian, our guide, was teaching us how to sense the presence of Kodiak brown bears, the largest grizzlies, the ones that can run thirty-five miles per hour.

“Never surprise them, that’s the main thing,” Joe said.

And, keeping in mind the fate of Timothy Treadwell, documentary filmmaker—and meal—never try to be their new best friend.

In the shallow green pools, bracketed between two walls of forest, the salmon—chum, sockeye, and pink—come here to spawn and die; this is a bear kitchen. So we talked, sang, and shook the bear bells on our vests, watched for tracks, and sniffed the air for the distinctive, mingled odors of musk and rotted salmon. Now and then during the week that fragrance would suddenly fill the air and the hair on the

backs of our necks would stand up. That meant a bear was watching us from the thickets, or just around the bend, or had just left.

One afternoon, we did see a bear. It was upwind from us, beyond our hearing distance. It came out of the forest and lumbered across a gravel bar, raised its muzzle, hesitated, then turned and loped across the creek and into the trees.

Singing for bears puts the risks of everyday life in perspective.

So does being on this island. In 1964, a tsunami wave thirty feet high destroyed shoreline villages. An even greater cataclysm occurred in 1912, when Mount Katmai erupted on the mainland.

“About three o’clock in the afternoon, as we emerged from the forest, we saw, for the first time, a huge, fan-shaped cloud directly west of the village,” wrote Hildred Erskine, a Kodiak survivor. “It was the blackest and densest cloud that I have ever seen. Lightning frequently flashed through . . . electrical storms just do not happen in Alaska. Static was so bad that radio operators did not dare go near their instruments.” It grew dark, strange for June in Kodiak, when daylight is almost continuous. “We began thinking of the fate of the people of Pompeii.”

Lakes filled with the ash; ptarmigan were killed in their nesting season; trout were destroyed, and most of the island biota was, indeed, buried alive. But soon, from that ash, life began again. With the help of winds from the mainland, which brought the seeds of trees and plants that had never grown there, the island was reborn. In geologic terms, then, the surface and life of Kodiak is brand-new, a reminder that creation is the other face of death.

After Hurricane Katrina, some people said that New Orleans should be allowed to revert to its natural wetland state; the population resettled in surrounding cities on higher ground; perhaps a Bourbon Street amusement park, easily evacuated, built in that drowning pool. The wetland reversion approach is sensible, because to a degree it restores natural, protective habitat. But when people say, as they often do, that

other humans are fools if they live in a natural disaster zone, they base this on the assumption that ultimate high ground exists. Should people—you and I—be marched out of any habitat threatened by natural disaster? I don’t think so. Where would we go? Where no flood ever runs or fire ignites? To the seemingly safe boot heel of Missouri, which happens to be located on a fault that once changed the course of the Mississippi River?

Nearly a century after that Katmai eruption, my son and I leave our footprints in this dark volcanic soil of renewal. Life edges back from the brink, then pushes forward again. So Matthew and I press on, up the stream, awake, more careful than we would ever be in our daily lives, listening, watching, lifting our heads to sense what the wind carries. Something is coming. So we ring the bells. And we sing.

### **More Senses Than We Sense**

Singing for bears, or smelling them, may not be your idea of a good time, but it hints at the sensory capabilities that are in our nature, if seldom used.

Many of us desire a fuller life of the senses.

By its broadest interpretation, nature-deficit disorder is an atrophied awareness, a diminished ability to find meaning in the life that surrounds us, whatever form it takes. This shrinkage of our lives has a direct impact on our physical, mental, and societal health. However, not only can nature-deficit disorder be reversed, but our lives can be vastly enriched through our relationship with nature, beginning with our senses. In *A Natural History of the Senses*, Diane Ackerman writes: “People think of the mind as being located in the head, but the latest findings in physiology suggest that the mind doesn’t really dwell in the brain but travels the whole body on caravans of enzyme, busily making sense of the compound wonders we catalogue as touch, taste, smell, hearing, vision.”<sup>1</sup> We city dwellers marvel at the seemingly superhuman or supernatural abilities of Australian aborigines and other “primitive”

people, but consider such talents vestigial, like that remnant tailbone. Here's another view. Such senses are not vestigial but latent, blanketed by noise and assumptions.

Ever wonder why you have two nostrils? Researchers at the University of California–Berkeley did. They published their findings in the journal *Nature Neuroscience*. Jay Gottfried, a professor of neurology at Northwestern University, wrote: “What this study highlights most for me is that the human sense of smell is a lot better than many people think it is. It’s true that narrow visual and auditory streams comprise the primary sensory currents of our lives. But all of our senses are capable of more than what we assume.” The researchers fitted college undergraduates with taped-over goggles, earmuffs, and work gloves to block other senses, then set them loose in a field; most of the students could follow a thirty-foot-long trail of chocolate perfume and even changed direction precisely where the invisible path took a turn. The subjects also were able to smell better with two functioning nostrils, which researchers likened to hearing in stereo.<sup>2</sup> One researcher postulated that the brain gathers odor “images” from each nostril to construct a composite picture of the trail. The students found themselves zigzagging, a technique employed by dogs as they track.

The study also found that the students’ olfactory tracking abilities improved with practice, suggesting that humans could develop the ability to match the tracking talents of many other animals. According to researcher Noam Sobel, part of the reason dogs are better at this than humans is that dogs sniff quickly. Very quickly. “We interpret these results to suggest that, as subjects increased their speed, it was necessary for them to sniff more quickly to get the same quality of information,” reported Sobel. “We found that not only are humans capable of scent-tracking, but they spontaneously mimic the tracking pattern of [other] mammals.”<sup>3</sup>

What else can we do that we have forgotten? What do we miss seeing, hearing, and knowing because we allow the tangle of technology’s

wire to tighten around us a little more each day? And how can we develop these natural but obscured abilities and make them applicable to the lives we live today?

Perhaps you recall a time when you took in more of the world—you just *did* it. You were new and the world was new. As a boy, I would go out in the woods and sit under a tree, wet my thumb, and then wipe each nostril with it. I had read somewhere that people—pioneers or Indians—would do this in order to keen their sense of smell for approaching game, or even danger. I did this and held perfectly still, my back against rough bark, waiting. And, slowly, the animal life returned. A rabbit appeared under a bush, birds swooped low, an ant went on a walkabout over my knee to see what was on the other side. And I felt intensely alive.

