

Robin Wall Kimmerer On Scientific And Native American Views Of The Natural World

LEATH TONINO

Robin Wall Kimmerer has a PhD in botany and is a member of the Citizen Potawatomi Nation, a Native American people originally from the Great Lakes, with a reservation today in Oklahoma. She describes herself as a “traveler between scientific and indigenous ways of knowing,” but there is little about her writing, public speaking, or teaching that suggests movement back and forth. Rather she seems to be standing still, looking simultaneously through two lenses, expressing two worldviews. Trees, for her, are photosynthesizing beings as well as teachers. A forest is an ecosystem and a home at once.

Born in 1953, Kimmerer was raised in upstate New York. The federal government had forced her grandfather, as a boy, to leave his home on the Potawatomi reservation in Oklahoma and attend the Carlisle Indian Industrial School in Pennsylvania. The school’s purpose was to assimilate Native American children, even against their will, and its founder’s motto was “Kill the Indian, and save the man.” Over time her family rekindled tribal connections, which she says had been “frayed by history, but never broken.” She did her graduate studies at the University of Wisconsin, where she focused on how plants reclaim abandoned zinc and lead mines, healing the damage of a destructive industry.

For a decade Kimmerer taught college biology in Kentucky, establishing herself as a leading expert on mosses. In 1993 she returned to upstate New York — which she calls “Maple Nation” — where she’s currently a Distinguished Teaching Professor in the Department of Environmental and Forest Biology at the State University of New York, Syracuse. Eight years ago she founded the Center for Native Peoples and the Environment, whose mission is to promote sustainability through programs that draw on both indigenous knowledge and science. The Center also works to increase opportunities for Native American students in the environmental sciences. “Science is often perceived to be at odds with indigenous values,” she writes. “The result is that Native Americans are barely present in the scientific community, where their unique cultural perspectives on environmental stewardship are greatly needed.”

Kimmerer’s first book, *Gathering Moss*, won the John Burroughs Medal in 2005, and her second, *Braiding Sweetgrass*, received the Sigurd F. Olson Nature Writing Award in 2014. Last year she addressed the General Assembly of the United Nations for the commemoration of International Mother Earth Day, and the year before that, she was a keynote speaker at the National Bioneers Conference.

I talked to Kimmerer on a bright summer morning at her farmhouse in Fabius, New York, where she raised her two daugh-

ters, both of whom are now grown. Before beginning the interview, we ate a brunch of quiche and green salad with strawberries at a picnic table in her yard. Kimmerer was warm and welcoming, with long, graying hair and dangling porcupine-quill earrings. She spoke with assurance, rarely pausing, her voice and her thoughts always clear.

After two hours we got up to stretch our legs and walked down a mowed trail, past a vegetable garden, and around a small pond. I mentioned a slug I’d recently seen that used a thread of slime to rappel off a ledge, as a rock climber might, and Kimmerer responded by pointing out the place where, a few days prior, she had encountered a wriggling green nematode: “It was a four-inch-long thread of a creature, a species I’d never seen before, living right here in the yard.” The two of us continued trading small wonders in a kind of ping-pong match. “Isn’t it all fantastic?” she finally said, the comment less a question than an exclamation.

Tonino: You’ve always loved plants, but your relationship to them has transformed over time.

Kimmerer: I would describe my journey as a circle, moving out into academia but coming back to the way that I knew plants as a child. I grew up in a rural area much like where we’re sitting today, and I was interacting every day with plants in the garden, the woods, or the wetlands. I couldn’t go outside without being surprised and amazed by some small green life. I suppose it was their great diversity of form that first drew my interest: that on a small patch of ground there could be so many different ways to exist. Each plant seemed to have its own sense of self, yet they fit together as a community. And each had a home, a place where I knew I could find it. This inspired my curiosity.

From as far back as I can remember, I had this notion of plants as companions and teachers, neighbors and friends. Then, when I went to college, a shift occurred for me. As an aspiring botany major, I was pressured to adopt the scientific worldview; to conceive of these living beings as mere objects; to ask not, “Who are you?” but, “How does it work?” This was a real challenge for me. But I was madly in love with plants, so I worked hard to accommodate myself to this new approach.

Later in my career, after I’d gotten my PhD and started teaching, I was invited to sit among indigenous knowledge holders who understood plants as beings with their own songs and sensibilities. In their presence, and in the presence of the plants themselves, I woke from the sleep I’d fallen into. I was reminded of what I’d always known in my core: that my primary relationship with plants was one of apprenticeship. I’m

learning *from* plants, as opposed to only learning *about* them.

I was especially moved by an elderly Diné woman who told the biographies of each plant in her valley: its gifts, its responsibilities, its history, and its relationships — both friendships and animosities. As a scientist I had learned only about plants' physical attributes. Her stories reminded me of how I had encountered plants as a young person. That's why I say I'm coming full circle after all these years — because I'm able to stop speaking of plants as objects.

Let me add that my appreciation of plants has been greatly enriched by knowing the beauty of chlorophyll and photosynthesis and hormones and cellular biology. Ideally the two ways of knowing can reinforce one another.

Tonino: Writer Vine Deloria Jr. has called indigenous knowledge the "intellectual twin to science." Is that what you're talking about?

Kimmerer: Yes. Both Western science and traditional ecological knowledge are methods of reading the land. That's where they come together. But they're reading the land in different ways. Scientists use the intellect and the senses, usually enhanced by technology. They set spirit and emotion off to the side and bar them from participating. Often science dismisses indigenous knowledge as folklore — not objective or empirical, and thus not valid. But indigenous knowledge, too, is based on observation, on experiment. The difference is that it includes spiritual relationships and spiritual explanations. Traditional knowledge brings together the seen and the unseen, whereas Western science says that if we can't measure something, it doesn't exist.

