

The term "i'n't it," as used in Navajo vernacular English, is a contraction of "isn't it" in the sense of "isn't that so?" or "isn't that correct?" One is likely to hear "you're going to town today, i'n't it?" or "they're crazy, i'n't it?" The pronunciation is almost exactly like "in it?" I am obliged to Chiyo and Pete DeCory, George Wasson, James Florendo, and Denny DeGross for keeping me supplied with examples of NDN humor on the Internet. Tim Giago's article on Native humor appeared in his syndicated column in *The Idaho Statesman*, 14 July 2001, p. 7.

James Welch's *Winter in the Blood* (New York: Harper & Row, 1974) is the first in a line of extremely penetrating fictional works about Native Americans caught in a meaningless, threatening, confusing white world.

From Barry Toelken
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 Cultural Patterns of Discovery

Just about everything the old-timers knew, it was given to them by the animals and the plants.

—Charlie Ashcraft, Seneca, responding to my question about how the Indians figured out how to make maple syrup

Roger, if a treasure is lost, it isn't gone. It's still there, where it has always been. . . . The knowledge isn't lost. We are. The truth never sleeps . . . but for a moment we don't know about it—just as it was when we had the willow but didn't know about the willow.

—Fool Bull, Lakota, refusing Roger Welsch's request to record the old man's medical knowledge before it died out and became lost.

Who taught you to ask questions like that: the missionaries?

—Yellowman, Navajo, responding to my asking how the Navajos found out that *chiilchim* (the bitter red berry of the desert sumac) could prevent colds

SOME YEARS AGO, when I taught at the University of Oregon, I was asked to join a group of colleagues who were visiting high schools to speak with seniors about coming to the university. Among other things, we suggested courses they might take in high school to prepare themselves for the university experience. Aaron Novick, director of the university's Institute of Molecular Biology and one of the country's foremost scientists, astounded everyone by telling the students that if they anticipated going into the sciences, they should take every literature and art class they could get. "For one thing," he said, "we already have enough overtrained and undereducated scientists." Beyond that, he pointed out, we now have calculators, computers, electron microscopes, and other tools to aid scientific observation and analysis.

Most important, though, we need people who can think. Literature requires you to deal with imagery, subtle characterizations, various

levels of meaning, ambiguous plots, even puns—all of which make you think and imagine beyond what you personally believe you know as fact. Art requires you to be creative, be aware of relationships, of patterns beyond yourself—maybe even create new ones. We will not be asking you to recite the periodic table of the elements; we will be asking you to think.

In the earlier chapters of this book, we have considered Native American literature, expressive arts, culturally structured dance, and the subtleties of humor. I've suggested that even though Native tribes are not all alike, their traditional expressions provide us with a thumbprint—if you will—of shared assumptions about relationships in the world, their view of normality. In this chapter, following Aaron Novick's lead, I want to go further and point out some ways in which these artistic and narrative patterns also illustrate distinctive Native ways of thinking and discovering.

Let's begin our speculation about Native discovery by looking carefully at the logic behind Fool Bull's comment to Roger Welsch at the head of the chapter. In that conversation, Fool Bull told Welsch, "If everyone were to forget for a moment that aspirin cures a headache, does that mean that aspirin no longer cures headache? No, it simply means that for a moment we don't *know* that aspirin cures headache. . . . The knowledge is still there to be found again. The truth never sleeps." In addition to the reciprocal logic we've noticed previously, I think the Native assumption behind this kind of statement is that the world around us abounds with information waiting to be found, experienced, and, by inference, passed on to others. If people happen to forget or misunderstand, well, the information is still there, waiting for someone else to discover it. This attitude describes an environment that is not opaque, stoic, or reluctant, one that does not require us to pry out its secrets by force and at great expense; rather, the environment is seen as an ongoing walk-in laboratory, a living library, a nurturing family.

Now, admittedly, this is a very easy image to romanticize: We can imbue it with personality, and suddenly we have the Earth Mother hovering over us, complete with beatific smile. While some Native cultures indeed envision a Mother Earth—or at least an Earth whose basic role is female (in spite of some scholars' assertions to the contrary), I think the main point is that humans have the responsibility to glean nature for its information and then apply it. Such an assumption is so obvious to most traditional Native Americans that if you appear not to know it, you are suspected of having been influenced by missionaries or schoolteachers—whose main function seems to be undermining traditional Native precepts

(hence, Yellowman's acerbic response). The world of information and nurturing surrounds us, and it's ready to share.

I'm not suggesting, of course, that Natives are automatic gurus of natural principles that are invisible to the rest of us. Nor, at the other extreme, do I think Native discoveries were fortuitously stumbled upon by someone accidentally chewing on willow twigs. Rather, I argue that there is a particular frame of mind, encouraged by attitudes like Fool Bull's and perpetuated in stories that continue to provide dramatic structures and patterns conducive to creative thought. Indeed, all cultures have a similar frame of mind, a shared worldview, or they would not have survived and flourished. If the natives of the Americas were actually as primitive as they have been made out to be (admittedly, the term "primitive" is seldom used by students of culture these days, but it's still on the loose in everyday chatter), how could they have developed rich cultures with such extensive arts, oral literatures, rituals, and metaphorical expressions as we have been discussing?

In this chapter, we'll look deeper at some of these culturally situated patterns to see how they function on the complex level of evaluative thought, following Norwood Russell Hanson's assertion that critical insight is not totally dependent on individual brilliance: "We are set to appreciate the visual aspects of things in certain ways. Elements in our experience do not cluster at random. . . . Seeing is not only the having of a visual experience; it is also the way in which the visual experience is had." The way we are "set," Hanson points out in his *Patterns of Discovery*, has to do with our assumptions, our own experiences, and our turn of mind, and although the author doesn't pursue the issue, I think we can argue that these assumptions include patterns provided by our culturally shared worldview. That worldview not only makes particular discoveries "thinkable" to begin with but often makes it difficult to appreciate, or even see, the discoveries of others whose way of thinking is distinctly different.

Thus, because the Indian tribes had no technology for weighing, measuring, and timing, our scientists have been skeptical of their discoveries until very recently. They had no real science, in our sense of that term: laboratories, the scientific method of objective analysis, double-blind testing, a writing system, a means of tracking replicable results over time. They must have inadvertently stumbled on ideas that they somehow managed to duplicate occasionally, however, even though they lacked schools, writing, and technology.

This attitude persists despite the fact that many foods now nourishing the world's population were developed by Native Americans and Native medicines are the source of many of our culture's pharmaceutical

"discoveries." Indians knew of vitamin C and its relation to scurvy well before the white arrival; in fact, we know about it mainly because Native people saved Jacques Cartier and his men from scurvy when they were icebound in the St. Lawrence River in 1533 by giving them a tea made from evergreen needles (probably northern white cedar, *Thuja occidentalis*, also known as *arbor vitae*—the tree of life). Later, back home in France, Cartier tried unsuccessfully to promote this tea (as a cure for syphilis), and we know that because he recorded it in his journals, and the idea was picked up more than two hundred years later by James Lind, a British naval surgeon seeking a cure for scurvy. His recommendation that ships carry citrus fruits and issue juice to long-haul sailors not only revolutionized British survivability at sea but also led to their long-standing nickname, Limeys. Ironically, it also facilitated major conquests, invasions, the Empire, and migration; led to the successful long voyages of Captains Cook, Bligh, and Vancouver; and resulted in major displacement and eradication of Native populations. In hindsight, perhaps a higher level of secrecy about Native medicines would have served the world better, but the Natives, in the typical style we'll see in this chapter, shared their information freely.

More recently, Frederick Banting, the discoverer of insulin, gave credit to Indians for their original pharmaceutical experimentation. The birth-control pill, antibiotics, digitalis, and the rubber syringe for enemas and injections all have their antecedents in Native medicine. Some two hundred Native drugs are still listed in the *Pharmacopoeia*, not to mention hundreds of others categorized as home or folk remedies.

Even though Euro-American scientists have been interested in Native plant use since the earliest contacts (they were hoping to find everything from the cure for syphilis to the remedy for old age), Western cultures in general have minimized Indian discovery because it does not conform to the familiar systematic generalizations of Western worldview. Home remedies and "snake-oil" medicines have been popular through the years, but seldom have everyday Americans availed themselves of the vast medicinal repertoire that surrounds them in the customs of their Indian neighbors. We seem to feel that discoveries have to be ferreted out of an unfriendly—or at least reticent and inarticulate—environment, and then—to become acceptable—they must be weighed, measured, and analyzed in distant, objective laboratories where professional scientists guard against wishful thinking and coincidence.

The Native American ways of seeing result in experiential data becoming generalized in entirely different ways. No doubt originating sometimes in coincidence, their discoveries have grown empirically from

experimentation within a consistent and widely shared body of experience and cultural worldview. This way of looking at the world encourages people not to view experience as coincidence but be alert to relationship and processes which are embodied in—and interpreted by—tales, myths, songs, dances, and beliefs, whose patterns, congruent with one another, stress integration, reciprocity, and cooperation among all members of a dynamic system. Humanity is not separate from nature in this mode; indeed, very little is removed from anything else. Rather, everything is assumed to belong together in balance. Knowledge about this integrated process is archived and continually dramatized in story, sacred customs, religious rituals, art forms, and dance, not simply recorded in objective explanatory, data-centered commentary.