Most scientists who study human perception no longer assume that we have five senses: taste, touch, smell, sight, and hearing. The current number ranges from a conservative ten senses to as many as thirty, including blood-sugar levels, empty stomach, thirst, joint position, and more. The list is growing.

In 2010, scientists at University College in London published the results of a study suggesting that human beings may be hardwired with an inner sense of direction.<sup>4</sup> Another related sense is called proprioception: the awareness of your body’s position in space, including movement and balance; this sense makes it possible for us to touch our noses when our eyes are closed. Dolphins and bats might teach us a thing or two about a latent talent we share with them: echolocation, the ability to locate objects by interpreting sounds bouncing off of them. In 2009, researchers at Madrid’s University of Alcalá de Henares showed how people could identify objects around them, without needing to “see” them, through the echoes of human tongue clicks. According to the lead researcher, echoes are also perceived through vibrations in ears, tongue, and bones.<sup>5</sup> This refined sense has been learned by trial and error by some blind people and even by some sighted individuals.

“In certain circumstances, we humans could rival bats in our echolocation or biosonar capacity,” said Juan Antonio Martínez Rojas, lead author of the study. “Lots of things, like an empty room, don’t make a sound, but they do structure it. They give it shape, which people can see without seeing. I have had students listen to sounds broadcast between two boards and be able to tell me whether there was enough space between the boards for them to fit through.” Human echolocation can be done without technology or “without having to develop any new mental processes,” according to Lawrence D. Rosenblum, a professor of psychology at University of California–Riverside. To him, it’s all about “hearing” a world that exists beyond what we normally mistake for silence.<sup>6</sup>

Karen Landen hears that world. A former newspaper editor, Landen had been a birder many years when, on field trips, she noticed a few people had an uncanny knack for detecting and identifying birds. These “superbirders,” as she calls them, were, in a sense, seeing with their ears. How? They had taken Seattle Audubon’s *Birding by Ear* course, taught by professional birding-tour leader Bob Sundstrom. Landen had studied singing and languages, so she thought “bird” would be easy.

She soon understood why most students were repeaters: “Unlike human language, birds don’t have rules. We studied pages of song types—think whistle, squawk, whinny, rattle, chatter, trill—and qualities—clear, liquid, metallic, raspy, burry, sweet. You listen for a pattern: number of beats, duration, simplicity/complexity, repeated phrases. Are notes ascending or descending? Are there pauses, or one long breath? The songs of a robin and black-headed grosbeak sound alike until you notice that the robin’s notes are distinct and the grosbeak’s slurred (hence the grosbeak’s song described as ‘drunk robin’).”

She also learned that some birds are instrumentalists, others are composers: “Woodpeckers drum, and a hummingbird’s wings ‘hum.’ A young song sparrow may sing a basic phrase, but an older one with

prime territory will throw in extra flourishes to advertise his status. On top of that, species’ sounds vary by region and by individual, just like us.” What Landen learned was that birding starts with one sense, which leads to an opening up of other senses. A superbirder learns to see birds first, then learns to hear them, and then to “see” them by hearing them. “When you bird by ear, you learn that there’s a whole life story going on out there. Calls warn of predators. A male sings ‘no trespassing’ to other males but also, ‘hey, ladies, here’s a handsome, successful guy who’ll make a great family man.’” She laughs. “You know how when you wake up at the tail end of a dream, if it was a good one, its memory creates a rich extra layer that hovers over your day? Well, birding by ear creates this luscious extra layer in life that just rises above the day-to-day. I can’t imagine a life without birds, without their beauty, their spiritedness, and their song. That would be a poverty of the senses.”

This brings us to the so-called sixth sense, which to some means intuition, to others extrasensory perception, and to still others, the human’s ability to unconsciously detect danger.

In December 2004, as the devastating Asian tsunami approached, Jarawa tribespeople, along with some animals, reportedly sensed or detected sounds from the approaching wave, or other unusual natural activity, long before the water struck the shore. They fled to higher ground. The Jarawa used tribal knowledge of nature’s warning signs, explained V. R. Rao, director of the Anthropological Survey of India, based in Kolkata. “They got wind of impending danger from biological warning signals, like the cry of birds and change in the behavioral patterns of marine animals.”<sup>7</sup> In the Jarawa’s case, the simplest explanation may be that the sixth sense is the sum of all the other senses put together, combined with everyday nature-knowledge.

Researchers at Washington University in St. Louis point to the anterior cingulate cortex, the brain’s early warning system, which is better at picking up subtle warning signs than scientists had previously

thought. Joshua W. Brown, director of the Cognitive Control Lab, Indiana University–Bloomington, coauthored a study reported in 2005, in the journal *Science*.<sup>8</sup> “It makes sense that this mechanism exists because there are plenty of situations in our everyday lives that require the brain to monitor subtle changes in our environment and adjust our behavior, even in cases where we may not necessarily be aware of the conditions that prompted the adjustment,” he wrote. “In some cases, the brain’s ability to monitor subtle environmental changes and make adjustments may actually be even more robust if it takes place on a subconscious level.”

Ron Rensink, an associate professor in both psychology and computer science at the University of British Columbia, has investigated the sixth sense, which he calls “mindsight,” as a way to understand how people can have accurate “intuition” that something is about to happen. “In a way, it’s like a ‘first strike’ system . . . that we use without conscious thought,” Rensink told the *Monitor*, the journal of the American Psychological Association.<sup>9</sup> His research suggests that vision is, in fact, a collection of abilities, not just one sense—and that the brain can receive, through light, a kind of pre-image vision. In the University of British Columbia’s monthly newspaper, *UBC Reports*, he explained: “There is something there—people do have access to this other subsystem. . . . It turns out these are two very different subsystems—one of them is conscious, one of them is non-conscious—and they actually work slightly differently. . . . In the past, people believed that if light came into your eyes, it would have to result in a picture. If it didn’t result in a picture, it must mean that it can’t be vision.” On the contrary, he wrote, light can enter your eyes and be employed by other perceptual systems. “It’s just another way of seeing.”<sup>10</sup>

In separate research, the U.S. military has studied how some soldiers and marines can apparently use their latent senses to detect roadside bombs and other hazards in war zones in Afghanistan and Iraq. “Military researchers have found that two groups of personnel are par-

ticularly good at spotting anomalies: those with hunting backgrounds, who traipsed through the woods as youths looking to bag a deer or turkey; and those who grew up in tough urban neighborhoods, where it is often important to know what gang controls which block,” reported Tony Perry of the *Los Angeles Times*.<sup>11</sup>