Tonino: What are some other differences between the traditional indigenous approach and the Western scientific tradition?

Kimmerer: When we use the scientific method in an experiment, we look at one variable at a time. In order to really understand how something works, science says, we must exclude all else. We're not going to talk about relationships. We're going to limit ourselves to cause and effect. This notion that you can rigorously exclude all factors save one, and in so doing find *the* cause, is not part of traditional knowledge.

In the traditional way of learning, instead of conducting a tightly controlled experiment, you interact with the being in question — with *that* plant, with *that* stream. And you watch what happens to everything around it, too. The idea is to pay attention to the living world as if it were a spider's web: when you touch one part, the whole web responds. Experimental, hypothesis-driven science looks just at that one point you touched.

Another important difference is that science tends to want



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to make universal statements, whereas to the indigenous way of thinking, what's happening between two organisms is always particular and localized, unique in space and time. Take the example of a bee landing on a flower for a sip of nectar. To the indigenous observer, it's not some idealized Bee meeting some idealized Flower. There isn't an attempt to generalize to pollinator ecology, or to say that it's all being driven by certain physical principles. Those principles may be real, but they aren't any more real than *this* bee on *this* flower at *this* time on *this* day with *this* weather.

Tonino: But how do you get beyond that isolated moment in space and time to develop a broader understanding? It can't be that you have to start over with every bee and flower. Don't the observations pile up?

Kimmerer: You're asking: Is there an equivalent in traditional knowledge to what science calls a theory? Absolutely. But it's a different kind of theory, one that centers on the idea of responsibilities.

All bees, for example, have a responsibility to pollinate. The indigenous observer is asking the bee, How are you living out your responsibility? And what about you, flower?

The individual observer brings findings back to the community to share. He might talk about what happened when he was setting his trapline that day, and someone else might say, "Oh, a few falls ago I saw that same thing, and the consequence was this or that." And then maybe somebody else chimes in that she saw the same thing, too, but the consequence was a little different. The information isn't published in a professional journal, but it's shared with the community and vetted by that community's collective intelligence. I think of it as the equivalent of peer review.

Tonino: You say that indigenous observers interact with the world they're studying. They participate. Why is that so important?

Kimmerer: Western science explicitly separates observer and observed. It's rule number one: keep yourself out of the experiment. But to the indigenous way of thinking, the observer is always in relationship with the observed, and thus it's important that she know herself: As I watch that bee and flower, as I study how water moves, as I observe the growth of the grass in this meadow, I understand that the kind of being I am colors how I see and feel and know. Furthermore, my presence might even be influencing how the world is working around me.

It's important to recognize the relationship that exists between the observer and the observed. In Western science we believe our technologies and how we frame our hypotheses will eliminate our bias. A traditional perspective instead cel-

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embrates the relationship. A young person is going to see things differently than an old person. A daughter and a mother and a grandmother will see in different ways. All of these perspectives should be brought to bear. Rather than isolate them, we can incorporate them into the learning process.

Tonino: Do you think there's an analogy between Native American oral traditions and long-term scientific research projects?

Kimmerer: Let me back up and say that paying attention to natural data has evolutionary value for a culture. If you don't pay attention to the circumstances under which the salmon return to the rivers to spawn, you will fail at fishing. So there has always been great impetus to make meaning from data.

That data might not be quantitative, though. It's not as if a thousand years ago on the Pacific coast people were measuring and weighing fish. But they were cleaning hundreds of fish, so their hands knew the size and weight and relative health of these beings. And their hands remembered "data" from the previous year and the year before. I can imagine a conversation that went something like: "You know what else was happening that year when the fish were so fat? There was a great hatch of mosquitoes," or, "We had a really long winter," or, "Water temperatures were up." We search for connections. It's what we do as a species.

The ecological history of a place is passed down through foodways, through stories around the campfire, through ceremonies performed on certain dates in honor of the cycles — such and such natural event tends to occur around such and such a date. And this knowledge has adaptive significance. If you don't pay attention, you're going to go hungry, or you won't be able to find the medicine you need. It's imperative that you collect and safeguard knowledge over the years. Western science — or, at least, ecology — has a growing appreciation for this basic truth: if we don't have a handle on our fisheries and forests, we're in huge trouble.

Tonino: Long-term studies, whether conducted by Western scientists or indigenous peoples, strike me as an effort to prevent amnesia.

Kimmerer: Yes, forgetfulness. I think of my friends just a few miles over the hill here at Onondaga Nation. They're trying to restore their sacred lake, which has been horribly polluted by industrial dumping and sewage. They want to bring it back to the state described in the prayer of gratitude that opens and closes all their group meetings. They call it the Thanksgiving Address, and it's an ancient description of how the world once was and can be again. They're not using the EPA's standards of allowable parts per million of some toxic chemical. They're saying that lakes are places where eagles can come and feed and breed. Lakes are places where people can gather their

medicines. Lakes are places where all kinds of creatures can drink and be refreshed.

Ceremony is often said to be how we remember to remember. The great orations, such as the Thanksgiving Address, reach back through time and say, "These are the relationships that have existed and should exist. With that in mind, let's go forward and restore our environment."

Tonino: That's a lovely thought: ceremonies are how we remember to remember.

Kimmerer: Ceremony also reminds us of our responsibilities to creation. When you have ceremonies of gratitude, you understand how much the world gives to you, and you remember your dependency. Through the ceremony itself — the food, the regalia, the time spent in preparation — you are giving back. You're putting energy back into both the material and the spiritual world. The two are inseparable. Ceremonies are as much about reciprocity as they are about gratitude.

