

# PHILOSOPHY OF NATIVE SCIENCE

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In the conceptual framework of philosophy, Native American science may be said to be based upon perceptual phenomenology, the philosophical study of phenomena. The central premise of phenomenology roots the entire tree of knowledge in the soil of direct physical and perceptual experience of the earth. From a phenomenological viewpoint, all sciences are earth-based. In Abram's words: "Every theoretical and scientific practice grows out of and remains supported by the forgotten ground of our directly felt and lived experience, and has value and meaning only in reference to this primordial and open realm" (Abram 1996: 43).

Edmund Husserl, the original promulgator of phenomenology, believed that lived experience, or the "lifeworld," was the ultimate source of human knowledge and meaning. The lifeworld evolves through our experience from birth to death and forms the basis for our explanation of reality before we rationalize it into categories of facts and apply scientific principles. In other words, it is *subjective* experience that forms the basis for the *objective* explanation of the world.

The lifeworld, a vast ocean of direct human experience that lies below all cultural mediation, forms a foundation of Native science. Husserl described it as culturally relative, diverse and different for each culture and each person because it is based on the experienced world of distinct peoples who evolve in distinct places and describe themselves and their surroundings in distinct languages. Yet, there is a unity in such diversity derived from the fact that humans share a species-specific experience and knowledge of nature. Humans also share an experience of nature with all other living things, although our perceptions are different from those of other species because of our unique physical biology. Metaphoric for a wide range of tribal processes of perceiving,

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thinking, acting and "coming to know" that have evolved through human experience with the natural world, Native science is born of a lived and storied participation with natural landscape and reality. Current cultural concepts of time, space, relationships, and linguistic forms are rooted in this precultural biological awareness.

Native American philosophy of science has always been a broad-based ecological philosophy, based not on rational thought alone, but also incorporating to the highest degree all aspects of interactions of "man in and of nature," i.e. the knowledge and truth gained from interaction of body, mind, soul, and spirit with all aspects of Nature. As all knowledge originates in a people's culture, its roots lie in cosmology, that contextual foundation for philosophy, a grand guiding story, by nature speculative, in that it tries to explain the universe, its origin, characteristics, and essential nature. Any attempt to explain the story of the cosmos is also metaphysical as the method of research always stems from a cultural orientation, a paradigm of thinking that has a history in some particular tradition. Therefore, there can be no such thing as a fully objective story of the universe.

Their cosmology, a people's deep-rooted, symbolically expressed understanding of "humanness," predates all other human-structured expressions, including religion and social and political orders. The first cosmologies were built with the perception that the spirit of the universe resided in the earth and things of the earth, including human beings. A people's understanding of the cycles of nature, behavior of animals, growth of plants, and interdependence of all things in nature determined their culture, that is, ethics, morals, religious expression, politics, and economics. The people came to know and to express a "natural democracy," in which humans are related and interdependent with plants, animals, stones, water, clouds, and everything else.

According to Husserl, there is a kind of "associative empathy" between humans and other living things which is grounded in the physical nature of bodies. The creative body and all that comprises it – mind, body, and spirit – is the creative, moving center of Native science. Although this may seem common sense, modern thinking abstracts the mind from the human body and the body of the world. This modern orientation frequently disconnects Western science from the lived and experienced world of nature. The disassociation becomes most pronounced at the level of perception, because our perceptions orient us in the most elemental way to our surroundings. Receptivity to our surroundings combined with creativity characterizes our perception.

Indigenous people are people of place, and the nature of place is embedded in their language. The physical, cognitive, and emotional orientation of a people is a kind of "map" they carry in their heads and transfer from generation to generation. This map is multidimensional and reflects the spiritual as well as the mythic geography of a people.

Knowing the origins of their people, their place, and the all-important things the place contains is considered essential orientation for a tribal person. A people's origin story maps and integrates the key relationships with all aspects of the landscape.

The metaphor of the body is often used by tribes to describe themselves: not just the physical body, but the mind-body that experiences and participates in the world, as well as their communities, social organization, and important relationships in the world. Indeed, humans and the natural world interpenetrate one another at many levels,

including in the air we breathe, the carbon dioxide we contribute to the food we transform, and the chemical energy we transmute at every moment of our lives from birth to death. "Ultimately, to acknowledge the life of the body, and affirm our solidarity with this physical form, is to acknowledge our existence as one of earth's animals, and so to remember and rejuvenate the organic basis of our thoughts and our intelligence" (Abram 1996: 47).