If the world is a constellation of interdependent relatives, Native Americans assume that sickness, for example, must result from a failure of balance of processes, and thus, logically, somewhere among all the plant and animal relatives in nature must be some way of restoring balance and harmony (the Navajos call it *hózhó*). Armed with this assumption, Native people "experimented" with various plants, animals, and rituals until they discovered how to regain the necessary balance. Aided (or at least supported) by neighbors who probably felt the imbalance, too, and guided by stories and extensive botanical traditions, they enjoyed a culturally structured hunting license.

Once the balance point was found, it is unlikely that it would have been easily forgotten. There is ample evidence that in hundreds of instances, it was quickly invested with story and ritual and incorporated into the performance repertoire of the tribes. If a medicine did prove continually efficacious, why shouldn't the people have seen the results at firsthand (isn't this "empirical"?) evidence that their assumptions were valid and the world did operate as the stories indicated?

To be sure, in all Native societies gifted individuals have specialized in learning, discovering, and disseminating medicinal processes. Thus, even though everyone was attentive to the cues in nature more than most of us tend to be today, there were those who knew a lot more than the ordinary person, and these people were—and still are—sought out when extraordinary medical problems require a specialist. For convenience, these practitioners can be described as belonging to two large (and partly overlapping) categories: shamans and doctors. A shaman is usually understood to be the kind of practitioner, male or female, who has personal magical or spiritual power which can be focused on the dilemma at hand. The problem may relate to human health (including psychological), but since most shamans are found among hunting cultures and are thought to

have a strong influence on life-and-death processes, they often function as spiritual liaisons between the human world and that of the game animals. Many shamans claim to have gained their power by apprenticing themselves to a senior shaman who, among other things, killed them and brought them back to life. Others self-induce a traumatic moment (in a rigorous vision quest, for example) when an animal or other spiritual helper announces that it will aid them in healing if proper ceremonies are conducted. Shamans often use botanical and animal medicines, of course, but their intersection with their patients—both human and animal—seems to be primarily magical, spiritual, psychological.

Native doctors, on the other hand, spend years learning an extensive range of medicines, rituals, and diagnostic procedures in the belief that these factors, and not the personal force of the practitioner, bring about healing. For example, it is typical for a Navajo doctor to spend ten or more years learning the details of a particular healing system (each one called a way) which can be applied to a limited assortment of ailments. Red Antway, for example, concentrates primarily on stomach problems but can occasionally be used for upper-respiratory-tract ailments. In every tribe, the term for what I'm calling a "doctor" is different: in Hopi, it's *nuihikya*, "healer" (and the Hopi have specialists like the *oqatuihikya*, a bonesetter, and the *tipkyatuihika*, who deals with uterine ailments); in Lakota Sioux, it's *pejuta wicasa*, "medicine man" (as compared to *wasicim wakan*, literally "sacred white person," the white doctor); in Navajo, it's *hataalii*, a "singer"—one who knows the songs of the restorative ceremony or way. Almost all of these practitioners have been called medicine men by the whites.

The Native doctor is a person of accumulated learning and ritual competence, coupled with extraordinary memory (some Navajo curing ceremonies last fifteen days and nights, each day requiring a different complicated sand painting, specific medicinal applications, hundreds of ritual songs, and responsive interactions between singer and patient, all timed by star constellations that allow each night's ceremony to end before dawn). The cure cannot occur if the details of all these interactive steps are not performed correctly. The Native shaman is a person of striking psychological and spiritual force; the cure cannot happen if his or her power fails. In reality, both of these domains overlap because—as recently discovered by Western medicine—the psychological state of the patient is a key factor in any cure. In both kinds of medicine, one of the main goals is the restoration of balance and harmony between the patient and the total environment. In both kinds of practitioners, the exercise of too much personal power (especially to benefit the healer) is looked on with

suspicion and even fear. Yet there is still a distinction: In one kind of healing, the operative elements are chiefly known medicines and rigidly memorized rituals; in the other, they are psychological power and magic. In neither case do the names medicine man or shaman help us understand the rich complexity of knowledge and psychological know-how that connects Natives with the world around them.

As we have seen, the Native world is not distant and inarticulate; rather, it is inhabited by relatives whose activities are packed with meaning. Ongoing observation of animal and plant characteristics is not regarded as idle curiosity but paying attention to meaningful, articulate patterns where humans play an important role (just as in art, song, dance, and story). Moreover, animals and plants continue to articulate the truths of their existence whether we're watching or not. Or, to put it another way, they constitute a consistent baseline of natural relationships which we may consult anytime we need to know anything. It's for that reason that old Fool Bull ridiculed Roger Welsch's desire to document (and thus fossilize) his tribe's medicinal repertoire before it was "lost" with his death. In the Native view, there is no *it* which exists or dies out; there is a continuum of natural truths which are always there. Thus, as old man Fool Bull noted, even if everyone happened to forget a cure, the evidence is still living, waiting for someone else to notice and recall it to others.

But human inventiveness and cultural insight are also important: For example, many of the northern California tribes (and, indeed, tribes across the country) burned the forest's underbrush each year. For years, whites, including forestry specialists, considered the practice damaging to the ecosystem. Even Aldo Leopold, the early conservation pioneer, railed against the destructiveness of what he called "Piute Forestry," claiming that it "is the very negation of the fundamental principle of forestry, namely, to make forests productive not only of a vegetive cover to clothe and protect our mountains, but also of the greatest possible amount of lumber, forage, and other forest products." We now realize that by burning off forest undergrowth, Native people were able to reduce the fuel to support greater forest fires, encourage the growth of grass and small plants and thus the immigration of deer and small animals into areas close to tribal lands, increase the ash in the soil, and produce local moisture through combustion.

By providing better browse for animals in forest clearings, this system allowed protein to be acquired at a minimal expenditure of human calories: inviting animals toward human environment instead of chasing them across the hills meant burning fewer calories in pursuing others, thereby promoting caloric conservation. How it was reflected in expressive folk

traditions like song and story, we may never fully know; for these northern California tribes are among the groups that were hunted and destroyed wholesale by the white invaders before we were able to learn much about them (one Ishi is not enough of a basis for broad spiritual and cultural generalizations). But some of these people remain, and their beliefs today suggest that they actually saw the fires as a way of creating deer and causing the trees to produce more seeds.

In a modern sequel, the Bureau of Land Management and the Forest Service now burn off undergrowth in some areas to reduce the possibility of fires reaching high enough to set forest canopies ablaze. Government experiments have shown as well that lodgepole and ponderosa pines produce noticeably more cones and seeds after being challenged by controlled undergrowth burns. It is now common knowledge in forestry that some trees are "fire dependent" for full natural propagation.

Another example of a scientific process embedded in culture is the botanical development of corn. Maize (*zea mays* or *z. mays*) evolved with human help from an early hard-seeded grass into a pod corn where each seed was enclosed in its own chaff, allowing it to be dispersed by wind or passing animals. Early gatherers would have gotten their hands most easily on those few seeds that had not been dropped by the grass—in botanical terms, the less-successful seeds—and planting these would have encouraged a particular strain that did not cast its seeds so readily. The pod-corn gene was eventually lost, and the result was a cob of seeds wholly dependent on humans for survival, for corn cannot disperse its own seeds; for that reason, it has been called the "hopeless monster" by botanists. But maize hybridizes so easily that it is said to have more variations than any other crop species, and its development as a major food source must have been noticed by those responsible—especially because they had to plant it! Virtually every story and myth about corn attributes energy and fertility to it and describes the plant as a reciprocating relative who nurtures us in return for us nourishing it. Even the word "maize" seems to derive from the Arawak word *mahiz*, "life giver," which is not surprising when we think of the sudden burst of energy available to humans from this new plant.

In many tribes, the interdependence of corn and humans was characterized by the now-familiar terms of sacred balance, reciprocity. Recognizing this strong relationship, humans seem to have made their own gods by investing this botanical creation with sacred power. Yet godliness here, as with the Sioux and other tribes, is expressed fully only through a reciprocal process—not the one-way power of a superior being. Not only were there maize gods and goddesses but there was a delicate

concern for the safety and sacredness of the corn itself: said the Zunis, "Love and cherish your corn as you love and cherish your women." Knowing how central the creative power of women is in Pueblo society, one can glimpse the significance of this sacred equation.

In fact, in one passage in the Zuni emergence story, "The First Beginning," the newly arrived people, led by the Ahayuuta twins, ask "the Mexicans" what they are good for. One replies,

"When you come to the middle, it will be well to have my seeds. Because we do not [yet] live on the good seeds of the corn, but on wild grasses only. Mine are the seeds of the corn. . . ." He showed them an ear of yellow corn. "Now give me one of your people." Thus he said. They gave him a baby. When they gave him the baby it seems he did something to her. She became sick. After a short time she died. When she had died he said, "Now bury her." They dug a hole and buried her. After four days he said to the two [the Ahayuuta], "Come now. Go and see her. . . ." When they got there the little one was playing in the dirt.