Tonino: You've said that an indigenous elder might see the scientific method, which asks a direct question, as disrespectful. Why?

Kimmerer: Because the organism being questioned has its own intentions, its own agency in the world. It is rude of us to prod this sovereign being and ask: How come you're doing that? How come you're living that way? How come you're that color? How come you're that tall? How come you die in the winter? To someone who views each organism as a potential teacher, this type of pushy questioning is just plain rude.

It has also been explained to me that scientists' interest in how things work leads us out of our place and into the Creator's realm. We don't need to know *how* something works. We need to know *that* it works to keep natural systems intact. We should remember that our curiosity exists in the human realm. It's sometimes said that we humans are the "youngest brothers of creation." We haven't been around very long, and we should be humble and pay attention.

My personal view, as a Native American scientist, is that, while I honor this traditional perspective and acknowledge that science sometimes overreaches, I also understand that knowledge of underlying mechanisms can provide us with the tools for positive intervention in ecological systems. Knowing how something works can also be a source of wonder. At the same time, I appreciate the traditional perspective, which cautions against hubris and arrogance and the sense that we are "controlling" nature, as if it were a machine.

Tonino: If asking a direct question of the natural world is disrespectful, what's the alternative?

Kimmerer: We can find creative ways of pursuing inquiry that are courteous and delicate and don't demand information but instead search for it. I like to think of my own research as

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an interview process, a conversation.

Let's say we want to know how a particular species of moss responds to drought. Some people would take samples into the lab and drought-stress them, but that's pretty crude, in my opinion. If I want to know how water is important to moss, I'm going to go to wet places and be with the moss, and I'm going to go to dry places and be with the moss, and I'm going to discover whatever I can. I will say to the moss, "I'm not going to snatch you from your home and grind you up to learn your secrets. Instead I will sit at your feet and wait for you to tell me what I need to know." And I'll do so joyfully, appreciating the experience regardless of what data might come from it. A way of learning that's not destructive, that minimizes interference — that's my goal.

Patience and commitment are the key to learning from a being or a place. Unfortunately the institutions of science don't commonly make room for the slow, steady approach.

I want to be careful here to separate the institutions of science from scientific inquiry itself. They shouldn't be conflated. The institutions of science dictate that your grant lasts only three years and must produce a report. This propels a reductive, mechanistic approach. And the sad truth is that scientists have no choice but to follow the money. If you can't secure the funding to do your research the way you want, you devise a project that you *can* get funded.

Tonino: What are the chief virtues of scientific inquiry?

Kimmerer: The first that comes to mind is repeated measurement as a way of seeing. I can think of instances in which the observations of native peoples could lead them astray. We can't separate the observer from the observed, but we can avoid imposing our human perspective on the facts. Measurement can help with this.

Science also offers us many lenses for viewing the world. Technology can help us get outside of our human perceptions. When we look at a flower, we don't see it the way a bee sees it. Advanced technologies can help us to see the flower from the bee's perspective and get beyond the limitations of our five senses.

Tonino: That reminds me of an essay by Gary Snyder in which he makes the point that our bipedal, binocular, 150-pound, mostly hairless way of experiencing the world can get us only so far, and we need to try to go beyond it, if only imaginatively.

Kimmerer: This is especially true with plants. As a society we are plant-blind. It's just green wallpaper to most of us. We don't distinguish one species from the next, let alone appreciate that there's a reason the leaf of this plant differs from the leaf of that plant; that a tree's leaves change shape as it grows

from a seedling to maturity; that bark can be thick or thin, smooth or rough. We hardly notice plants' sophistication. We believe they don't exhibit intentional behavior, but really they just behave *very slowly*. Although plants don't have a nervous system like ours, there is good evidence that they can recognize other species around them and adjust their chemistry, growth patterns, and so on accordingly. Plants are interacting with one another all the time.

Tonino: Do they communicate? Collaborate? Wage war?

Kimmerer: Plants certainly do communicate, primarily through the exchange of chemical signals. They inform one another of insect and pathogen attacks, for example, which allows them to mount defenses. And there is evidence of collaboration as well as antagonism between plants. To my mind, plants meet any definition of intelligence. They have the ability to perceive, sense, respond to, and communicate about the environment. They create and maintain relationships with other beings. And they adjust their behavior in ways that benefit survival and reproduction.

Tonino: Why do most people resist the idea of plant intelligence?

Kimmerer: We tend to view the world through an anthropocentric lens. Plants are radically different from us, and we tend to see "others" as inferior. Since most plants don't exhibit rapid motion, we assume they do not exhibit behaviors. Because they do not have the same sensory organs and nervous systems that animals do, we assume that they have no sensation. Yet they sense the world in ways that are completely beyond us, such as perceiving very long and short wavelengths of light. We don't understand plant intelligence very well, so we tend to dismiss it as nonexistent or primitive. But we also used to think that the world was flat. If we would embrace the possibility of plant intelligence and investigate it without any anthropocentric bias, we might be surprised by what we learn.

Then there's the philosophical barrier to acknowledging plant intelligence: it would mean including plants within our circle of ethical responsibility. If we assume that plants are just objects, we are free to treat them however we please — they are of no moral consequence. If, however, we acknowledge the intelligence of plants, it would have significant implications for how we use them.

Tonino: Has your scientific work led you to feel greater empathy for the species you're studying?

Kimmerer: Absolutely. I'd go so far as to say that if you can't get to the point of feeling empathy, it's not worth doing the work. I want to know what it's like to be an oak or a birch or an ash.

Tonino: There's a poem by Mary Oliver that begins: "Have you ever tried to enter the long black branches / of other lives . . . ?"