Native science is a broad term that can include metaphysics and philosophy, art and architecture, practical technologies, and agriculture, as well as ritual and ceremony practiced by Indigenous peoples past and present. More specifically, Native science encompasses such areas as astronomy, farming, plant domestication, plant medicine, animal husbandry, hunting, fishing, metallurgy, geology – studies related to plants, animals, and natural phenomena, yet may extend to include spirituality, community, creativity, and technologies which sustain environments and support essential aspects of human life. It may even include exploration of such questions as the nature of language, thought, and perception, the movement of time and space, the nature of human knowing and feeling, the nature of the human relationship to the cosmos – questions related to natural reality. The collective heritage of human experience with the natural world, Native science is a map of natural reality drawn from the experience of thousands of human generations. It has given rise to the diversity of human technologies, even to the advent of modern mechanistic science.

Phenomenology parallels the approach of Native science in that it provides a viewpoint based on our innate human experience within nature. Native science strives to understand and apply the knowledge gained from participation in the here and now, and emphasizes our role as one of nature's members rather than as striving to be in control of it.

Our universe is still unfolding and human beings are active and creative participants. Creativity is both the universe's ordering principle and its process, part of the greater flow of creativity in nature. It flows from the "implicate order" or inherent potential of the universe, and whatever it produces becomes a part of the "explicate order" of material or energetic expressions. These expressions range from entire galaxies to the quarks and leptons of the subatomic world. Human creativity is located in this immense continuum. We are, after all, a microcosm of the macrocosm. We are an expression of the nature within us, a part of a greater generative order of life that is ever-evolving. It is from this creative, generative center of human life that central principles of Native science emanate (Briggs and Peat 1999: 28–30).

An understanding of the nature of creativity is important for gaining insight. Native science embraces the inherent creativity of nature as the foundation for both knowledge and action. Human life at all levels is wholly a creative activity and may be said to be an expression of the nature within us with regard to "seeking life," the most basic of human motivations since it is connected to our natural instinct for survival and self-preservation.

The concepts of creativity: *chaos, participation, and metaphoric thinking*, lend themselves specifically to the way in which Native peoples envision the *process* of science. They also form a conceptual bridge between Native and Western science, although Native

science refers to them differently through particular cultural representations in story, art, and ways of community. These theories and their connections to quantum physics have brought Western science closer to understanding nature as Native peoples have always understood it – that is, not simply as a collection of objects, but rather as a dynamic, ever-flowing river of creation inseparable from our own perceptions, the creative center from which we and everything else have come and to which we always return.

*Chaos* is both movement and evolution, the process through which everything in the universe becomes manifest and then returns. The flux, or ebb and flow, of chaos appears in everything and envelops us at all times and in all places. From the evolving universe to the mountain to the human brain, chaos is the field from which all things come into being. It plays a central role in the creation of the universe, the earth, and humankind in the mythology of all ancient cultures. Chaos and its offspring, creativity, are the generative forces of the universe.

*Chaos theory* describes the way nature makes new forms and structures out of the potential of the great void. It also represents the unpredictability and relative randomness of the creative process, appearing in mythology throughout the world in stories of the trickster – the sacred fool whose antics remind us of the essential role of disorder in the creation of order.

There is an ordering or self-organizing process that results from chaos, called “order for free.” A simple example may be found in the boiling of water. As water is heated, the water at the bottom of a saucepan starts to rise to the top while cooler water at the top moves to the bottom. This causes a turbulence which takes the form of boiling water or, as a chaos theorist might describe it, the water in the pan exercises its “maximum degree of freedom.” In other words, the water in the closed system of the saucepan is exercising the maximum range of behavior available to it. However, if the water is brought slowly to the point just before boiling, something interesting and characteristic of chaotic systems occurs. The water self-organizes into a pattern of vortices. This is called the “bifurcation point,” the point just before the system transforms itself, in this case, to boiling water. The bifurcation point is the direct result of the interaction of “positive feedback,” which amplifies the transformation to boil, and “negative feedback,” which dampens the transformation. These tendencies interact to create a stable pattern of vortices.