It would be difficult to find a more succinct, dramatic rendering of the geographical origin of corn, its replacement of wild seeds as food, and its apparent death and rebirth through burial, described as the death and rebirth of a girl—the epitome of potential fertility and nurturing. Maize was developed in northern Mexico more than seven thousand years ago; in its development and later ritual functions, we see a botanical and ecological fact (obligatory reciprocity and concern in the survival of people and corn) phrased in cultural terms; yet, at the same time, they are terms based on systematized knowledge derived from empirical observations.

Evidence of Native deduction and discovery is never difficult to find. Many tribes, as revealed by the Fool Bull anecdote, chewed willow twigs to relieve the pain of headache or toothache; they had discovered a principle they could employ with highly consistent results. Today, we know that the salicin ($C_{13}H_{18}O_7$) in the bark of the willow is changed to salicylic acid ($C_7H_6O_3$) by the enzymes in human saliva. It's the salicylic acid, not the willow itself, that addresses the pain. Of course, Native people did not use these terms, but they discovered the process nonetheless, and they had to discover it by biting on the willow twig, noting the effects, and passing the word to others. Fool Bull's comment gives us part of the answer to such questions as, "Why did they even bother to experiment?" or "Where did they get the idea?" for we know they saw themselves surrounded by a living world of information, of "truth," to use Fool Bull's words. Beyond the

belief, widely held among Natives, that nature is ready to share such truths is the proviso that human seekers must be motivated by a genuine desire for healing, not hopes of personal aggrandizement. Tom Yellowtail, former leader of the Crow Sun Dance, believed that medicinal plants would reveal themselves to those who prayed appropriately but not those who wanted to gather them for commercial exploitation.

An articulate ecosystem obviously requires an attentive audience, but do we dare—at least for purposes of discussion—take the Natives at their word and consider the possibility that, in addition to their own sensitive deductive logic, they were also instructed by the animals? In Euro-American cultural terms, the idea seems untenable: Did they really get lectures from bears and ravens as described in children's literature? Unlikely. So then, what do they mean when they say they were taught by the animals?

I remember hearing in school that the Pilgrims learned how to make maple syrup and sugar from the Indians. They may have brought a small amount of honey with them, but they would have run out eventually, and honey bees had not yet made the voyage from Europe. So of course they must have learned eagerly from their Native neighbors (who, by the way, also kept them alive by teaching them almost everything about plants and planting in continuing instances of inexplicable generosity). But something always gnawed at my understanding of this cultural exchange, for, growing up in New England, I had also learned that making a gallon of maple syrup requires boiling down about forty gallons of sap. Easy enough (maybe) for the Pilgrims and their iron kettles, but how had the Indians done it, and how had they learned to do it? Making maple syrup, especially if you have to do it by putting hot rocks in little birch-bark baskets over and over again for ever so many days until you've boiled forty units of sap down to one unit of syrup—and still further if you want sugar—isn't the sort of thing you would logically think of: "I think I'll go gather and boil a bunch of maple sap for several weeks just to see if anything will happen to it. After all, it's spring, and nothing else is going on."

The point is that maple sap itself is usually tasteless (oddly enough, some people find it terribly bitter), so what would give anybody the idea to start boiling it, and keep boiling it, for a very long time? I think it was a combination of animal instruction and human comprehension, and the key to the puzzle came to me in a conversation with my friend Bernd Heinrich, who teaches biology at the University of Vermont. Heinrich makes it a point to pay attention to what's happening in nature and ask questions about what he sees. He was sitting on the back porch of his cabin in Maine one spring when he noticed a red squirrel running across

the lot; the squirrel dashed up the trunks of several maple trees, stopping only long enough to bite a small incision under a branch or two, then ran to the next tree. Was he after moisture, Heinrich wondered? He didn't stay long enough in any one place to lick the sap, and besides, there was plenty of moisture on the ground. So was he after sweetness? Typical of Heinrich, he went and licked some of the places where the squirrel had bitten. No taste. No answer to the puzzle.

A few days later, he saw a red squirrel—probably the same one, but who knows?—running up the same trees and licking at the small incisions. When he was gone, Heinrich immediately went out and did some licking himself. This time, it was sweet. Apparently, some of the water in the sap had had time to evaporate, leaving a slightly sweet taste—probably one that was more interesting to the squirrel than to a human, except for one factor: natives were aware of evaporation because they knew how to boil water and make soup in birch-bark baskets. How much of a leap would it take to reason that if water evaporating from maple sap over a few days made the sap sweeter, then by evaporating a lot of it at one time (as happened when you made soup, for example), you might get a denser, sweet-flavored fluid? Heinrich thinks Natives may well have learned about the principles of making maple syrup from the animals, just as they have always said. And I think he's right. But it was a joint venture: it took a brilliant deductive leap on someone's part to connect the animals' behavior to human experience with the results of evaporation.

In his best-selling (and controversial) book, *Of Wolves and Men*, Barry Lopez devotes a whole chapter to the proposition that, while we cannot talk to wolves directly, we may learn about their patterns of life by interviewing and observing people who have known wolves for thousands of years and in many ways continue to pattern their actions as hunters and family members on the behavior of wolves. Attitudes toward death, nature, family responsibility, travel, and relationships with other animals are all culturally interpreted "wolf values" among the Nunamiut and Naskapi (to name only a few of the Arctic people who consciously know and interact with wolves); they result from millennia of close observation and imitation of what Elaine Jahner calls "wilderness mentors." Many Plains tribes have legends and tales of wolves who discover lost humans (children or women, usually—that is to say, utterly defenseless) and guide them back to their villages, and regardless of how one evaluates them, the stories dramatize a set of relationships which can be inferred from empirical observation (including the widespread knowledge among Indians, now slowly spreading to skeptical white people, that wolves don't attack people, while they *do* lead nurturing family lives). But do they "talk" to us?

Barry Lopez comments, "The idea that animals can convey meaning, and thereby offer an attentive human being illumination, is a commonly held belief the world over," and adds, "The eloquence of animals is in their behavior, not their speech. . . . To 'hear' wild animals is not to leave the realm of the human; it's to expand that realm to include voices other than our own."

Obviously, for Native peoples, who already regarded the animals as relatives, this realm already included what Lopez terms the "voice of the indigenes." Calvin Martin, in *Keepers of the Game* (1978), argues that we will never fully understand Native involvement in the fur-trade era unless we pay serious attention to the Natives' belief that they spoke with animals. The Lummi of northwestern Washington, having watched the behavior of migrating salmon for generations, learned how to attract them to spawn in, and therefore return to, areas closer to their village. Today the Lummi tribe supports itself largely with aquaculture and an extensive shellfish-propagation program—paralleled since the 1970s by academic programs in biology offered by their community college. The Yupiks of Alaska are so convinced of the delicate communication between humans and fish that they avoid even speaking about a decline in fish population for fear of offending the fish. Similarly, they find catch-and-release sport fishing repulsive because it is insulting to the fish who have willingly offered themselves. Such examples (and one could quote hundreds more) suggest that Native peoples see the ecosystem not simply as biologically integrated but as a communicative constellation where all participants are articulate.

How eloquently animal behavior dramatizes indigenous truths can be seen in a Navajo belief relating rain to burrowing animals. Government agents were forced to learn about it during the 1950s when they proposed getting rid of prairie dogs on some parts of the reservation to protect the roots of the sparse desert grass and thereby maintain at least marginal grazing for sheep. Navajos objected strongly, insisting, "If you kill off the prairie dogs, there will be no one to cry for rain." Of course, they were assured by the amused government men that there was no conceivable connection between rain and prairie dogs, a fact that could be proven easily by a simple scientific experiment: a specific area would be set aside, and all burrowing animals would be exterminated. The experiment was carried out, over the continuing objections of the Navajos, and its outcome was surprising only to the white scientists. A few years later, the area (not far from Chilchinbito, Arizona) had become a virtual wasteland with very little grass. Apparently, without the ground-turning activity of the prairie dogs, the sand in the area became solidly packed, causing massive runoff whenever it rained, and the already-sparse vegetation has since been

carried off by the annual flooding waters. No doubt it would be incautious to suggest that the Navajos had a clear, conscious, objective theory about water absorption and retention in packed sand. On the other hand, it would certainly be difficult to ignore the fact that the Navajo myth system, which includes a long Coyote story about prairie dogs' connection with rain, anticipated more accurately than our science the results of an imbalance between principal communicants in the rain process.

Just as animals and plants "instruct" people, so do still larger phenomena of nature—especially the weather, the sun and moon, the night sky. Native stories and customs make it clear that people are not only surrounded by living relatives close by but enjoy reciprocal relations with the visible universe. A Kiowa story told by N. Scott Momaday relates that seven sisters being chased by their angry brother were taken up into the sky by a helpful tree trunk. They became the stars of the Big Dipper, and the brother became a bear. Ever since, Momaday says, the Kiowas have known they have relatives in the night sky. What's the point of having relatives in the sky? Well, for one thing, relatives help you and guide you. Certainly for these early navigators on the Great Plains, a standard reference to the North Star must have been important. And, although Momaday doesn't mention it, the Kiowas must also know they have relatives on the earth around them in the form of the bear, an animal Momaday himself has a unique relationship with.