A common factor seemed to be at work: plenty of experience outside the home and outside the electronic bubble, in an environment that *demands* better use of the senses. Army Sgt. Maj. Todd Burnett, who has served in Iraq and Afghanistan, conducted the research. The eighteen-month-long study of eight hundred military personnel at several bases found that the best bomb-spotters were rural people, familiar with hunting, who signed on with the South Carolina National Guard. According to Burnett, “They just seemed to pick up things much better. . . . They know how to look at the entire environment.” And the other young soldiers, the ones who were raised with Game Boys and spent weekends at the mall? By and large, these enlistees lacked the ability to see nuances that might enable a soldier to spot a hidden bomb. Even with perfect vision, they lacked the special ability, that combination of depth perception, peripheral vision, and instinct, if you will, to see what was out of place in the environment. Their focus was narrow, as if they were seeing the world in a set format, “as if the windshield of their Humvee [was] a computer screen,” Perry wrote. Sgt. Maj. Burnett put it this way: The gamers were “focused on the screen rather than the whole surrounding.”

The explanation may be partly physiological. Australian researchers suggest that the troubling increase in cases of myopia—nearsightedness—is linked to children and young people spending less time outdoors, where eyes are conditioned to focus on longer distances.<sup>12</sup> But more is probably going on here. Vision, including mindsight; more acute hearing; an attuned sense of smell; a sense of where one’s body is in space—all of these abilities could be operating simultaneously. In a natural environment, this advantage offers practical applications and

benefits: one is an increased ability to learn; another is an enhanced capability to avoid danger; and still another, perhaps the most important application of all, is the measurement-defying ability to more fully engage in life.

Beyond proprioception, that awareness of our body's position through movement and balance, nature also offers us the opportunity to realize an even larger sense—the position of our body and spirit in the universe and in time.

One day, my son Matthew wondered, “Is faith a sense?”

“What do you mean?” I asked.

“You know, as in sensing a higher power?”

This is a wonderful question, and it leads to other questions: Could a literal sense of spirit exist on the far edge of our senses, out where the flat earth stops and all that is beyond and within begins? Might this particular sense be activated by the other senses, when they're working at full throttle—which often occurs when we are in nature?

Perhaps this sense, if it is one, is why so many of us use religious terminology as we talk about our experience of nature, even if we're not religious in a formal way.

Nature writer Robert Michael Pyle, who coined the elegant phrase “the extinction of experience,” asks: “What happens to a species that loses touch with its habitat?” Our sensitivity to nature, and our humility within it, are essential to our physical and spiritual survival. Yet, our growing disconnection from nature dulls our senses, and eventually blunts even the sharpened sensory state created by man-made or natural disaster. Spending time in nature, particularly in wilderness, can pose physical dangers, but rejecting nature because of those risks and discomforts is a greater gamble.

### **The Humility Sense**

On that Alaska stream, where the red sockeye moved against the current and the forest leaned inward over cut banks, the potential of a bear

in those bushes presented a danger. At the same time, our awareness gave us protection and excited our senses to everything around and above and in that stream. It offered us something larger, too: a sense of natural humility.

Far across an open plain, a bear was running toward us. Joe suggested that we stand together. “We'll look like one big animal with a lot of legs,” he said. This seemed a sensible recommendation. It was not lost on me that the Kodiak brown bear, isolated on the Kodiak Archipelago for twelve thousand years, is the world's largest land carnivore, weighing up to seventeen hundred pounds.

“Let's back away from the water,” said Joe.

The bear crossed in front of us and leaped into the bend of the river where we had just crossed. We watched in awe. Young but impressive, the bear pounced and swiped at the migrating salmon, and occasionally lifted his nose and bobbed his head and looked our way, then went back to his fishing.

“He has to make a living, too,” Joe said.

I glanced at Matthew, who clutched his can of pepper spray. Irrationally, I felt a surge of joy that outweighed any concern about safety. How fine it is, I thought, for Matthew to experience this moment, with its beauty and imposed natural humility. The pleasure of being alive is brought into sharper focus when you need to pay attention to *staying* alive. Alive in the larger universe, alive in time.

Kodiak Island, with more bears than human residents, is one of the last wild places on the planet where human beings can feel that peculiar constriction of flesh on the back of the neck that occurs only when one is in another predator's environment. Even those who live in less-developed areas of the world know such moments are growing rare. In his 2003 book *Monsters of God*, David Quammen predicts that by the year 2150, all the world's top predators will either be wiped out or in zoos, their genetic pool dwindling, their fierce possibility caged. Then, he writes, people “will find it hard to conceive that those

animals were once proud, dangerous, unpredictable, widespread and kingly. . . . Children will be startled and excited to learn, if anyone tells them, that once there were lions at large in the very world." And tigers, and bears.

In rare cases, large predators are on the rebound. After being decimated by hunters in the 1940s, and subsequent efforts to protect it, the Kodiak bear population is stable and possibly increasing. In Southern California, the number of mountain lions has grown dramatically since the state banned lion hunting in 1990. However, an accurate mountain lion count grows more elusive because of the "shoot, shovel, and shut up" mentality of ranchers who sometimes conduct their own kind of animal control. Wolves reintroduced in Yellowstone face a similarly questionable future. We no longer hear much about human population control, just wildlife control.

In wilderness, and in natural cases or even natural urban parks, we find our senses—but can we come to them in time? Even if human beings never encounter predator species (other than humans), their protection of wildlife preserves or restores part of our humanity. It nourishes the remnants of our deeper senses, especially the sense of humility required for true human intelligence.

On Kodiak, a piece of that frontier survives—a kind of Jurassic Park with salmon. Another day, my son and I watched a different bear move quickly up a small ridge, straight for a cluster of the island's wild, or feral, horses. Perhaps it hoped to take the little white colt from them. Remarkably, the horses (more dangerous to people than were the bears, Joe told us), led by a strong palomino, ran directly at the bear. As the horses raced forward, tails flying like flags, the bear considered a different plan.

The wild horses stopped and stood together and watched, and so did we, as the bear ambled along the beach and disappeared into the fog. The horses went their own way, into the same fog. Then we were alone on the plain.

## The Hybrid Mind

### *Enhancing Intelligence through the World Outdoors*

LET'S BE REALISTIC. Even if we're lucky enough to sing for bears in Alaska or to have bonded with nature when we were young, keeping that bond or establishing an evolved relationship with nature is no easy thing.