This moment, the bifurcation point, when a truth comes to be intuitively known is like the still point in the eye of a hurricane; it is that point when a connection is made to a natural principle manifesting itself in the unfolding of a natural process. Like the birth of a child or a bolt of lightning connecting sky and earth for a moment in time, these are the infinite moments of both chaos and order. This is a precept of Native science, for truth is not a fixed point, but rather an ever-evolving point of balance, perpetually created and perpetually new.

In nature, all systems of energy transformation exhibit a similar kind of behavior. The survival of any self-organizing system depends upon its ability to keep itself open to the flow of energy and matter through it. This necessity may last a millionth of a second or billions of years, as is the case with the universe.

Self-organization or "creativity" out of the field of chaos occurs everywhere in nature. Random interstellar gases and electromagnetic fields of radiation self-organize to form galaxies and star systems. The interaction of rain with the earth's geological landscape leads to the vast patterns of rivers and streams that form drainage systems. Birds or insects fly in perfect unison.

Then there is the notion of subtle influences, or the "butterfly effect" in chaos theory. In chaotic systems, even small things turn out to have large-scale effects over a period of time. For example, if we look at weather we see a recurring climatic pattern over a long period of time. However, if we examine details we see that weather is in constant flux due to the bifurcating and amplifying activity of a host of subtle effects. In a weather system, everything is interconnected. Positive and negative feedback loops are in constant motion, and somewhere in the system, a "butterfly" loop may cause slight changes. Sooner or later one of these loops is amplified, and we see a dramatic and unpredictable shift in the pattern. The butterfly effect may be called chance, but it is really the cumulative influence of a small change in a system. It may be an increase or decrease of temperature in a weather pattern, an individual such as Gandhi taking a stand against oppression, or a Native prayer, song, dance, or ritual to bring rain to a parched land. In the world of chaos, anything is possible.

Chaos theory shows that everything is related, everything has an effect, and that even small things have an influence. In a postmodern society ruled by an obsession with control, we as individuals may feel powerless, but each of us may subtly influence the course of any system, including those that seem to be the most intractable.

Chaos theory offers insight into human creativity. Embodied in the human mind and body, it is chaos that allows humans the ability to respond creatively to constant changes in the environment. Our instinctual ability to "flow" with the stream of chaos and creativity leads us metaphorically to the "vortices" of individual and collective truth. What is true from this viewpoint is that the experience of the moment of balance inherent in chaos, like that point at which water, not quite boiling, forms vortices. Human "butterfly power" resides in our ability to create.

At its highest levels of expression, Native science is a system of pathways for reaching this perpetually moving truth or "spirit." This understanding of the creative nature of the world and of human beings is reflected in the core beliefs of Native thought, life, and tradition.

The quality and nature of human life are the result of human consciousness, or the influences of our experiences, perceptions, language, and society. Consciousness consists of an open system, and is "created," in that this system is constantly being influenced by the forces of chaos expressed through us and by us at the individual and collective levels. Herein lies the true power of individual and collective creativity and its subtle power to influence the entire world. This is the basis of the precept of Native science that a single individual's vision may transform a society, or that a rain dance done properly, with one mind, can bring rain. Hence, Native science is a reflection of *creative participation*, a dance with chaos and her child, the creative spirit (Briggs and Peat 1999: 5-22).

We cannot help but participate with the world. Whether we acknowledge and are creatively open to the perceptions that will result, or remain oblivious to its influence and creative possibilities toward deeper understanding, is our decision. Native science continually relates to and speaks of the world as full of *active* entities with which people engage. This active perceptual engagement with the animate world was termed the *participation mystique* by French anthropologist Lucien Lévy-Bruhl to describe "the animistic logic of indigenous, oral peoples for whom ostensibly 'inanimate' objects like stones or mountains are often thought to be alive and from whom certain names, spoken out loud, may be felt to influence the things or beings that they name, for whom particular plants, particular animals, particular places, persons and powers may all be felt to 'participate' in one another's existence, influencing each other and being influenced in return" (Lévy-Bruhl 1985, in Abram 1996: 57).