Kimmerer: Yes, I've tried. It's an ability that can be learned — or relearned, as the case may be. Our ancestors understood this as quite normal and natural, whereas in our modern era we have forgotten what this kind of wordless communication is like.

Tonino: You've said that both science and traditional knowledge can be pathways to kinship. Does it matter which path we take, as long as we arrive at kinship eventually?

Kimmerer: No, I don't think it matters how you get there. The scientist peering through binoculars and the native hunter studying tracks in the mud both experience kinship with the living world.

Tonino: So what *is* kinship?

Kimmerer: It has to do with the realization that we are all beings on the same earth, and that we all need the same things to flourish. Water, for example. When I pay attention to how birds interact with water, or how mosses interact with water, or how lichens interact with water, I feel a kinship with them. I know what a cold drink of water feels like, but what would it be like to drink water over my entire body, as a lichen does?

Kinship also comes from our reciprocal relationship with other species. Sitting here, you can get a whiff of ripe wild strawberries off the hillside. They are fulfilling their responsibility to us, and we will fulfill our responsibility to them. Those berries provide us with food and medicine, and in reciprocity, we perhaps unwittingly disperse their seeds and tend their habitat so they can continue to thrive. It's like a family: we help each other out.

Tonino: Is that what you mean when you write that all flourishing is mutual?

Kimmerer: Yes. What's good for life is good for all life, whether it's green or two-legged or any other kind. Obviously there are trade-offs: the individual fish doesn't flourish when it's being eaten by the fisherman. But human flourishing and fish flourishing must be mutually reinforcing, or we wouldn't both still be here, right?

Tonino: Do you experience pushback on your work from either scientists or native people?

Kimmerer: Certainly. Scientists push back against my respect for traditional knowledge, because they believe it isn't rigorous; it's not equivalent to what they are doing in their labs and publishing in their journals. Traditional knowledge allows for spiritual explanations, emotional explanations, stories and myths, and therefore, for those scientists, its findings are invalid. As far as I can tell, the people who make this claim don't understand what traditional knowledge really is. In some cases, they probably don't understand what science really is either.

The pushback from native peoples is largely due to their resistance to sharing certain privileged knowledge with scientists. This is appropriate since native peoples have had so much taken from them; the possibility that their traditional knowledge may be borrowed and misused is a valid concern. Knowledge should be coupled with the responsibility to use

that knowledge wisely. I try to talk only in terms of traditional principles and philosophies that are commonly shared and not about specifics, because those details are often closely guarded by communities. If we're going to bring science and traditional ways together, the holders of indigenous knowledge need to control how it is used, and it needs to be shared freely, not taken.

It's important to recognize that traditional knowledge is not one monolithic thing. There are nearly six hundred tribal groups in the United States alone. And because the land under each tribe's feet is the source of its culture, each is unique. Hopi knowledge is different from Potawatomi knowledge. That said, I see certain common principles, values, and philosophies that unite native cultures in terms of how they think about the human relationship with land.

Tonino: I guess speaking of "traditional knowledge" isn't all that different from the way we lump the Dutch and the British and the French together under the umbrella "Western."

Kimmerer: That's right. And when we talk about science, we also tend to treat it as monolithic, even though ecologists and molecular geneticists and astrophysicists think about the world differently. These, too, are different tribes.

Tonino: What would you say to a non-Native American who is worried about appropriating Native American perspectives and practices?

Kimmerer: Be careful. Go cautiously. It's tough to say at what point appreciation becomes appropriation. Loving and respecting the earth, living by the rules of gratitude and reciprocity — those principles cross cultural boundaries and seem to be the property of our species. But people who go to a place that is sacred to a native community and bang on drums and say words they've read in a book — those people are taking somebody else's culture.

We should be inspired and broadened by other cultures, but we each need to build a unique relationship with our own place.