My office in San Diego is a sea of distraction. Two computers, two printers, a fax/answering machine/scanner, a negative and slide scanner, a radio, and four hard drives sit on my desk; beneath it, a tangle of wires that has baffled me for years. I half expect this mess of ganglia to creep up the stairs one night, like a serial-killer Slinky, and strangle me where I sleep. Right now, however, I see a movement in the bushes beyond the sliding glass door. A spotted towhee dances in the leaves, doing its comical back-kick as it searches for bugs, calling *to-whoeeee*. Recently, our son Matthew, who has taken up birding with a passion, gave my wife and me a set of 10×42 binoculars and *The National Audubon Society Field Guide to Birds: Western Region*. He has marked pages of the book with yellow tags to show which birds frequent our territory.

The binoculars and the book are on my desk. The desk is vibrating. I reach for the iPhone.

Robert Michael Pyle would be the first to say that finding a balance isn't easy. In 2007, Pyle announced in his *Orion Magazine* nature

column that he was thinking about going cold turkey on e-mail. "Time will tell whether I can make a living without e-mail," he wrote. "In the meantime, I'm going back to the post, and the virtues of patience and silence. My loss, you'll say. Maybe so. We'll see . . ." <sup>1</sup>

Two years later, I e-mailed Bob and asked him how his life was going since he swore off e-mail. It was a bad sign when he answered, quickly. "I have backslid," he wrote. "You could say I had a hiatus, but I haven't yet fully succeeded in achieving the ideal. I try to spend as little time as I can on the machine away from writing, however, and do as little as possible on the web." When he must spend time before a screen to do his daily work of writing, he gets up and goes outside as soon as possible.

Sometimes, even Pyle — as hopeful and energetic a man as you'll ever meet — gets discouraged about the odds against a human/nature reunion.

Unctuous personalities squawk at us from flat-panel TVs on gas pumps. Billboard companies replace pasted paper with flashing digital screens. Screens pop up in airports, coffeehouses, banks, and grocery-store checkout lines, even in restrooms, above the urinal or mounted on hand dryers. On some airlines, advertising messages reach out to us from the seatback dining tables and motion-sickness bags. Disney advertises DVDs for preschoolers on the paper liners of examination tables in pediatricians' offices. Perhaps this is our punishment for using the DVR to skip the commercials. "We never know where the consumer is going to be at any point in time, so we have to find a way to be everywhere," Linda Kaplan Thaler, chief executive at the ad agency Kaplan Thaler Group, tells the *New York Times*. "Ubiquity is the new exclusivity." <sup>2</sup>

This info-blitzkrieg has spawned a new field called "interruption science" and a newly minted condition: continuous partial attention. <sup>3</sup>

Maggie Jackson, author of *Distracted: The Erosion of Attention and the Coming Dark Age*, reports that a distracted worker takes nearly a half hour to get back to and continue a task; 28 percent of a typical worker's

day is taken up by interruptions and recovery time; constant electronic intrusions leave interrupted workers feeling frustrated, pressured and stressed, and less creative. <sup>4</sup> We text more, communicate less. At the UCLA Center on Everyday Lives of Families, Elinor Ochs, a linguistic anthropologist, and a team of twenty-one researchers, have been using the tools of ethnography, ecology, archaeology, and primatology to videotape and study the routines of thirty-two families in the Los Angeles area. The team found that restless family members moved quickly, gathering in the same room only 16 percent of the time; they tended to grunt more than talk; they walked past one another without greeting, barely looking up from the video game, television, or computer. "Returning home at the end of the day is one of the most delicate and vulnerable moments in life. Everywhere in the world, in all societies, there is some kind of greeting." But not in these families. <sup>5</sup>

Larry Hinman, professor of philosophy and director of the Values Institute at the University of San Diego, has studied the evolution of robots. One scientist he interviewed remarked that machines are "without entanglements," and he considered that a positive feature. "Nature is a complex world, and you are born with entanglements, starting with the umbilical cord," says Hinman. Notwithstanding electric cords, "the technological world is the world of the blank slate; you can redo it without the messiness of reality. A false dream, but that's what captures the imagination of some people who work in the field of robotics." This is particularly true in Japan, where demonstration robots are becoming eerily humanlike. "One robot 'newscaster' read the news one night on television, and virtually no one noticed," he says. "Another scientist created a basic prototype with the features of his own young son, who commented, 'Aren't I enough, Dad?' It was devastating to him."

Taken to its extreme, a denatured life is a dehumanized life. As the American naturalist and writer Henry Beston put it, when the wind in the grass is "no longer a part of the human spirit, a part of very flesh

and bone, man becomes, as it were, a kind of cosmic outlaw.” There’s no denying the benefits of the Internet. But electronic immersion, without a force to balance it, creates the hole in the boat—draining our ability to pay attention, to think clearly, to be productive and creative. The best antidote to negative electronic information immersion will be an increase in the amount of *natural* information we receive.

*The more high-tech we become, the more nature we need.*

### **Nature Smart**

During a visit to the Galapagos Islands in 2010, I spent an afternoon at the Tomas de Berlanga School on the island of Santa Cruz. Scalesia Foundation, a nongovernment organization created in 1991 to provide an education alternative for residents of the archipelago, supports the school, which serves the islands’ growing number of children whose parents moved there in pursuit of ecotourism jobs. Even here, on these extraordinary islands—where you must be careful where you put your feet, lest you step on an iguana, lava lizard, sea lion, or blue-footed booby—children know little about their own bioregion.

Not so at this school. With the exception of courses requiring computers, classes are conducted under rough shelters with no walls. Such “forest schools,” particularly popular in Europe, can range from traditional schools that send the students outdoors a few hours a week, to ones that have no buildings at all. Their effectiveness is supported by several studies.

The director of the Berlanga School, Reyna Oleas, is a vivacious former environmental consultant from Ecuador, who, in her former life, helped design more than twenty environmental funds in Latin America and the Caribbean. Now in her late thirties, she moved to the Galapagos in 2007 to open this school. I asked her how the natural world had influenced her way of thinking. Had it made her smarter?

“I’d prefer the word *sharpness*. I have more sharpness and perpetual awareness,” she said. “Before I came here, my life was . . . dormant.”