Native stories abound about hero twins visiting the sun, or a warrior getting revenge against the sky people, or people being carried into the night sky to become stars, sun, and moon, all of them dramatizing certain assumptions about ongoing relationships between people and the forces which surround them. Most of them can be taken as metaphorical (unless one wants to believe it is possible to visit the sun by floating up there on an eagle feather, or for humans to become stars), but even so they testify to the unlimited imaginations of the storytellers, who invented space travel before it was technically possible. A Navajo story relates that an incestuous family was put inside a gigantic arrow and shot to the moon. In a Coos story that clearly comes from the prejet era, Old Man Coyote's violent farting propels him up off the trail so high that he bumps his head on a tree limb (a comical enactment of the principle behind Newton's second law). So we are not surprised to encounter imaginative stories about immense journeys, strange animals and spirits, stunning transformations, and miraculous returns from the land of the dead. But, that said, we also now and then come across a detail that goes beyond imagination and drama and presents the possibility that some narratives are actual accounts of intentional or accidental journeys of discovery.

For example, the Kiowas, according to N. Scott Momaday, have a story about a group of young men who decide to see where the sun spends the winter. They saddle their horses (which means that the journey must have happened within the past five hundred years) and ride south into country they've never seen before. While camped in a forest, however, they notice that "men were all about in the trees, moving silently from limb to limb. . . . they were small and had tails!" This is too much for the Kiowas, and they head for home. How far south did they have to travel to encounter monkeys? Well, to about twenty-one degrees south, somewhere around Vera Cruz. And if the Kiowas didn't actually make this trip, why (and how) could they have invented the idea of monkeys? A common motif in stories of this kind is that the travelers see—and must cope with—some feature of life quite unfamiliar to them, and this feature is then incorporated into the traditional stories, as well as speculations about the nature of the world. Already in 1823, an Iroquois (Tuscarora) writer David Cusick had suggested that monkeys were predecessors to human beings.

In a Tillamook story, the people of a coastal village see what they think is a large whale floating in the bay with birds sitting on it. When they go out in their canoe to investigate, it turns out to be a huge boat full of people from the other side of the ocean. The villagers retreat toward shore, followed by the bigger boat, and some of them are captured and taken across the ocean. The Tillamooks follow in an attempt to rescue their brothers:

They fitted out their largest canoe and started out the next morning. At nightfall they stopped far out at sea. The mountains of their home had disappeared from their view. . . . Thus they traveled for many days, steering towards the sunset. Finally they saw the land at the other side of the ocean. They found a kind of wood which they did not know. It looked like reed, but was as tall as a tree.

They have arrived in a land where bamboo grows. The story goes on, describing subsequent trips across the ocean and eventual marriages between the two peoples. Is this—among other things—a record of travel to the Orient, or did the Tillamook people simply dream up the idea of a hollow plant as tall as a tree? If it were the only example of such an imaginative act, we might remain skeptical. But it isn't.

In the Tlingit tale of "Kaax'achgoók," a leader and his friends are out hunting and fishing in their boat and are caught in a storm that lasts several days. They find themselves cast up on an island covered with bamboo, far from home—so far, in fact, that it takes their leader a year to

figure out where they are by referring to the star constellations they know. There is no water on the island, but the broken stumps of the bamboo are full of rainwater, so they survive. Kaax'achgoók studies the stars every night until he falls asleep and finally determines a course for their return. "We'll start out while the handle of the big dipper is still visible," he says. Are they so far south down the coast of Asia? How far do you have to go to find bamboo big enough to hold water? In any case, using bamboo poles and seal stomachs for sea anchors to keep them from drifting off course at night, they eventually reach Tlingit country and are reunited with their families. After noting that bamboo does not grow in Alaska, Nora and Richard Dauenhauer suggest that "the implication is that the men crossed the Pacific to Hawaii or possibly the Kuril Islands. The voyage of Kaax'achgoók belongs in the annals of small craft navigation such as Captain William Bligh's saving his crew after the mutiny on the *Bounty*, the voyages of the Vikings, the wanderings of Odysseus, and the traditional chants of Polynesian navigation."

Such lengthy voyages require a complex combination of know-how, navigation techniques, boat-building skills, and guts. Just think of the boats: Northwest coastal tribes built gigantic dugouts which could withstand the pounding of the sea far from shore and which they used to successfully pursue and kill the world's largest mammal before European boats could even cross the Atlantic. Eskimo kayaks and umiaks, made of driftwood, bones, and seal or walrus hides, could carry anywhere from one to twelve persons out to sea to hunt seal, whale, and walrus (an aeronautical engineer told me that the umiak's structure sustains the pressure of the water with more struts than are in a modern jetliner's wing; efficient, maneuverable, flexible, and resilient, the boat is an engineering marvel). The Aleut *baidarka* was similarly capable of carrying large groups of people on long sea journeys. The efficiency of the kayak design is verified by its widespread use today in sports—pretty much unchanged except the materials from which it is made. Eastern Native boats—like the birch-bark canoe—provide other stunning examples of human inventiveness: lightweight, waterworthy, and maneuverable, the birch-bark canoe was also incredibly thin and vulnerable. How did people travel long distances, carrying considerable loads, without sticking their feet through the bottom? Such works of art and engineering—in addition to the agility required to ride in such a boat without ruining it—can be created consistently only by people who have a clear, ongoing conception of what they're doing.

And think of the navigation. Though we don't know much about its principles, we know from innumerable stories that star lore played a large role in it, and this means that people had noticed the consistency of

heavenly movements and learned how to orient themselves to the patterns in the sky. Ethnoastronomy—as this field of study is known today—shows that virtually all tribes had an extensive knowledge of the night sky and patterned much of their lives by the regular movements they saw there. In addition to navigation (a body of knowledge used not only by seafarers but all wanderers and migrators), tribes like the Hopi begin and end most Kachina Dances by the appearance of certain constellations in the entryway of a kiva; Navajo all-night healing rituals (“sings”) end “just before dawn,” a moment computed by the singer, who checks the stars periodically all night during the ceremony; the Pawnee patterned their councils after the “star that does not move” (Polaris), surrounded by nearby stars. Most tribes keep track of the solstices and equinoxes and orient their various seasonal activities and rituals to them. The Navajo hogan is conceived as a model of the sky, and the Maya used constellations as guides to architectural planning. The Mesoamericans paid so much attention to the rhythms in the sky that they were able to construct complex calendars—some of them more accurate than European models.

Native exploration and discovery did not cease with the invasion of the Europeans, either. Adapting themselves to the newly arrived horse, several small woodland tribes (like the various Sioux groups, the Kiowas, and others) rode out into the Great Plains and evolved entirely new cultures which changed the nature of inland North America forever. A number of eastern coastal people accompanied early European explorers back to the courts of France, England, and Spain, some, to be sure, as captives, but others as willing travelers. In 1498, for example, Sebastian Cabot brought several Indians to England, at least two of whom were reported two years later dressed like Englishmen and doing well. During the 1530s, Jacques Cartier either invited on board or kidnaped the two men who had taught him the cure for scurvy and took them to France to exhibit at court. When he brought them back on his second voyage, these two (Domagaya and Taïnoagny) guided him up the St. Lawrence. Jean Ribaut's 1562 expedition was ordered by the queen of France to bring back some Natives. In 1687, some Iroquois leaders, who had been invited to Montreal to confer with the governor of Canada, were captured and sent to France to serve in the galleys.

Probably the best-known mass abduction took place in 1614, when at least thirty Natives were taken by Captains Frobisher, Weymouth, and Harlow, who tried to sell them in Spain as slaves. But some local friars heard of the pending transaction and put an end to it, turning the captives loose and harboring some of them until they could find ways to

return home. One of these, Tisquantum, had already been to England with Captain Weymouth in 1605 and had lived there with Sir Ferdinando Georges, learning English language and customs before sailing back to North America in 1614 to help sea captains with mapping and interpreting. Now, captured and rudely hauled off again to Europe, he stayed with the liberating friars in Spain from 1614 until 1618, when he was able to sail to Newfoundland. There he was recognized by one of Georges's captains and taken back to England, but soon headed back to North America with another expedition, landing near his home near present-day Plymouth in 1619 to discover that his whole tribe had been wiped out by an epidemic. Taking refuge with the Wampanoags, he had barely settled in before the Pilgrims arrived and gladly took advantage of his ability to speak English (a friend of his, Samoset, who also spoke English, had—in a way—introduced them).

Tisquantum, or Squanto, as the Pilgrims and most of us ever since have called him, is a favorite character in our account of the Pilgrims' survival in the New World, and he is known to virtually every schoolchild in the United States. But I don't recall Squanto ever being described as an intellectually gifted, multilingual, brave world traveler and diplomat, just as I don't remember hearing that Pocohantas, the legendary savior of Captain John Smith, married a man named John Rolfe and moved to England, where she lived out her life as an Englishwoman until she died of smallpox. And whatever happened to all those other travelers—both voluntary and kidnaped—who went to Europe in those early days? How many got home and played some intermediary role during the European invasion that soon followed? How many became ancestors of today's Europeans? Our knowledge of these discoverers is slim indeed.