The word "animism" perpetuates a modern prejudice, a disdain, and a projection of inferiority toward the worldview of Indigenous peoples. But if, as the French phenomenologist, Merleau-Ponty contends, perception at its most elemental expression in the human body is based on participation with our surroundings, then it can be said that "animism" is a basic human trait common to both Indigenous and modern sensibilities. Indeed, all humans are animists.

It may also be said that we all use *the metaphoric mind* to describe, imagine, and create from the animate world with which we constantly participate. Just as the focus on participation in Native science brings forth creative communion with the world through our senses, so too the application of the metaphoric mind brings forth the descriptive and creative "storying" of the world by humans. Science in every form is a story of the world. In Native contexts, participation and the use of metaphor may result in a story, song, dance, new technology, or even a vision, ritual, or ceremony.

The metaphoric or nature mind of humans is our oldest mind and has been evolving for approximately three million years. Its time of greatest development probably occurred during the Paleolithic era about 70,000 years ago. Paralleling its collective evolution, the metaphoric mind in the individual develops from birth to about the time a child begins to learn language. When language is developed and used extensively, the holistic experience of the metaphoric mind begins to get chopped up and labeled, until, eventually, it recedes into the subconscious. Yet the metaphoric mind remains very important in continued development because it encompasses the perceptual, creative, and imaginative experience of a person's inner world.

Language is our symbolic code for representing the world that we perceive with our senses. Meaning is not connected solely to intellectual definition but to the life of the body and spirit of the speaker. At the deeper psychological level, language is sensuous, evocative, filled with emotion, meaning and spirit. In its holistic and natural sense, language is animate and animating, it expresses our living spirit through sound and the emotion with which we speak. In the Native perspective, language exemplifies our communion with Nature.

As the rational mind develops and the metaphoric mind recedes into the subconscious, there to lie in wait until its special skills are called upon by the conscious mind, it emerges to be used in creative play and imaginative reverie, or in dreams and stories.



As the rational mind develops further and language becomes literacy, the metaphoric mind becomes significantly differentiated from the rational mind and that of social conditioning.

This differentiation has become compounded in Western society with its overt focus on scientific rationalism. Despite the conscious separation of the metaphoric mind from the rational, both minds work together when the conditioning of separation is suspended during creative play, meditation, ritual, or other modes of spontaneous thinking. In Native societies, the two minds of human experience are typically given more balanced regard. Both minds are respected for what they allow people to do, yet the metaphoric mind remains the first foundation of Native science.

Connected to the creative center of nature, the metaphoric mind has none of the limiting conditioning of the cultural order. Its processing is natural and instinctive; it perceives itself as part of the natural order, a part of the earth mind, inclusive and expansive in its processing of experience and knowledge. It invented the rational mind, and the rational mind in turn invented language, the written word, abstraction, and eventually the disposition to control nature rather than to be of nature. But this propensity of the rational mind also leads to the development of anthropocentric philosophy and of a science that would legitimize the oppression of nature, its elder brother, the metaphoric mind.

Because its processes are tied to creativity, perception, image, physical senses, and intuition, the metaphoric mind reveals itself through abstract symbols, visual/spatial reasoning, sound, kinesthetic expression, and various forms of ecological and integrative thinking. The facilitator of the creative process, it invents, integrates, and applies the deep levels of human perception and intuition to the task of living. Understanding Native science begins with developing the creative ability to decode layers of meaning embedded in symbols that have been used for thousands of years and are used artistically and linguistically to depict structures and relationship to places. These metaphoric modes of expression are the foundations for various components of Native science, as well as of art, music, and dance. The metaphoric mind underpins the numerous ecological foundations of knowledge and has been specifically applied in creating the stories that make up the complex forms of oral traditions. As the greatest source of metaphor comes from nature, these stories are filled with analogies, characters, and representations drawn from nature, metaphors that more often than not refer back to the processes of nature from which they are drawn, or to human nature, which they attempt to reflect.

## PROCESS OF NATIVE SCIENCE

The perspective of Native science goes beyond objective measurement, honoring the primacy of direct experience, interconnectedness, relationship, holism, quality, and value. Its definition is based on its own merits, conceptual framework, and practice and orientation in the tribal contexts in which it is expressed. Concerned with the processes and energies within the universe, it continually deals in systems of

relationships and their application to the life of the community. Science is integrated into the whole of life and being and provides a basic schema and basis for action.