She offered an interesting definition of dormant: not asleep, but driven to distraction. “You’re writing e-mail, watching TV, answering the phone. You’ve got your head in so many channels. Your body could collapse and you wouldn’t even realize it. I was smoking two packs of cigarettes a day. I was stressed out. I wasn’t well. Here, I healed, I quit smoking.” And here, her thinking cleared. “When there is something you have to deal with, you go do it. Solutions come more naturally. I can separate the real problem from the static. Before, it was—you have a problem, and everything is huge. And now, if something happens, okay, this is what it is, how are we going to deal with it?”

This seems clear enough: When truly present in nature, we do use all our senses at the same time, which is the optimum state of learning.

At lunch that day, I met Celso Montalvo, a naturalist and expedition leader in his early forties who worked with Lindblad National Geographic Expeditions. Celso spent part of his childhood in the Galapagos. A graduate of the Ecuadorian Naval Academy, he studied computer science in New York but decided to return to the islands he loved. As Oleas and I talked about natural intelligence—or as she put it, sharpness and awareness—Celso jumped into the conversation. He defined natural intelligence as “knowing the signs of nature.”

“I see a kind of a general animal intelligence. I can see this in the fish, I can see this in the birds,” he said. “We all are born with it. It can be triggered again. It’s not that hard. It helps to know biology, but this knowledge becomes much deeper. Every time I step out on the deck or out of the house, I can feel the direction of the breeze; I feel what animals can feel. They can feel the sun rise and the sun set. The plants point in one direction when it is wet and then the other direction when it is dry. Connecting dots. It’s as simple as that. Off the Internet, everything is connecting you with the world. *Everything*.”

The natural world helps us perceive connections; it can also help us fine-tune knowledge.

Wolf Berger, Distinguished Research Professor at the Geosciences

Research Division of the Scripps Institution of Oceanography and a friend, hikes to clear his mind and to focus. Usually, he walks along the beach at La Jolla, up the paths of Torrey Pines State Park, along the gnarled mud sculptures of the sandstone cliffs frozen hard by time, through California coastal sage where rattlesnakes sun themselves, through groves of the rarest pine in North America, a remnant of an ancient coastal forest. He looks out to sea and follows the porpoises with their curved backs stitching the waves, the dipping gulls.

One day, as he and I walked along a plateau farther inland, he explained the way his scientific mind processes nature. “Soils and plants have a plethora of different hues of browns and greens, and by noting these carefully, one can guess what to expect in terms of rocks and plants when coming closer,” he said. “As I get older, my hearing suffers, but I still enjoy the whispering of the pines and firs in the breeze, and the song of birds. I try to guess the size of each bird from the frequency distribution in its acoustic emissions—perhaps not a very romantic approach. Even more than my senses, my *thinking* is enhanced in nature.”

Our society seems to look everywhere *but* the natural domain for the enhancement of intelligence. Gary Stix, writing in *Scientific American*, reports a boom in pill popping to build brain performance. Many people already take “natural” supplements to enhance or calm the brain—*Ginkgo biloba* for increased blood flow to the brain, Saint-John’s-wort for depression, and so on. And psychoactive substances have been used for thousands of years to enhance the human ability to envision and then create. As any baby-boom survivor of the 1960s can attest, though, results may vary. Now we’re taking the next leap. “The 1990s, proclaimed the decade of the brain by President George H. W. Bush, have been followed by what might be labeled ‘the decade of the better brain,’” writes Stix. College students and business executives are downing stimulant drugs for routine mental performance, though the drugs were never approved for that purpose.

Called neuroenhancers, nootropics, or smart drugs, the smart pills of choice currently include methylphenidate (Ritalin), the amphetamine Adderall, and modafinil (Provigil). “On some campuses, one quarter of students have reported using the drugs,” according to Stix.<sup>6</sup> Some people need such medication, of course, but reliance on these drugs remains a massive experiment, with long-term side effects yet to be determined. Beyond drugs, the news media’s imagination is captured by the potential of artificial neural networks—the reproduction or extension of the biological nervous system—to boost human intelligence. Yet an immediately available, low-cost intelligence-enhancing supplement already exists.

The study of the relationship between mental acuity, creativity, and time spent outdoors is a frontier for science. But new research suggests that exposure to the living world can enhance intelligence for some people. This probably happens in at least two ways: first, our senses and sensibilities are improved through our direct interaction with nature (and practical knowledge of natural systems is still applicable in our everyday lives); second, a more natural environment seems to stimulate our ability to pay attention, think clearly, and be more creative, even in dense urban neighborhoods. This research has positive implications for education, for business, and for the daily lives of young and old.

Foundational work in this arena was begun in the 1970s by environmental psychologists Rachel and Stephen Kaplan.<sup>7</sup> Findings from their nine-year study for the U.S. Forest Service and later research suggested that direct and indirect contact with nature can help with recovery from mental fatigue and the restoration of attention. In addition to supporting the theory that nature experience can improve psychological health, they also found that it helped restore the brain’s ability to process information. They followed participants in an Outward Bound–like wilderness program, which took people into the wilds for up to two weeks. During these treks or afterward, subjects reported experiencing a sense of peace and an ability to think more clearly; they

also reported that just being in nature was more restorative than the physically challenging activities, such as rock climbing, for which such programs are mainly known.

Over time, the Kaplans developed their theory of directed-attention fatigue. As described in a paper by Stephen Kaplan and Raymond DeYoung: "Under continual demand our ability to direct our inhibitory processes tires. . . . This condition reduces mental effectiveness and makes consideration of abstract long-term goals difficult. A number of symptoms are commonly attributed to this fatigue: irritability and impulsivity that results in regrettable choices, impatience that has us making ill-formed decisions, and distractibility that allows the immediate environment to have a magnified effect on our behavioral choices."<sup>8</sup> The Kaplans hypothesize that the best antidote to such fatigue, which is brought on by too much directed attention, is involuntary attention, what they call "fascination," which occurs when we are in an environment that fulfills certain criteria: the setting must transport the person away from their day-to-day routine, provide a sense of fascination, a feeling of extent (enough available space to allow exploration), and some compatibility with a person's expectations for the environment being explored. Furthermore, they have found that the natural world is a particularly effective place for the human brain to overcome mental fatigue, to be restored.