Clearly, one of the most stunning examples of Native exploration is the comparatively recent story of Ranald MacDonald, a man virtually unrecognized in his native United States but renowned in Japan (and among historians) as the first American to enter Japan after it had been closed to outsiders for 264 years by the leaders of the Tokugawa era (1603–1867). MacDonald was a Chinook Indian from the Pacific Northwest coast who had grown up hearing stories about castaway Japanese fishermen being adopted and enslaved by his ancestors and noticed there were Japanese loan words in his Native language (one example: *hy-yak*, from Japanese *haiyaku*, which means “to hurry”). Fascinated by the possibilities of relatives in Japan and apparently convinced that his own Asian features and small collection of loan words would overcome the Japanese threat to execute all foreigners who set foot there, MacDonald contrived to make the journey.

In the fall of 1847, after having worked on sailing ships bound for London and the Far East, MacDonald signed aboard the U.S. whaler *Plymouth* under the command of Captain Lawrence B. Edwards and sailed out of Kalakakna Bay, Hawaii, having made a deal with the captain that if they came close enough to Japan, he would forego his pay (usually a share of the whaling profits) in return for a small boat and a few provisions. They did reach the vicinity of Japan, and the captain, wary of Japanese defensiveness, quickly lowered MacDonald over the side in his boat and made a hasty retreat. MacDonald landed—actually, shipwrecked himself—on Rishiri Island in Hokkaido on July 2, 1848, and was immediately arrested by coastal guards. Instead of dispatching him on the spot, however (apparently impressed by his Asian looks and his insistence on repeating those Japanese words), they contacted authorities, who, in turn, sent him to the capital at Edo (Tokyo). There he was held under house arrest while two and sometimes three leading scholars interrogated him and tried to figure out just who he was. In the process, he taught them a good deal of English.

In 1853, when Commodore Matthew C. Perry steamed into Edo harbor with a letter from President Franklin Pierce to the emperor demanding that Japan be opened, curiously enough three Japanese scholars were able to serve as interpreters—all of them trained by Ranald MacDonald, a Chinook Indian from Astoria, Oregon. But MacDonald was far away by that time; he had managed to obtain permission to leave Japan and was prospecting for gold in Australia. Born in 1824, he died at Fort Colville, Washington, on August 24, 1894; his grave can still be seen along the highway on the Colville Indian Reservation, but his intellectual and exploratory triumphs remain unknown to most of his countrymen.

For Natives, having relatives across the ocean would have seemed no odder than having them in the night sky. Native people knew the earth was round (Black Elk pointed out that everything in nature was round), and they believed all its inhabitants were related in one way or another. Perhaps they sensed that if they went and looked, they'd find someone. Perhaps that explains why others from across the ocean came looking for them. There are legends among the Tlingits of relatives who sailed off in boats with people who came from the South Seas, for example. At a recent meeting of Native elders in Alaska, I met Lela Oman, an eighty-five-year-old Yupik elder from Nome, who told me an incredible travel story. According to her family's tradition, her great-great-grandfather—named Kaiana—fought on the losing side of an uprising against King Kamehameha in Hawaii. Afraid of being banished or executed (he was a close relative of the king), he and some friends "just got in their boat and sailed north," landing somewhere on the coast of British Columbia about

1840. One wonders why the escapees headed north, away from warm weather. In any case, they later decided to go even farther north (apparently through the Aleutian chain) and eventually landed near Nome. They took Yupik wives, settled in the Kobuk Valley area, adopted the local hunting and subsistence lifestyle, and raised their families—whose descendants still inhabit the area. In recent years, Lela told me, she and some family members visited Hawaii so they could check out the family names and various Hawaiian phrases that had been passed down in oral tradition. They were welcomed as long-lost, royal relatives. "So. Now then," she said to me, lips pursed in a coquettish smile, "you knew I was a Yupik elder, but I bet you didn't know I was a Hawaiian princess!"

The Coquelles on the southwestern coast of Oregon tell of relatives who visited Japan during military service after World War II and found Milluk-speaking people there, corroborating an old story about a whole Coquelle village that disappeared long ago. When they couldn't pay a debt to a neighboring village, incurred when the neighbors helped them catch and kill a miscreant, they began to fear their own demise. According to the old story, the whole village built a big canoe, and—in the words of Coquelle elder George B. Wasson—"they just climbed in it and traveled across the ocean to Japan." Presumably, someone must have come back eventually, or no one would know if they survived or where they went, but the story—still told by people who find sea voyages unsurprising—does not say.

Clearly, in any case, ocean voyages—with all their demands of navigation and grit—were not the exclusive invention of Europeans. Moreover, since virtually all Northwest coast cultures have stories of prodigious sea journeys, it would not be a stretch of the imagination to add boat travel to the possible ways Natives moved into North America. This approach would alleviate the restrictive dates when the Bering Strait land bridge was open for travel (a thorny dilemma because glottochronology—the rates at which languages change—and the evidence for far earlier settlements along the coast of North and South America have never matched the Beringian "tourist seasons"). And it would also help explain why Native Americans keep insisting that they were already "here" and thus did not need to migrate from somewhere else. Look down at a globe from the North Pole toward the coast of western America: it's the clearest line in world geography, running along the coast, along the Aleutian Islands, along northern Asia, and on to the lands of bamboo. People traveling along this coast by boat would only need to keep their land on their right on the way to Asia, and on their left on the way back. People living along the coast—where, by the way, they would have been

surrounded by food supplies—would have been pushed one way or another by the outward movements of the ice packs and might have gone one way or another by boat as well. Apparently, the polar region has been inhabited for an exceptionally long time, with every retreating glacier exposing even more evidence. Ancient tenure along this coast, and ancient movements in both directions (chasing food, being chased by ice), could certainly have formed the traditional concept that “we have always been here.” Of course, such puzzles will not be resolved by speculative books, but—as we’ve already seen—we always gain perspective by taking the Native voice seriously.

I think it is clear that Natives and non-Natives alike have benefitted immensely from this cultural accumulation of Native discovery, speculation, and invention; and the process is not over yet. Just to mention a few Navajo examples, take Fred Begay (once the subject of a documentary called *The Long Walk of Fred Young*), a physicist at Los Alamos doing research on the bombardment of heavy water with laser beams. By utilizing the vocabulary from the Navajo story of the Twin Brothers (one of whom receives from the Sun a spear of jagged lightning to combat monsters, the other a beam of pure, straight light to cure diseases), Begay finds that he can describe the motion of light beams more articulately than he can with English verbs, which are—to the Navajos—far less capable of detailing fine movements. Naturally, discussing his work with his colleagues must be difficult, but the point remains: by using the perspectives inherent in a Native language, one can see and discuss issues that are not totally understandable in English. Take the modern field of ethnomathematics, where researchers have found surprising resources in most Native languages; in particular, anthropologist Rik Pinxten suggests that the Navajo language presents the ideal base to study space navigation and topology (the mathematical study of geometric forms in motion).

And take the case of Tacheeni Scott, now a professor of biology at California State University at Northridge. When he was a graduate student at the University of Oregon, he phoned me late one evening to say he was frustrated by the way his laboratory work was going. “I just want to spit on my slides,” he said, which I took to mean he was ready to dump his project. But no: he thought he had detected two totally different kinds of movement by one microscopic specimen and suspected spitting on the slide would prove it. I asked how that would help, and he replied—as if answering an obvious question from a child:

“You know, it’s like when we butcher a young goat or sheep; all those little pieces of meat on the front legs are hard to get loose without cutting them, but if you spit on your hand and pat the legs, that thin membrane

comes loose, and you can pull all those little pieces right off the leg. I have a hunch that if I spit on my slides, the cell wall will be at least partly digested, and these two different animals will float out separately where I can photograph them.”

“Go ahead, then,” I said, “why not?”

“Well, how can I explain that in scientific terms? My committee will kill me. ‘I applied some spit to the specimen, and I discovered x, y, or z?’”

“Why don’t you go ahead and try it,” I said, “and if it works, then test your saliva to see what enzymes may be there. Then you write, ‘I applied x amount of x enzyme, and the result was whatever.’”

It worked, and he was able to determine that the specimen—a kind of algae, as I recall, that had never been properly categorized—actually featured two different entities sharing one cell wall. But these small animals moved so differently that he had to use two totally different verbs in Navajo to describe them, and there was no way to translate the variation into English. His committee was baffled because they couldn’t understand the nature of his discovery. One result was that I, a professor of English, was added to his biology doctoral committee so we could negotiate the nature of the discovery, and we eventually worked out a way of describing it so others could understand.

Today Tacheeni Scott and Fred Begay, in addition to their own ongoing research, regularly visit schools on the Navajo Reservation to persuade students to hold onto their language and think about going into the fields of science. Begay and Scott, addressing an assembly of Navajo students a few years ago at Red Mesa High School in Arizona, said, “Your language and your culture are resources. Don’t let anyone tell you they are burdens. They are the basis for the way you look at the world and discover things. Listen to your elders and the stories: they are your treasures. You will be able to see things that others haven’t noticed. You already know things that others haven’t thought about. Don’t lose this!” I am sure that molecular biologist Aaron Novick would agree.

Notes

Roger Welsch’s discussion with Fool Bull can be found in *It’s Not the End of the Earth, but You Can See It from Here: Tales of the Great Plains* (New York: Villard Books, 1990), 50–51. Welsch has played a significant role in my understanding of this topic.