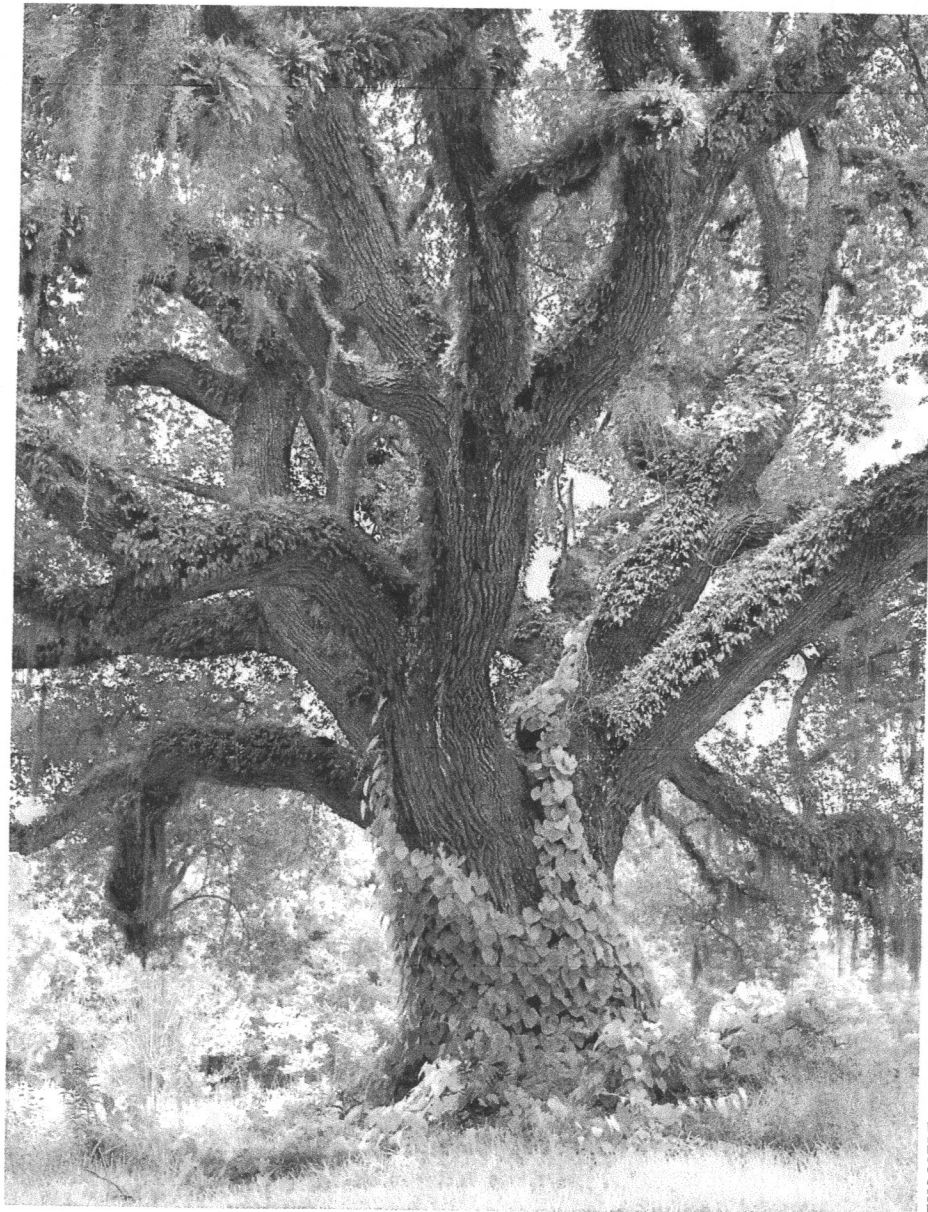
Tonino: How?

Kimmerer: By paying attention. By imagining what a reciprocal relationship with that place might be like. By asking, "How does this land sustain me, and how do I sustain this land?" By expressing gratitude for the land. By living in such a way that the land will be grateful for your presence on it.

Tonino: Returning to the question of synthesizing science and traditional knowledge: Are there arguments for keeping these ways of knowing separate and, in a sense, pure?

Kimmerer: Absolutely. I am not talking about blending knowledge. With blending, you're left with neither of the original elements. They both disappear.

Instead of blending, we need knowledge symbiosis, or relationship. I think of the metaphor of the Three Sisters garden. When you plant the Three Sisters — corn, beans, and squash — together, they complement one another and produce more nourishment than if they were grown in isolation. The beans need to climb the corn's stalk. The corn and squash need the beans to fix nitrogen in the soil. Obviously the corn doesn't blend with the beans and the squash. In fact, it's essential that



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the corn be itself in order for the symbiosis to work. Likewise, I think it's important to recognize the sovereignty of each kind of knowledge, to maintain their distinctiveness and allow each to be visible and vital.

My goal is to take indigenous and Western knowledge systems and ask how we can use them together for a common purpose. It's never about blending, particularly given the power differential between scientific knowledge and indigenous knowledge.

Tonino: You mean the authority science has in our culture?

Kimmerer: I do. It has the authority and also the resources to make its worldview manifest in the world.

Tonino: You teach a class in ethnobotany. What is that?

Kimmerer: Ethnobotany is the study of the relationships between plants and people. Its original focus was on the material uses of plants by indigenous people — who were then called “primitive” people. Today, in addition to looking at material uses, ethnobotanists study how people think about plants and interact with them in all realms, from the materi-

al to the spiritual.

I don't teach in the classroom. My ethnobotany class is held in the field, where the plants can be our teachers. The only way to really understand the gifts that plants offer us is to roll up our sleeves and get busy. So my students and I build our own shelters. We weave baskets. We spend time making dyes and medicines. We gather wild edibles for a feast. My students say, “Wow, you can eat cattails and lichens?” Yes, of course. Take a stroll through the forest, and almost everything you see is edible or medicinal or useful in some way.

Teaching ethnobotany is different from teaching botany. When I taught regular botany in the classroom, we learned root anatomy by studying textbook graphics and samples under the microscope. My ethnobotany students harvest spruce roots, which are long and strong, and use them to sew together birch-bark baskets. I guarantee that after a day of gathering and cleaning and working with spruce roots, my students know more about them than somebody who spent two weeks looking at cells under a microscope.

That's what I mean by letting the plant be the teacher:

Why is it that I can sew baskets with spruce roots, but when I try it with birch roots, I end up with a handful of splinters? The students learn by discovering the different species' gifts. And they don't forget what they've learned, because a basket is a thing of beauty to be admired long after the class has ended.

Tonino: You're a bryologist, a moss expert. What have mosses taught you?

Kimmerer: Where to start? Broadly speaking, they teach sustainability. They take little from the world and yet flourish everywhere, whether in the city or in the wilderness or on an old stone wall at the edge of a farm. They're not the biggest or the most complex species, but they have managed to survive on earth for at least 350 million years. All these angiosperms around us, these flowering plants, are Johnny-come-latelies. The mosses were the first plants to come out of the water and onto the land. And they give much more to the community than they take. They build soil, purify water, make seed beds, and provide habitat for microscopic animals. One gram of moss from the forest floor can be home to hundreds of creatures. Yet mosses use so few resources. They are a lesson in generosity.

There is almost no barrier between mosses and their environment, because their leaf is just a single cell thick. When the world is dry, they're dry. When it's wet, they're wet. That sort of intimate contact with the natural world is something to aspire to — if not literally, then metaphorically. What if your body were so permeable that the world just rushed inside of you, filling you up?