The Kaplans' work suggests that nature simultaneously calms and focuses the mind, and at the same time offers a state that transcends relaxation, allowing the mind to detect patterns that it would otherwise miss. Yes, some people might achieve a similar state while walking the streets of New York, or through advanced meditation, or perhaps someday from a pill. The natural world, though, offers its own supplements. "Our work has focused on the many ways in which nearby nature, whether experienced directly or indirectly, can contribute to well-being," says Rachel Kaplan. "Tending houseplants, the view of a tree from the window, gardening, street trees, planters with flowers at

bus stops . . . there are so many ways in which the natural world may benefit people."

Subsequent research supported the Kaplans' findings. The researchers Marlis Mang and Terry Hartig, at the University of California-Irvine, compared three groups of backpacking enthusiasts. One group went on a wilderness-backpacking trip and showed improved proof-reading performance, while those who went on an urban vacation or took no vacation showed no improvement in this task.<sup>9</sup> At the University of Michigan, researchers demonstrated that participants' memory performance, and attention spans improved by 20 percent after just an hour of interacting with nature, according to results published in *Psychological Science* in 2008.<sup>10</sup> Marc Berman, a psychologist at the University of Michigan, and lead author of the study commented: "People don't have to enjoy the walk to get the benefits. We found the same benefits when it was 80 degrees and sunny over the summer as when the temperatures dropped to 25 degrees in January. The only difference was that participants enjoyed the walks more in the spring and summer than in the dead of winter."

Meanwhile, at the Human-Environment Research Laboratory at the University of Illinois, researchers have discovered that children show a significant reduction in the symptoms of attention-deficit disorder when they engage with nature.<sup>11</sup> Since grown-ups can exhibit the symptoms of attention-deficit disorder, too, one might speculate that this research is also relevant to the lives of adults.

Most research on how nature experience can improve learning has been conducted with young people. But nature-smart education appears to work for everyone involved, including the teachers. A Canadian study showed that greening school grounds not only improved academic performance of students; it also lowered exposure to toxins and increased teachers' enthusiasm for being teachers, in part due to fewer classroom discipline problems.<sup>12</sup>

Schools with greened grounds experience reduced absenteeism.

School gardening can improve students' learning and behavior; students participating in gardening had improved school attitude and teamwork and expanded learning opportunities. Natural views from high schools can positively impact students' academic achievement and behavior. A study that investigated 101 public high schools in Michigan found that students in schools with larger windows and more views of nearby nature—from classrooms, lunchrooms, and outdoor eating areas—had both higher standardized test scores and higher graduation rates, and a greater percentage of those students planned to attend college. (There were also fewer reports of criminal behavior.)<sup>13</sup> Real field trips offer better learning environments than virtual field trips. This isn't to say virtual field trips (via webcams, for example) aren't useful, but a real field trip provides a chance for students to use all their senses, spontaneity, and instigative learning—what the researchers called a superior learning environment that goes beyond specific curriculum-based learning.<sup>14</sup> So-called at-risk students who have not had much experience in nature show a marked improvement of 27 percent in test scores, related to mastery of science, when they learn in weeklong residential outdoor education programs. They also showed enhanced cooperation and conflict-resolution skills; gains in self-esteem; gains in positive environmental behavior; and improvements in problem solving, motivation to learn, and classroom behavior.<sup>15</sup> Typically, these studies controlled for socioeconomic status, racial/ethnic makeup, building age, and size of enrollment.

More research is needed on adult learning, but the studies and theories related to the young are relevant in any discussion of intelligence, no matter what the age of the student.<sup>16</sup>

Got dirt? A study conducted by Dorothy Matthews and Susan Jenks at the Sage Colleges in Troy, New York, has found that a bacterium given to mice helped them navigate a maze twice as fast. The bacterium in question is *Mycobacterium vaccae*, a natural soil bacterium commonly ingested or inhaled when people spend time in nature. The

effect wore off in a few days, but, Matthews said, the research suggests that *M. vaccae* may play a role in learning in mammals. She speculated that creating outdoor learning environments where *M. vaccae* is present may “improve the ability to learn new tasks.”<sup>17</sup> Smart pill, meet smart bug.

Even if the bacteria research turns out to be on the mark, don't expect anyone to start handing out smart bugs in the classroom or the boardroom. But, whether conducted on adults or children, the growing body of research associating learning ability with time spent in nature does have implications for teaching methods at all levels, as well as implications for the design of school grounds and buildings. This thinking extends to colleges and universities, and to how educational institutions and businesses might offer extended or continuing education programs. One can imagine a nature-based trend in education that would rival the explosion of high-tech virtual education. This research also suggests that individuals can proceed on their own to gain a natural intellectual and creative advantage by tapping into nature.

Still, most people need a little help from their friends to sharpen their minds in nature. Jon Young, a longtime wilderness-tracking teacher, works with adults and children in the Bay Area through the Regenerative Design Institute in Bolinas, California. “You almost never find one person being connected to nature and the whole community not being connected to nature,” he says. “There are cultural practices that get the whole community involved in what amounts to ‘nature-connection practice.’” He works with up to two hundred adults a year, teaching them how to become nature-connection mentors. In his courses, Young applies the methods outlined in *Coyote's Guide to Connecting with Nature*, a book he coauthored with Ellen Haas and Evan McGown. Among the exercises and rituals: body radar, the six arts of tracking, mapping, mind's eye imagining, listening for bird language, and plant concentration. His school teaches navigation skills, the awareness of time of day, understanding that certain birds have

returned from their migration, the anticipation of seasonal change, knowing where the mushrooms are going to pop up on the hillside because of the rain patterns. “All that is deeply embedded in our — can I call it software? I hate to use that analogy. It’s the operating system our hardware is designed to run with, if you will. . . . And when we are connected to nature, all those functions turn on by themselves. We play outside, we track, we wander around. And a couple months into it, there’s a light that turns on in their eyes and they suddenly say, ‘Ah, this is great. I haven’t felt this way since I was nine.’ It’s as if there’s some sort of neurological phenomenon happening when that reawakening happens. Some adults feel guilty about that; they think learning has to hurt. The educational systems that we are used to are about information transfer.” If that approach is used exclusively, people tend to hold the information in their short-term memory, bring it out for a test, “and then they let it go — it’s not going to fill the memory banks long-term.” At the other end of the spectrum of learning environments is what Young calls “full connection.” He offers this example: “An eleven-year-old girl who has made a deep connection with a horse can tell you an extraordinary amount of information about horses, and she won’t even know where it’s coming from. She’ll be able to tell you this information through animated, engaging storytelling. I always remind people that if we do nature connection effectively, the information will come along for the ride.”