Sam D. Gill’s passionate argument that the Mother Earth concept is of recent (and largely non-Native) vintage is set forth in his *Mother Earth: An American*

Story (Chicago: University of Chicago Press, 1987). I have heard too many traditional Native references to the female earth and the male sky to find Gill's position convincing, however.

Norwood Russell Hanson's *Patterns of Discovery: An Inquiry into the Conceptual Foundations of Science* (Cambridge: Cambridge University Press, 1958) demonstrates the extent to which even our most scientific observations are channeled and defined by the way we are set. The quoted passage is on page 15, but the whole chapter, titled "Observation," is well worth reading as we try to understand that cultural worldviews are not simply differences of opinion or interpretation but represent a different mode of thinking and seeing.

See Virgil J. Vogel's *American Indian Medicine* (Norman: University of Oklahoma Press, 1970) for an extensive description of the many medicines and procedures developed by Native Americans. Robert and Michele Root-Bernstein's *Honey, Mud, Maggots, and Other Medical Marvels: The Science behind Folk Remedies and Old Wives' Tales* (Boston: Houghton Mifflin, 1997), despite its condescending title, provides a number of modern explanations of the way folk and tribal medicines work; many of their examples are from Native American medical practice. On the subject of Jacques Cartier and vitamin C, I am much indebted to Calvin Martin for sharing with me his year-long research at the Johns Hopkins Institute for the History of Medicine. His many books, especially *In the Spirit of the Earth: Rethinking History and Time* (Baltimore: Johns Hopkins University Press, 1992) and *The Way of the Human Being* (New Haven: Yale University Press, 1999) are exceptionally rich conceptualizations of Native thought and practice.

An interesting sidebar on Richard Evans Schultes, "the father of ethnobotany," appears in *Natural History*, February 2002, 22, along with a longer piece, "Flowers of Evil," by Rob Nicholson (pp. 20–24), detailing present research into psychoactive plants in South America. Nicholson describes the fleshy flowers of *Brugmansia sanguinea* and comments, "One feels compelled to fondle the flowers and inhale the complex perfume that wafts from the long trumpets. No wonder some native trailblazer was drawn to sample the taste of the plant; what an interesting meal that must have made" (20). The modern field of ethnobotany is well described and illustrated in Michael J. Balick and Paul Aslan Cox, *Plants, People, and Culture: The Science of Ethnobotany* (New York: Scientific American Library, 1997).

One of the standard comparative studies on shamanism is Mircea Eliade's learned *Shamanism: Archaic Techniques of Ecstasy*, translated by Willard R. Trask (New York: Pantheon Books, 1964), but modern books on the subject, especially by New Age seekers, are produced by the hundreds, spawning, among other things, a thriving tourist business for those who wish to visit practicing shamans. Anthropologist Bonnie Glass-Coffin has written brilliantly about the phenomenon in "Anthropology, Shamanism, and the 'New Age,'" in *The Chronicle of Higher Education*, 15 June 1994, p. A-48. Native commentary on white "wanna-

be shamans" is predictably (and justifiably) negative. Among others, see Ward Churchill's *Indians Are Us? Culture and Genocide in Native North America* (Monroe, Maine: Common Courage Press, 1994) and Wendy Rose's "The Great Pretenders: Further Reflections on Whiteman Shamanism" in M. Annette Jaimes's *The State of Native America: Genocide, Colonization, and Resistance* (Boston: South End Press, 1992), 403–21. Anthropological opinion is equally negative: see Alice B. Kehoe's "Primal Gaia: Primitivists and Plastic Medicine Men" in James A. Clifton, *The Invented Indian: Cultural Fictions and Government Policies* (New Brunswick, N.J.: Transaction Publishers, 1990), 193–209.

The ritual and rationale for the Navajo Red Antway ceremony is described (with photos—many of them covering items which must not be photographed) in Leland C. Wyman, *The Red Antway of the Navaho* (Santa Fe: Museum of Navajo Ceremonial Art, 1965). The Blessingway, considered the main stem of Navajo ceremonial practice, is given in three different versions with substantial elucidation by Wyman in *Blessingway* (Tucson: University of Arizona Press, 1970). The tribal doctor's extensive learning of ritual detail, the memorization of thousands of chants and their complicated sequences, the retention of lengthy mythic and historical narratives that inform the ceremonies, and the deep acquaintance with particular plants and minerals used for healing are all quite different from the traumatic events that usher the shaman into an active healer's life: One hears accounts of everything from a dream animal appearing during a vision quest to the young trainee being starved for a month in a snow hut or suspended under Arctic water and ice for forty days or even being killed and sent to live with the walruses for a year before returning to life in the human community. Among others, see Knud Rasmussen, *Across Arctic America* (New York: G. P. Putnam's, 1927), 82–84; and stories like "Sigvana" and "The Boy Who Went to Live with the Seals," both in Brian Swann, ed., *Coming to Light: Contemporary Translations of the Native American Literatures of North America* (New York: Vintage, 1996), 8–10, 57–74.

Aldo Leopold's opinions are succinctly expressed in his essay, "'Piute Forestry' vs. Forest Fire Prevention" (1920), in Susan L. Flader and J. Baird Callicott, eds., *The River of the Mother of God and other Essays by Aldo Leopold* (Madison: University of Wisconsin Press, 1991), 68–70. I am indebted to my colleague, Professor James J. Kennedy of Utah State University's College of Natural Resources, for calling this essay to my attention, as well as bringing me up to date on current forestry practice with regard to fires.

Ishi, the last of the Yahi tribe, lived out his last days working as a janitor at the Lowie Museum at the University of California, Berkeley, and died in 1916. His life is chronicled by Theodora Kroeber in *Ishi, Last of His Tribe* (Berkeley: Parnassus Press, 1964).

The past and present existence of corn is described in layman's terms by Betty Fussell, *The Story of Corn* (New York: Knopf, 1992); see especially pp. 15, 20. A

more succinct botanical account is given in Jacquetta Hawkes and Sir Leonard Wooley, *Prehistory and the Beginnings of Civilization* (New York: Harper & Row, 1963), 274–77. Botanists do not agree about the details of this development, but in any case, it seems clear that the relatively sudden appearance of maize in the food supply must have had a tremendous impact on Native nutrition.

The account of the Zuni emergence story, “Talk Concerning the First Beginning,” is taken from Ruth Bunzel, “Zuni Origin Myths,” in *Forty-seventh Annual Report of the Bureau of American Ethnology* (Washington, D.C.: GPO, 1929), 584–602; reprinted in Karl Kroeber, ed., *Traditional Literatures of the American Indian: Texts and Interpretations*, 2d ed. (Lincoln: University of Nebraska Press, 1997), 81–87; the quoted passage is on page 84.

Tom Yellowtail’s account of traveling to a remote canyon with Sun Dance leader John Trehero and stopping to pray so the medicines would reveal themselves appears in Michael Oren Fitzgerald, *Yellowtail: Crow Medicine Man and Sun Dance Chief* (Norman: University of Oklahoma Press, 1991), 46–47 (all of chapter 6, “Hunting Stories,” 37–49, is full of examples where animals and plants respond to human gestures).

Bernd Heinrich provides a compelling report on the squirrel “tapping” maple-sugar trees in “Nutcracker Sweets,” *Natural History*, February 1991, 4–8. For Barry Lopez’s comments on wolves and arctic cultures, see *Of Wolves and Men* (New York: Scribners, 1978). Elaine Jahner’s examples of animals helping humans are given in “Wilderness Mentors,” in Brian Swann, ed., *Coming to Light: Contemporary Translations of the Native American Literatures of North America*, 423–31.

Barry Lopez’s comments on the eloquence of animals appear in his essay, “The Language of Animals,” in Polly Stewart, Steve Siporin, C. W. Sullivan III, and Suzi Jones, eds., *Worldviews and the American West: The Life of the Place Itself* (Logan: Utah State University Press, 2000), 10, 11, 12, 14, 15. Calvin Martin’s *Keepers of the Game: Indian-Animal Relationships and the Fur Trade* (Berkeley: University of California Press, 1978) is a fine exposition of the many interactive, reciprocal models in Native thought relating them to their food supply and ecosystem. Anthropologists Phyllis Morrow and Chase Hensel have generously shared their insights into the cultural world of the Yupiks with me; I am indebted to them for examples throughout this book, especially on the articulated relationship between humans and animals.

The experimental killing of prairie dogs near Chilchinbito was recounted to me by Ray Hunt, longtime trader to the Navajos, who, because he was operating the Chilchinbito Trading Post at that time, did the translating between the government soil specialists and the Navajos.

N. Scott Momaday’s story of the seven sisters who became stars can be found in the introduction to his *The Way to Rainy Mountain* (Albuquerque: University of

New Mexico Press, 1969). His story of the young men’s exploration into Mexico is retold in part 18 of the same book (page numbers vary in different editions). Early Tuscarora writer David Cusick’s musings on the relationship between monkeys and humans is mentioned in Gordon Brotherston, *The Book of the Fourth World* (Cambridge: Cambridge University Press, 1992), 293.