Tonino: There are sixteen thousand known species of moss.

Kimmerer: And more waiting to be discovered.

Tonino: Yet the English dictionary has only the single common word for them.

Kimmerer: Yes, mosses play a critical ecological role, but they are mostly beneath our notice. It's *just* moss. And this doesn't happen only with moss. People ignore the macroscopic world, too: It's just a bunch of trees. It's just grass. As I said earlier: green wallpaper.

I once came across a study that said people in my grandparents' generation could easily recognize a hundred distinct plant species. Those people lived on the land. They sat in the trees' shade on hot days. They related to plants as a daily presence and a vital resource. Today the average American can identify fewer than ten plants. That breaks my heart in two ways: I'm sad because we are so much poorer without the plants' company — "species loneliness," some have called it. And I'm sad for the plants, because we're not appreciating them. Here they are giving us these gifts, and we don't even bother to learn their names. How do we get people to care about endangered species and ecosystems if they can't appreciate nature's diversity?

My students in the College of Environmental Science and Forestry are an exception to the rule. They arrive on campus passionate and knowledgeable about the living world, and eager to know more. They are madly in love with plants, just as I was at their age. They give me hope.

But there's one thing that concerns me: my students are

more aware of humankind's negative impact on the environment than they are of our potential for positive impact. When I ask juniors in my ecology class to list negative relationships between people and land, they can name all sorts of examples. It's clear to them that people and nature are a bad mix. But when I ask, "What are the ways that humans can be beneficial for the land?" they don't have much to say.

That is dangerous. A lot of environmental-science classes are fear and disaster driven. The basic question they ask is "How can we mitigate the damage that we do simply by being alive on earth?" That's fearful thinking. We need to consider ways humans can live that embody the concept of mutual flourishing; that are good both for the land and for us.

Tonino: The term "impact" might discourage this.

Kimmerer: That's a good observation. *Impact* suggests we are outside the system as opposed to being a part of it.

Tonino: Are there any Potawatomi words that can help change our perception?

Kimmerer: One I write about often is *puhpowee*, which means "the force that causes mushrooms to rise up out of the earth at night." It's a word that shows appreciation for the mystery behind physical actions. It makes me wonder how many other mysteries surround us. If we had common words for these processes in English, would we awaken to their presence?

The real place where I sense language's transformative power is in grammar. In English, by default, we refer to maple trees and orioles and strawberries as "it." Humans are the only beings that aren't referred to as "it." Sometimes our companion animals escape from the "it" category. Maybe our cars do, too. But in Potawatomi and the other Anishinaabe languages, we use the same grammatical forms for all living beings. The maple is a person. The oriole is a person. The strawberry is a person. This is the grammar of a living world.

Tonino: The Haudenosaunee Confederacy here in New York — once known as the Iroquois League — is said to be the oldest living democracy on the planet. Is there a connection between this early practice of democracy and a more inclusive view of nonhuman species?

Kimmerer: The Haudenosaunee Confederacy is a model of representative democracy: six nations coming together, each contributing its voice to the whole. We could say that each species in nature should have a voice in the "democracy of species." Species are not just materials or resources; they're nations, collections of individuals. I say I live in Maple Nation. Someone else might live in Oak Nation. It's important to recognize that there are these other nations of beings within the one we call the United States.

Tonino: You've written that it's not the land that's broken, but our relationship with the land.

Kimmerer: The science of ecological restoration — of repairing the damage that humankind has done to the environment — has advanced in recent years. We can engineer ecosystems, return them to their predisturbance state: for example, returning a cornfield to its original tallgrass prairie, or restoring a degraded stream to a meandering, shaded

waterway that supports biodiversity. When we participate in this physical restoration, in many cases, the ecosystems respond beautifully. The land is resilient. It has the capacity to heal itself. We humans can accelerate that process, but even without us, the land will slowly come back around again.

What causes those brownfields, those clear-cuts, those toxic-waste dumps in the first place is our broken relationship with the land. And if we don't fix that relationship, we're going to replicate this destruction over and over again, creating more scarred, devastated landscapes. We need to break that cycle.

Tonino: In *Braiding Sweetgrass* you quote poet Franz Dolp: "To love a place is not enough. We must find ways to heal it." Where do we begin?

Kimmerer: The first step in healing is to recognize the source of the wound and attend to it. Then I think it's important to engage with the land's natural capacity for regeneration and support it with our human tools, in a partnership. Professional restoration ecologists would say that the first question to ask in any restoration project is: To what point in time are we restoring this place? Are we returning it to its predisturbance condition, the way it was just before the ecological disaster? Are we restoring it to its presettlement condition, the way it was before Europeans arrived in North America? Are we restoring it according to the Thanksgiving Address, as the Onondaga would? Some people are trying to restore damaged ecosystems to their Pleistocene condition. That's *twelve thousand years* ago. I think the restoration targets we choose should be based on our relationship with a place, not just on an abstract idea of what is "natural."

No matter how we approach it, however, restoration is a human-engineered solution. We decide what this place will become. Do we want it to be an oak savanna? Then we're going to grade the land, fix the hydrology, plant the trees, and scatter the grass seed. We think that we're the ones in charge. It's an imposed solution that doesn't always dovetail with natural processes of regeneration. There are many examples of how restorations have replaced a diverse native ecosystem with a simplified one. Corporations responsible for cleaning up their messes may go in and plant a bunch of non-native species. The land may end up with low biodiversity, and it may not resemble what was there a hundred years ago, but as long as there's a nutrient cycle and the ground is not eroding, they call it good: "We're done! Let's get out of here!"