The word *intelligence* gives Young pause. “I think of the nature connection as more nutritive, in an emotional, intellectual, spiritual sense. It’s such a profoundly deep part of who we are as human beings, and our potential.” Thus, Young wonders if we’re talking about intelligence or something he would call innate awareness. “Intelligence may be in the context of this larger awareness, a subset of a larger perceptual body. It’s the big container, larger than the collection of intelligences. It’s the background system.”

### Natural Creativity—Because Man Does Not Live by Dread Alone

Creative genius is not the accumulation of knowledge; it is the ability to see patterns in the universe, to detect hidden links between what is and what could be.

*To connect the dots*, as Celso Montalvo from the Galapagos school put it. Ralph Waldo Emerson, in a speech at Henry David Thoreau’s funeral service, described his friend’s many talents: “He was a good swimmer, runner, skater, boatman, and would probably out-walk most countrymen in a day’s journey. . . . The length of his walk uniformly made the length of his writing. If shut up in the house he did not write at all.”<sup>18</sup> These walks not only stimulated his creativity, but had practical, day-to-day application: Thoreau’s outdoor experiences made him a sought-after land surveyor; he could not only outline boundaries with exactitude, but could explain the ecological workings of an area in great detail. An amateur stream-watcher and river-gazer, he knew the secrets of local waters long before professional hydrologists took their measures.

When NPR commentator John Hockenberry reported the research that revealed greater mental acuity after a nature walk, he pointed out that Albert Einstein and the mathematician and philosopher Kurt Gödel, “two of the most brilliant people who ever walked the face of the earth, used to famously, every single day, take walks in the woods on the Princeton campus.” Well, we’re not all Einsteins. But we’ve all experienced that *eureka* moment when the brain is relaxed in a positive state.

As with the studies of learning ability, most research on the relationship between nature experiences and creativity involves young people. In 2006, for example, a Danish study found that outdoor kindergartens were better than indoor schools at stimulating children’s creativity. The researchers reported that 58 percent of children who were in close

touch with nature often invented new games; just 16 percent of indoor kindergarten children did.<sup>19</sup> One explanation, for adults as well as children, is suggested by the “loose parts theory” in education, which holds that the more loose parts there are in an environment, the more creative the play. A computer game has plenty of loose parts, in the form of programming code, but the number and the interaction of those parts is limited by the mind of the human who created the game. In a tree, a woods, a field, a mountain, a ravine, a vacant lot, the number of loose parts is unlimited. It’s possible, then, that exposure to the loose but related parts of nature can encourage a greater sensitivity to patterns that underlie all experience, all matter, and all that matters.

In 1977, the late Edith Cobb, a noted proponent of nature-based education, contended that geniuses share one trait: transcendent experience in nature in their early years.<sup>20</sup> Environmental psychologist Louise Chawla of the University of Colorado offers a broader view. “Nature isn’t only important to future geniuses,” she says. Her work explores “ecstatic places.” She uses the word *ecstatic* carefully. Rather than applying the contemporary definition of delight or rapture, she prefers the word’s ancient Greek roots—*ek stasis*—meaning “outstanding” or “standing outside ourselves.” These ecstatic moments are “radioactive jewels buried within us, emitting energy across the years of our lives,” as Chawla puts it. Such moments are often experienced during formative years. But, because of the brain’s plasticity, and individual sensitivities, they can happen throughout life.

And so can the creation of new neurons, the brain cells that process and transmit information. It’s reasonable to speculate, then, that time spent in the natural world, by both restoring and stimulating the brain, may lead to bursts of new neurons—“nature neurons,” as my wife puts it.

Time awareness may also be a factor. As noted in the report “Healthy Parks, Healthy People,” issued by the Deakin University School of Health and Social Development, in Melbourne, Australia:

“City life is dominated by mechanical time (punctuality, deadlines, etc.) yet our bodies and minds are dominated by biological time.” We know that conflict between biological and mechanical time—jet lag comes to mind—can lead to irritability, restlessness, depression, insomnia, tension, and headaches. In addition, “the experience of nature in a neurological sense can help strengthen the activities of the right hemisphere of the brain, and restore harmony to the functions of the brain as a whole,” the university report explains.<sup>21</sup> “This is perhaps a technical explanation of the process that occurs when people ‘clear their head’ by going for a walk in a park. . . . Furthermore, in the act of contemplating nature, researchers have found that the brain is relieved of ‘excess’ circulation (or activity), and nervous system activity is also reduced.”<sup>22</sup>

Whatever the process, creative people are often aware of being drawn to the outdoors for refreshment and ideas. “I always work outside, if I can. It’s important to grab the instant thought,” says writer Hilary Mantel, the 2009 winner of the prestigious Booker Prize.<sup>23</sup> American painter Richard C. Harrington continues in the tradition of artists who gain inspiration from being outdoors. He writes: “For me, to be removed from the environment, not to be outside on a regular basis, leaves me stressed, depressed, and generally unhappy.”<sup>24</sup>

Sculptor David Eisenhour, who is in his fifties, lives in a small town in Washington State. I met him one day in 2009 at the other side of the continent, at the Chautauqua Festival in upstate New York, where his art was featured. As a boy, he lived in a trailer with his father in a northern Pennsylvania farming community. He spent most of his free time in the wild, but he also kept aquariums filled with frogs, fish, crayfish, and insects. A good microscope took him deep into another world. Today, his cast-metal pieces express natural forms that seem familiar, yet his inspiration often comes from objects or creatures so small they escape notice. Lichens or beetles take on surprising shapes in his hands. His Chautauqua display was a large and unlikely

sculpture of a dung beetle's helmet; it looked rather like a Triceratops, and it was beautiful. As he sat on a rock wall near the display, he talked about the link between nature and inspiration.

"The reason my career seems to be progressing is that the imagery I'm doing isn't sentimental but it is very organic and very primordial looking. It's coming into its time because people are wanting this connection to the natural world. It opens up that childhood fascination again," he said. "I search for the imagery that, on a macro- or a microscopic level, is repeated. You're looking more at the building blocks of life. Somewhere in our simian brain, subconscious, we have all that information. We've just lost access to it . . . the fact that the spiral of a snail shell and the spiral of the Milky Way galaxy are the same thing."

But the main reason he chooses this imagery, he says, is because "being in nature quiets my mind and out of that quietness is where the real art happens."