The Tillamook account is taken from Franz Boas, “Traditions of the Tillamook Indians,” *Journal of American Folklore* 11 (Jan.–March 1898): 23–28, 137–50; a rephrased version is provided by Jarold Ramsey, ed., in *Coyote Was Going There: Indian Literature of the Oregon Country* (Seattle: University of Washington Press, 1977), 167–70. The fascinating Tlingit tale of traveling to Asia is called “Kaax’achgoók” and was told by Andrew P. Johnson. See Nora Marks Dauenhauer and Richard Dauenhauer, eds., *Haa Shuká, Our Ancestors: Tlingit Oral Narratives* (Seattle: University of Washington Press, 1987), 82–107.

For more on Native navigation and attitudes about the heavens, see Anthony F. Aveni, ed., *Native American Astronomy* (Austin: University of Texas Press, 1977) and Ray A. Williamson and Claire Farrer, eds., *Earth and Sky: Visions of the Cosmos in Native American Folklore* (Albuquerque: University of New Mexico Press, 1992).

A basic book on enslavement of Indians is Almon Wheeler Lauber, *Indian Slavery in Colonial Times within the Present Limits of the United States* (1913; reprint, New York: AMS Press, 1969); it gives detailed accounts of the many voyages, mostly unwilling, of Native people to Europe, among them the well-traveled Squanto. A succinct and well-researched account of Tisquantum (Squanto) can be found on the Internet at <http://members.aol.com/calebj/squanto.html>.

Accounts of Japanese crossing the Pacific are discussed by Katherine Plummer in *The Shogun’s Reluctant Ambassadors: Sea Drifters in the North Pacific*. The remarkable adventures of Ranald MacDonald are recounted in *Ranald MacDonald: The Narrative of his Life, 1824–1894*, edited by William S. Lewis and Naojiro Murakami (Portland: Oregon Historical Society, 1990), and in Jo Ann Roe’s *Ranald MacDonald: Pacific Rim Adventurer* (Pullman: Washington State University Press, 1997).

For the past fifty or sixty years, the archeological cliché for the peopling of North America was that a channel of land was open for foot traffic across the Bering Strait about twelve thousand years ago, and therefore, the migrations into the New World could not have occurred before that time. However, recent discoveries in South America (e.g., Monte Verde in Chile) of active settlements far to the south even before the standard date for the Bering Strait land bridge suggest that other means of migration—boats, for example—must be considered. (See *National Geographic* 192, no. 4 [October 1997]: 92–99.)

For more on the Native conception of science, mathematics, and space, see Michael P. Closs, ed., *Native American Mathematics* (Austin: University of Texas

Press, 1986); James F. Hamill, *Ethno-Logic: The Anthropology of Human Reasoning* (Urbana: University of Illinois Press, 1990); Rik Pinxten, Ingrid van Dooren, and Frank Harvey, eds., *The Anthropology of Space* (Philadelphia: University of Pennsylvania Press, 1983); and Marcia Ascher, *Ethnomathematics: A Multicultural View of Mathematical Ideas* (Pacific Grove, Calif.: Brooks/Cole Publ. Co., 1991). Jim Barta, a colleague of mine in Utah State's College of Education, has been developing approaches for teaching mathematics to Native children by using the precepts already present in tribal cultures; see his "Native American Beadwork and Mathematics" in *Winds of Change* (Spring 1999): 36–41.

Black Elk told John G. Neihardt that "everything the Power of the World does is done in a circle. The sky is round, and I have heard that the earth is round like a ball, and so are all the stars. . . . Birds make their nests in circles. . . . The sun comes forth and goes down again in a circle. The moon does the same, and both are round" (John G. Neihardt, ed., *Black Elk Speaks: Being the Life Story of a Holy Man of the Oglala Sioux* [1932; reprint, Lincoln: University of Nebraska Press, 1961], 198–99). Such an assumption, prevalent among the Native peoples of North America, helps explain the relative ease with which they understand topology and space navigation more readily than lineal algebra, as current research suggests.

My acquaintance with Tacheeni Scott began when we were both at the University of Oregon, he as a graduate student in biology, I as a professor of English. His interest in the perspectives of Navajo oral tradition led to his sitting in on several of my classes and finally to our collaboration on an essay, "Poetic Retranslation and the 'Pretty Languages' of Yellowman," in Karl Kroeber, ed., *Traditional Literatures of the American Indian: Texts and Interpretations*, 2d ed. (Lincoln: University of Nebraska Press, 1997), 88–134. As national faculty advisor to Red Mesa High School on the Navajo Reservation, I had the pleasure of inviting both Tacheeni Scott and Fred Begay to address the students, almost all of whom were Navajos and none of whom had heard the idea that their own language might be full of scientific perspectives.

Epilogue

"Gleaning" and the Active Audience

ALL THAT REMAINS is for us to take a look back over the vast array of implicit and explicit cultural meanings we have been discussing and contemplate how Native people derive significance from performed texts, artifacts, and movements which don't announce their meanings openly. How do they know what they mean—and more problematic—how can we be sure we know? After all, Native Americans do not go around giving explanatory lectures to each other, mostly, I presume, because the interpretations are seldom perceived consciously. I have been arguing that knowing more about a culture's assumptions and traditions helps us—Native and non-Native—immensely in gaining a sense of what is performed, and what those performances mean in their cultural contexts. To be sure, the argument is complicated by the tremendous range of cultural differences among tribes in North America, yet it is mitigated to some extent by certain similarities that allow us room for speculation and comparison. We have tried to avoid "reading into" our texts, yet we have to admit that much of what we have shared in this book is interpretive and tentative, rather than certain.

What we need is a good model for understanding just what happens when a talented storyteller, singer, or basketmaker performs a story, song, or basket for people who recognize the cultural codes in the genre. John Miles Foley uses the phrase *immanent art* to characterize the kind of artistic expression which comes into being as a traditional artist performs a traditional expression in the presence of a traditional audience in a traditional context: the art does not reside in the text or performance but emerges in the interaction between the artist and a knowledgeable audience as the event takes shape. It's a wonderful concept, and it resonates with the reciprocal systems we have encountered. But how does it work?

In a 1982 prepublication photocopy distributed to friends and colleagues, Ron and Suzanne Scollon discussed a number of special linguistic

features and insights they had encountered while doing field research in Northern Athabaskan communities. One of these caught my attention because of its compelling metaphorical quality: in Chipewyan Athabaskan, a verb stem identified later by Suzanne Scollon as *-sas/-zas* is used to describe a dog gnawing a bone until it is clean, a woman picking berries, and someone listening to—and understanding—what another person is saying. We can surmise that using this verb for these apparently disparate actions dramatizes a set of cultural nuances and assumptions about earnestness and thoroughness that may be approximated by the English term “gleaning” and that listening to others—not just obtaining food—falls into that important range of concerns.

Because bushes produce varying amounts of berries, the job of finding and properly harvesting them is the responsibility of the hardworking berry picker; in the subarctic, berries are not always abundant, and the picker needs to know where they are, as well as how and when to get them without losing or crushing any. Along with the berries, of course, there is the accumulation of leaves, twigs, and spoiled berries; in other words, the process of gleaning also produces materials which are not nutritious and need to be sorted out and discarded as superfluous.

The job of getting every last morsel from a bone is the responsibility of the dog who wants to eat, polish his teeth, and exercise his jaws. The more resilient parts of the bone may eventually be discarded, but the surviving dog is the one who can consistently glean the most nutrition out of what he gets. With an oral performance (let us say a traditional story, a hunting anecdote, or medicinal instructions), the job of “getting it” and obtaining its cultural nutrition is the responsibility of the listener, who has learned by experience to recognize and glean the important references, metaphors, nuances, and cultural assumptions, while carefully discarding the anecdotal leaves, stems, and other nonnutritive elements.

Listening, like gathering berries and gnawing a bone, is not easy: it requires effort and knowledge on the part of the gleaner. Another implication is that the process is evaluative as well as interactive: it is much more complicated than the old cliché about the tree falling in the forest where no one can hear it, for *-sas/* describes more than the physical registration of sound by an ear or the arrival of data at its intellectual destination (as suggested by various information and conduit models of communication). The *active reception* of an oral performance requires a conscious and energetic engagement which includes selection, scrutiny, sorting, interpretation, and digestion. Moreover, the concept of *-sas/* not only relates to survival but also encompasses a range of relationships within the cultural and natural world: plant/human, bone/animal,

human/human. The categories are different, but the principle of gleaning remains the same across them; thus, the verb is not denotative as much as it is metaphorical. It provides for the vivid, physical rendering of a culturally understood abstraction.

First, let us take a more detailed look at the implications of *-sas/* in English as applied to actively receiving and processing what others say. In the grain fields of northern Europe, after the reapers cut the wheat and barley, and the farm laborers took the bundles of grain away to be threshed, others came into the fields to glean the seeds of grain that had fallen to the ground. Just as the Athabaskan woman painstakingly searches for, identifies, and carefully plucks the smallest isolated berry, the gleaners went through a field in a careful, thorough, painstaking attempt to find and keep every last kernel of grain. In early Europe, of course, gleaning implied social status and customary privilege: some had rights to glean in certain fields after a harvest; others did not. The process was central not only to their physical survival but also their identity. Thus, the cultural meaning of gleaning (with all its associated nuances of position, custom, relationship) was multivalent, just as the cultural meaning of Arctic subsistence berry picking today is every bit as significant on a political and ethnic level as for the actual number of berries collected.