Nature is always changing. And that's why I think it's important to focus on restoring our relationship to a place. That relationship stays the same: I need a landscape that will provide oxygen and water purification and berries to pick, a place where we can swim and where birds sing in the canopy. Let's work toward that relationship. The species composition might be different than it originally was, but if the water is pure and the berries can ripen, and if relationships of respect and reciprocity are restored, maybe we can live with that.

Tonino: Could you describe a restoration project you've worked on?

Kimmerer: The work my colleagues and I did with sweetgrass wasn't a wholesale ecosystem restoration, but we did

assist in the return of a single species that had long been important to native peoples. Sweetgrass is used in basketry, and it's a ceremonial plant. So my graduate students and I worked with our Native American partners to bring sweetgrass back to meadows where it had been eradicated by land development.

Once our sweetgrass plots were growing, we had to figure out what, if any, level of harvesting they could endure without disappearing again — because we wanted people to harvest it. Under Western conservation paradigms, you've got to keep people away, put a fence around nature. But we found that plots doubled in vigor and density when some harvesting occurred according to traditional guidelines. The ones nobody was harvesting did worse.

Sweetgrass had coevolved with humans, and the plants needed the basket makers' disturbance to help them reproduce. It was a situation where we had to restore a relationship in order to restore the plant. We couldn't just stick it in the ground and call the job done.

Tonino: I've heard a lot of land managers and conservationists refer to "ecosystem services," meaning, for example, the clean air and clean water that an ecosystem provides. What do you think of that phrase?

Kimmerer: It's essential to acknowledge what the land provides, because most people don't understand it, or they forget. In a scientific sense, there's merit in identifying and talking about processes like water and air purification. But I do think the phrase "ecosystem services" can lead us to think of the land as a machine for our use. And it's not the most inspiring wording, either.

I prefer to ask what gifts the land offers. Gifts require a giver, a being with agency. Gifts invite reciprocity. Gifts help form relationships. Scientists aren't comfortable with the word *gifts*, so we get *ecosystem services* instead. These terms arise from different worldviews, but both recognize the way the land sustains life.

Tonino: How do these gifts or services enter our lives?

Kimmerer: When we breathe clean air or drink clean water, or when the slope our houses are built on refuses to erode because of the living roots holding the soil together, we're receiving gifts. Too often we take for granted the complex natural systems that support us. When I get up in the morning and breathe the sweet air, I try to remember all the beings around me that have worked hard to make this possible. I try to be grateful.

I receive many gifts on this seven-acre piece of hillside where I live. I've worked hard to tend to this land and to bring in plants that are important to my life. I've planted cordage plants, whose fibers can be used to make rope. I've got tea plants. Every kind of berry that lives in this area grows here. I'm a forager and a gardener. I pick a lot of medicinal plants: coltsfoot for coughs, plantain for healing salves, elderberries to prevent colds, hawthorn for blood pressure, heal-all and goldenrod for infections — there are so many helpful plants right outside my door. I tell people, "You're not driving *to* the pharmacy; you're driving *through* the pharmacy." Nearly every-

Today the average American can identify fewer than ten plants. That breaks my heart in two ways: I'm sad because we are so much poorer without the plants' company — "species loneliness," some have called it. And I'm sad for the plants, because we're not appreciating them. Here they are giving us these gifts, and we don't even bother to learn their names.

thing we need is on the land. That's not to dismiss modern medicine and technology — those are great, too.

Tonino: Can you talk about the difference between taking what you want, taking what you need, and taking what is given?

Kimmerer: You're referring to the teaching of the Honorable Harvest. To harvest in a nonexploitative way, we have to identify our needs and try to separate them from our wants. The earth provides the materials we need to survive. But heaped on top of that are our thousand wants. And our wants are sneaky. They're good at dressing up as needs in our minds. That's one reason indigenous ceremonies are so important: because they celebrate and name what it is that actually keeps us alive.

The Honorable Harvest tells us to take only what we need and never more than half of what's available, to use everything that we take, to minimize the harm that is done, to share what we've taken, and to be grateful and always return the gift, giving something back in return.

But you also asked, How do we take only what is *given*? That's a philosophical challenge: How do we know when something is given? The only way to identify an offering is to get to know the giver. And can we receive the offering without causing damage? Can we harvest in a way that is mutually beneficial? I think of an apple tree producing apples. They're meant to be taken. The fruit is the vehicle for transporting seeds — that's why the tree makes it. If the branches are bent low by the weight of dozens of apples, that's an offering. I don't do any damage to the tree or its habitat when I reach up and twist an apple loose. At the other end of the spectrum would be mountaintop-removal coal mining. The mountain is not offering that coal. The extraction is not easy. We have to destroy so much in order to get at it. That breaks the rules.

Tonino: Is it possible for the human population to reach a number where what is "given" isn't sufficient?

Kimmerer: The combination of too many people and too much consumption will inevitably cause environmental degradation. It's happening already. Infinite growth is not possible, no matter how economists might profess otherwise. The laws of thermodynamics haven't been repealed on our behalf.

Tonino: The legendary Anishinaabe monster Windigo figures prominently in your work. What is Windigo?

Kimmerer: It is said to come mostly in the cold and dark of winter, a time of great scarcity, when there's little to eat. The Windigo is always hungry — its curse is that the more it consumes, the more it wants. It is so hungry that it will eat its own kind. It's a cannibal; that's what makes it monstrous. To have an insatiable appetite that ends up destroying every-

thing you love is the hallmark of a monster. Windigos were once humans who became sick with this terrible hunger. The message is that we humans possess the potential for consuming too much at the expense of life, and we need to find ways to rein it in.