In the summer of 2009, several colleagues and I were invited to actor Val Kilmer's Pecos River Ranch, in New Mexico, to speak with him about his plans to create a sort of art museum/creativity center on his property. What struck me most during the visit was not the actor's vision, but a small black-and-white photograph on the fireplace mantel. The image was of a thunderhead above water. Under it, in Kilmer's cramped handwriting, was this inscription written for his son: "Inspiration is confirmation . . . xox Dad." In the bottom corner of the photo, he added a P.S. "*But if you ever run out of ideas, just go outside.*"

### Hybrid Thinking

One more thought before we move on to physical and emotional health. While still considering the arena of nature and intelligence, let's punch some holes in the false dichotomy of nature and technology.

When my sons were growing up, they spent a lot of time outdoors, but they also played plenty of video games—more than I was comfortable with. Every now and then, Jason and Matthew would try to

convince me that their generation was making an evolutionary leap; because they spent so much time texting, video-gaming, and so forth, they were wired differently. In response, I pointed out that my generation had said something similar about drugs, and that didn't work out so well. Chances are, neither will electronic addiction, which is why the nature balance is so necessary. What's different now is not the presence of technology, but the pace of change—the rapidity of the introduction of new media and adoption of new electronic devices.

Gary Small, a neuroscientist at the University of California—Los Angeles, suggests that the pace of technological change is creating what he calls a "brain gap" between the generations. "Perhaps not since early man first discovered how to use a tool has the human brain been affected so quickly and so dramatically," he writes in his book, *iBrain: Surviving the Technological Alteration of the Modern Mind*.<sup>25</sup>

If Small is right, then my response to my sons—that evolution doesn't work that fast—may be overstated.

Small and his colleagues used MRI imaging to study the dorsolateral area of the prefrontal cortex, which integrates complex information and short-term memory and is instrumental in decision making.<sup>26</sup> Two groups were tested: experienced, or "savvy," computer users; and inexperienced, or "naïve" users. While doing Web searches, the savvy users' dorsolateral area was quite active, while in the naïve users, the dorsolateral area was quiet. As the Canadian magazine *Maclean's* reported: "On day five, the savvy group's brain looked more or less the same. But in the naïve group, something amazing had happened: as they searched, their circuitry sprang to life, flashing and thundering in exactly the same way it did in their tech-trained counterparts."<sup>27</sup> After this short period of time, had the naïve subjects "already rewired their brains?" People over thirty, whose brains were fully formed when they first came to the Web, can also become proficient in the virtual universe. But teenagers' brains are particularly malleable, more apt to be shaped by technological experience.

One view is that people who experience too much technology in the formative years will stunt the maturation of normal frontal lobe development, “ultimately freezing them in teen brain mode,” as *Macleans* puts it. “Are we developing a generation with underdeveloped frontal lobes, unable to learn, remember, feel, control impulses?” Small writes. “Or will they develop new advanced skills that poise them for extraordinary experiences?”<sup>28</sup>

Optimistic researchers suggest that all this multitasking and texting is creating the smartest generation ever, freed from the limitations of geography, weather, and distance—all those pesky inconveniences of the physical world. But Mark Bauerlein, an English professor at Emory University, in his book, *The Dumbest Generation*, reels out studies comparing this generation of students with prior generations, finding that “they don’t know any more history or civics, economics or science, literature or current events” despite all that available information.

Here is a third possibility: We may be developing a hybrid mind. The ultimate multitasking will be to live simultaneously in both the digital and the physical world, using computers to maximize our powers to process intellectual data and natural environments to ignite all of our senses and accelerate our ability to learn and to feel; in this way, we could combine the “primitive” powers of our ancestors with the digital speed of our teenagers.

Evolution may (or may not) be out of our hands, but as individuals we can accept and celebrate our technological skills at the same time that we seek the gifts of nature essential for the realization of our full intellectual and spiritual potential.

The best preparation for the twenty-first century may be a combination of natural and virtual experience. An instructor who trains young people to become the pilots of cruise ships describes “two kinds of students, those who are good at video games, who are terrific with the electronic steering; and those who grew up outside—they’re far better at having a special sense of where the ship is. We tend to get

one or the other kind.” The ideal pilot, he says, is the person who has a balance of high-tech and natural knowledge: “We need people who have *both* ways of knowing the world.” In other words, a hybrid mind.

New strategies of personal discipline will be required to integrate or toggle between these seemingly incompatible ways of being in the world. Perhaps a fifteen-year-old can begin to show us the way.

On his LinkedIn page, Spencer Schoeben describes himself as “Marketing Manager at Teens in Tech Networks; Founder, Chief Site Architect at Twitloc; Web Developer at Cassy Bay Area; Webmaster, Social Media Editor at Paly Voice; and Founder of Netspencer (Self-employed).” A full tech plate. He also does time as a student at Palo Alto High School. Schoeben expresses pride in his knowledge of the computer world, and he sees the pluses of living “a life of connectivity,” as he puts it, on his Web site. “No matter where I am, no matter what I am doing, everything and everyone that I care about is at my fingertips.” But he also describes the impact of two weeks of summer camp at Hidden Villa, a nonprofit educational organization with an organic farm and native vegetation in the foothills of the Santa Cruz Mountains south of San Francisco. He writes that he wasn’t keen on going to Hidden Villa, at first. “I was thinking about how hard it would be for me to survive without an Internet connection.” But off to camp he went, where he “made French fries from potatoes which we picked and I even walked a goat through the woods. It turned out okay. Actually, it turned out amazing. I couldn’t believe that I had done it.” And he learned that there are “thousands and thousands of species of trees and plants and animals that don’t use an ounce of electricity.”

When he got home, he went straight to his room and grabbed his laptop and paged through twelve days of e-mail and Facebook notifications. “But I just didn’t care. What I really wanted to do was go outside and have fun in the real world.” Perhaps the best way to live, he realized, “is in the middle.” He can remain passionate about technology—“There is no use ditching it”—but the Internet is not the universe.

“It’s hard to realize how isolated your life can be . . . until you experience what it’s like to live on the other side.”

Spencer has a new map for his life. At least for now, he intends to balance the technological world with experience in that world of natural connections. In pursuit of that hybrid experience, he quotes Carl Sagan: “Somewhere, something incredible is waiting to be known.”

## Vitamin N

*Tapping the Power of the Natural World  
for our Physical, Emotional, and Family Fitness*



*We need the tonic of wilderness.*

—Henry David Thoreau