The analogy with gleaning is limited, of course (as are all attempts to exploit other cultures' wonderful phrases). Gleaning basically refers to discovering and utilizing leftovers, while *-sas/* relates to the central act of “harvesting,” in all senses of that term. Anyone who has watched subarctic Native people picking berries or choosing blades of grass for baskets has been impressed by the keen deliberation, the care, the delicacy, the almost fierce attention to small detail that characterize the process. And even a dog that is not hungry will “worry” a bone until it is almost gone—just on principle, it seems. The central quality of this action is total and energetic (but careful) commitment to getting all there is.

As it applies to an audience, gleaning suggests that the listeners (who, in a traditional society, very likely know the story or song—and could perform it themselves) are proactively absorbing every nuance of a performance, using what they know of their culture's customs, values, and traditions—along with their own familiarity with the song or story—to bring the full referent of the text dramatically into their minds. The term *referent* suggests that the text itself is not the focal point of a folk performance; rather, the performed text stimulates or creates a rich constellation of culturally significant associations in the minds of the listeners, and that's where the meaning is located. The listeners must identify, sort, bring up related cultural, contextual, and experiential possibilities and

apply them to the performance. This attitude was discovered by Phyllis Morrow when she tried to get Yupik narrator Elsie Mather to comment on the meaning in her stories. Mather replied that Yupiks don't explain their stories; instead, they listen to them throughout their lives and continually try to understand the stories as they accumulate the personal and cultural experiences to interpret them.

As I look back on some forty years of working with Navajo narratives, I realize that my understanding of what was going on would have benefitted immensely from a better grasp of what the Navajos were gleaning—not only from their telling of their stories but from my continuing interest in talking about their motifs and nuances. For I discovered about thirty years into the process that not only did my friend and adopted brother-in-law Yellowman skillfully shape brilliant dramas that embodied positive moral and ritual values for an audience who already knew those ideas and stories, but a constant threat of invoking evil and destructive forces existed when the stories were being discussed. When I finally asked Yellowman directly why he hadn't warned me we were treading on dangerous ground, he replied with some distaste, "We don't talk about those things." And perhaps that's an important point to make about this kind of gleaning in general: it is so basic, so common, so self-evident that people don't talk about it; they simply do it.

Yet the transmission of culturally important information also depends on the aggregate gleaned efforts of a community, a fact nowhere more eloquently illustrated than in an Arctic experience shared with me by filmmaker Leonard Kamerling. While he was filming in the Nelson Island village of Tununak in the early 1970s, he went with a small group of Yupik hunters on snow machines to set blackfish traps under the ice. They had been traveling across what appeared to be featureless frozen tundra for more than an hour when suddenly the weather changed. A dense white mist surrounded them, blotting out even the distinction between the sky and the ground. The hunters, apparently lost, stopped their snow machines and gathered for a lengthy discussion about the nature of being lost, how to discover which way to go, the meaning of subtle landmarks in this area, the particular shapes of willow clumps, and where the river should be. They joked, and they compared stories and anecdotes. Kamerling remembers that the conversation mostly centered on details which he could not see. A younger hunter admitted that he couldn't recognize anything in the vicinity, and an older man responded jokingly, "I know this area like the back of my hand."

"But clearly," Kamerling writes, "they were lost. Finally, they picked a route and started out, snow machines and sleds in close formation one

behind the other, and found a slough that they all agreed was 'So and So's slough,' and which looked exactly the same to me as where we had just come from. They were right—we traveled on and they found the place they were looking for, where the blackfish nets went in under the ice." Fortunately, Kamerling filmed all this, and the event makes up one section of the resultant film, *Timunerimiut: The People of Timunak* (in Yupik, with English subtitles, 1972). Just as clearly as they were lost, the hunters shared everything each one knew about the area and its idiosyncrasies, and by gleaned they came up with a composite set of understandings that no individual commanded separately.

In a similar instance, Dennis DeGross tells about a group of Yupik hunters who, suddenly caught in a furious snowstorm, built an impromptu snow hut, sat inside telling anecdotes and jokes about the area (sometimes sticking an arm outside to bring in snowflakes for close inspection), and—having decided which way the wind was blowing and where the ice must be—abruptly stood up, got a grip on each other's jackets and belts, and hiked resolutely through the storm for an hour to find themselves in the middle of a village. Whether vernacular gleaned results in survival or cultural enrichment, its exercise is clearly conscious, interactive, and multivalent; it depends upon the seriousness with which people regard their stories.

Well and good for the Native insider who has been able to hold onto cultural traditions in spite of the forces exerting contrary pressure. Where does that leave us, the viewers of the snail shell from the outside? What kind of help does it give us when we try to explain a fast, but puzzling, break within our own culture? Rather than select a complex and lengthy example from our own or another culture, let's take a common occurrence in all cultures: a stroke, something I experienced on July 5, 2002. From the Western point of view, this is easy; we only need to consult a dictionary. According to *Random House Webster's College Dictionary*, a stroke is "a blockage or hemorrhage of a blood vessel leading to the brain, causing an inadequate oxygen supply and often long-term impairment of the sensation, movement, or functioning of part of the body."

That tells us what a stroke is; it doesn't tell us what causes it, what forms it may take, and how long it may take to recover. It only says what a dimly opinionated victim can already surmise. What's to be done against it? Should one focus on large muscles, small muscles, the voice, or all three (why three categories, one wonders)? Doctors lift their eyebrows and say, "Well, it takes various people different amounts of time to get out of such a fix or heal. You may or may not recuperate from the stroke." But you try, and a little bit at a time, you do come back from the stroke to some extent. With the exception of dietary or life style choices, Western

society does not believe that there are any reasons other than physiological for a stroke, including where it actually takes place. Japanese physicians have reported at conferences that the Japanese suffer strokes within the vessels of the brain, not in those leading to the brain. In my case, the stroke occurred in my right temple, puzzling my doctors (is it because I've been eating Japanese food for forty years?).

The Navajos would take another healing approach, peopled with those who are interested in your illness and physical well-being. The questions would be more psychological and focus on the patient's relationships with other people. You may have done something wrong to someone or something, or been the victim of witchcraft (forget about whether you believe in such things or not), or you may have simply done something which wasn't wrong but that interfered with someone else's plan for events unknown to you. Add another couple of hundred possibilities (the number doesn't matter). What you see developing is the difference between the scientific answer based upon scientific facts and the human answer based upon human facts. One isn't right and the other wrong. They are both right in their own way, and just as many people probably get cured from strokes among Navajos as whites.

Western traditional medical prescriptions for recovery from stroke include a low-salt diet, rest, no alcohol, physical, occupational, and speech therapies, and various medications for depression, high blood pressure, and elevated cholesterol. Navajo remedies involve sweat baths and healing ceremonies with other people, and medicines taken by others as well. The principal difference is whether one's stroke is treated as a personal affliction or a group-oriented one. Which cure to follow? They both yield results. The difference is that if I go to my doctor, I'll get another appointment within a month or six months, and if I go to a Navajo medicine man, I will get a long, thoughtful description and schedule another ritual. It's a matter of whether I want to face the thing alone or with someone else.

I'm simplifying considerably, but I am buoyed by the knowledge that my Navajo sister stayed home this summer from the Northwest and is waiting for me to call. From my Western doctor, I get a list of dates he will be in his office, a list of medications to take, and a list of therapies to pursue. If you add this scenario to the hundreds of others available from ethnic groups in America, you will see that the choice is mine: I can go with one answer or with five or ten or twenty. When will we give up our one answer for the world of the many which surrounds us? I, in any case, will be reaching for at least two telephones, one to call my Western doctor and one to commune with my Navajo sister.

Notes

On immanent art, see John Miles Foley, *Immanent Art: From Structure to Meaning in Traditional Oral Epic* (Bloomington: Indiana University Press, 1991). The collaboration of Elsie P. Mather and Phyllis Morrow is discussed in "There Are No More Words to the Story," in Larry Evers and Barre Toelken, eds., *Native American Oral Traditions: Collaboration and Interpretation* (Logan: Utah State University Press, 2001), 200–42.

Ron and Suzanne Scollon's paper later appeared as "Language Dilemmas in Alaska," *Society* 24 (1984): 77–81. See also S. B. K. Scollon, "Reality Set, Socialization, and Linguistic Convergence" (Ph.D. dissertation, University of Hawaii, Honolulu, 1982).

Filmmaker Leonard Kamerling's and Dennis DeGross's stories are based on personal communications with me; respectively, letter, 20 November 2001, and letter, 18 December 2000.

For the author's work with Navajo narratives, see Barre Toelken, "Life and Death in the Navajo Coyote Tales," in Arnold Krupat and Brian Swann, eds., *Recovering the Word: Essays on Native American Literature* (Berkeley: University of California Press, 1987), 388–401, and "From Entertainment to Realization in Navajo Fieldwork" in Bruce Jackson and Edward D. Ives, eds., *The World Observed: Reflections on the Fieldwork Process* (Urbana: University of Illinois Press, 1996), 1–17.