The story of the Windigo is a cautionary tale about greed. It establishes a taboo: the community needs to survive, and if one individual takes too much, then the community is endangered. All flourishing is mutual. I've been told that one of the meanings of the name Windigo has to do with thinking only of oneself.

I see parallels between this monster and the kind of economies we have created, which are never satisfied and will destroy us all in order to have more, more, more. I see extreme methods of resource extraction — fracking, offshore drilling, various types of mining — as Windigo footprints. We don't need to do these things. They are the antithesis of taking only what is given. The Windigo comes with blood on its mouth, always looking for more.

Tonino: You've written that in old times those "who endangered the community by taking too much for themselves were first counseled, then ostracized, and if the greed continued, they were eventually banished." Can we do anything like that today, or has our world changed too much?

Kimmerer: I think there's a lot of wisdom in that hierarchy of escalating punishment. First it says, "How can we help you? How can we make it clear to you that what you're doing is not right?" Then comes the public shaming, which interests me the most. This is not some soft admonishment but an attack: "Even with the support of your community, you haven't changed your ways. Your values are harmful to us all. You should be ashamed of yourself." But it's hard to shame people today, because our value system is turned upside down. Someone can take a pristine piece of land and build a McMansion on it, and we're taught to applaud the person's money and power. The ones who are made to feel ashamed are those with less money, smaller houses, older cars. Until the collective sentiment is that greed really does deserve to be punished, it's as if we're stuck.

Part of the problem is the cultural view of land primarily as individual property rather than as shared commons. Land is associated with rights: it's my right to destroy this piece of land, tear up these wildflowers, and pour this concrete, because I own it. But I think about land not as a place you have rights to, but as a place for which you have responsibility. You have duties, obligations. And if you don't fulfill them, you're in for trouble.

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The last step in that hierarchy of punishment for people who had become Windigos was banishment: "You do not share our values. You endanger us all, so you can't live with us any longer." In the old days this meant, most likely, that the offending person would die without the community. There are obviously dangers to banishing people, to having communities decide which individuals do and don't belong, but I think we need to restore balance. There have to be incentives to do right by the community of living beings, but there also have to be real costs to going in the opposite direction.

Tonino: You've said that as a young person you were "colonized by the arrogance of science." That brings to mind the European colonization of North America. Can you connect those dots?

Kimmerer: One of the many factors that fueled the colonization of North America by European settlers was the settlers' materialist worldview. Native peoples were pushed off the land in large part because their values and ways of living were incompatible with the notion of progress, which required the exploitation of resources and individual property ownership. That worldview was linked to the scientific worldview. Scientific institutions became, in a sense, a tool of colonialism. There was a sort of philosophical and linguistic imperialism underlying this: the replacement of a way of relating to the land as kin and community with the notion that land was just property.

As a young person, in order to enter academia and learn to understand plants and work with plants, I was in a sense colonized, assimilated into the scientific way of knowing. My notion that plants could be persons, could be teachers — that had to go; it had no place in academia at that time. I was taught that the land does not have a spirit. The land is made up of molecules that we can look at under the microscope. My professors colonized my mind: "This is the way you should think." It's not unlike what my grandfather experienced at the Carlisle Indian School. It took me a long time to reclaim an indigenous way of knowing, but that restoration has shaped my life's work.

Tonino: On the whole, your writing is hopeful and celebratory. To what degree have frustration and anger also fueled your work?

Kimmerer: I remember being acutely disappointed when what I thought was important about plants growing up was dismissed by the scientific establishment. I remember wanting to know more about Potawatomi culture as a young person, and my family saying, "We can't tell you. We don't know

it anymore." Our heritage had been taken away from us by the Carlisle Indian School. It was one of many such brainwashing institutions. I remember being outraged by this as a child. I wanted to know why, if they could build a school that taught us not to be Indian, we couldn't build a school that taught us to reclaim that heritage. Loss and anger can be powerful creative forces. My work with the Center for Native Peoples and the Environment comes from the outrage I felt as a girl. I want to create opportunities for that reclamation.

Tonino: This farm you live on is two hundred years old. It's a storied place, but they aren't your stories, because the Potawatomi homeland is the Upper Mississippi region.

Kimmerer: This entire region is Haudenosaunee territory. I'm always mindful of that. But this is also Maple Nation, and my people are from Maple Nation, too. Potawatomi peoples live to the west of here now, but historically we were neighbors with the Haudenosaunee.

Though long ago there was conflict between our peoples, today our cultures are bound by the fact that we are both caretakers of Maple Nation. That's where I find common ground. This was never my people's territory in the sense of political boundaries, but in a deeper sense it always was. My neighbors have made me feel welcome here, and I feel a responsibility to this place. That sense of responsibility is what makes a place a home.

Tonino: You've written that ecological insight is the "music of the spheres." How so?

Kimmerer: That's an old phrase for the principles and forces that make the universe work. Ecological insights and observations of nature are an appreciation of those physical laws to which we are all subject. Ecological laws are like perfectly composed music, and there's a beauty in harmonizing with them. The forces that make the clouds drift over our heads are the same forces that propel our breath. The water in our cells is the same as the water at the bottom of the ocean. No matter how you look at it, it's still two hydrogen atoms attached to an oxygen atom. I love the kinship that chemistry implies.

Tonino: A final question: Getting down on your knees to dig in the garden or inspect a plant through a hand lens, as you sometimes do, can resemble a posture of prayer. Are those types of activities spiritual for you?

Kimmerer: Yes. The act of looking, of paying attention, is akin to prayer for me. It can be transporting. I particularly love observing plants. I like climbing mountains and paddling rivers and chasing butterflies, too, but plants are my doorways to wonder. ■