Meaning and understanding were the priorities of Native science, rather than a need to predict and control. People were interested in finding the proper, ethical, and moral paths upon which human beings should walk. Meaningful relationship and an understanding of one's responsibilities to those entities in nature that people depended on were the reasons for a Native science, which invited the energies and animating power of nature. Native symbols go beyond simple energies and the animating power of nature, beyond simple archetypes, for they attempt to represent the universe itself, as in a ceremonial structure like the Navajo hogan.

As co-creators with nature, everything we do and experience has importance to the rest of the world. We cannot misexperience anything, we can only misinterpret what we experience. It must be emphasized that what we think and believe, and how we act in the world impacts on literally everything. We humans bring our reality into being by our thoughts, actions, and intentions; hence, the focus of Native traditions on prayer to bring about and perpetuate life. Native science is about creating the inner sensibilities of humans, or the inner ear, which hears the subtle voice of nature.

No body of knowledge exists for its own sake outside the moral framework of understanding. The information gained through experience is considered in interpreting our relationship with the natural world, thereby pointing to the kind of "story" that might contain and convey that information. Concerned about the ethical aspects of knowledge, environmental observation, and understanding received from visions, ceremonies, and spirits, Native scientific philosophy reflects an inclusive and moral universe. Methodological elements and tools of Native science include:

**Causality:** Native science reflects a belief in causes that affect and go beyond the physical, principles such as synchronicity and the action of natural energies and entities. Other such principles include the transformation of energy to other forms and resonance with the order of the universe, as reflected in the adage, "as above so below."

**Instrumentation:** Native science relies on preparation of the mind, body, and spirit of each person as the primary vehicle of "coming to know," the best translation for education in Native traditions. A coming-to-know, a coming-to-understand, metaphorically entails a journey, a process, a quest for knowledge and understanding. There is then a visionary tradition involved with these understandings that encompasses harmony, compassion, hunting, growing, technology, spirit, song, dance, color, number, cycle, balance, death, and renewal. The mind and body can be used for careful, disciplined, and repeatable experimentation and observation. Knowledge is gathered through the body, mind, and heart in altered states of being, in songs and dance, in meditation and reflection, and in dreams and visions.

**Observation:** All science depends on careful observation of plants, animals, weather, celestial events, healing processes, the structures of natural entities, and the ecologies of nature.

**Experiment:** Native peoples applied practical experimentation at all times to find efficient ways to live in their various environments, and ingenious and ecologically appropri-



ate technologies were developed, creating a desired result through entry into specific relationships with the energies of the natural world.

**Objectivity:** Objectivity is founded on subjectivity. Direct subjective experience, predicated on a personal and collective closeness to nature, will lead to an understanding of the subtle qualities of nature.

**Unity:** Native science stresses order and harmony but also acknowledges and honors diversity and chaos as creators of reality. "Relationships and renewable alliances take the place of fixed laws, and Indigenous science accepts the possibility that chance and the unexpected can enter and disturb any scheme" (Peat 1996: 257).

**Models:** Native science also has models. Teaching revolves around high-context models in which information is communicated at many levels and which are highly representational and elicit higher-order thinking and understanding. An example of such a ritual process model would be the Plains Sun Dance which may include symbols such as the circle, or numbers, geometric shapes, special objects, art forms, songs, dances, stories, proverbs, metaphors, all of which unify experience with meaning and facilitate the mind's conscious process of connecting with relationships.

**Appropriate technology:** Because social value is gained by honoring mutual reciprocal relationships, spin-offs of Native science in technology are carefully applied. Adoption of technology is conservative and based on intrinsic need, and care is taken to ensure that technologies adopted and applied do not disrupt a particular ecology. Such care is grounded in the belief that it is possible to live well through adhering to a cosmology and philosophy honoring balance, harmony, and ecologically sustainable relationships.

**Spirit:** Native science incorporates spiritual process: no division exists between science and spirituality. Every act, element, plant, animal, and natural process is considered to have a moving spirit with which we continually communicate.

**Interpretation:** Native science bases its interpretation of natural phenomena on context. Therefore, meaning is based the context of the events and reflection of Native philosophy.

**Explanation:** Native science works with a multiplicity of metaphoric stories, symbols, and images to explain events in nature.

**Authority:** Native science gains its authority partly through the society, elders, direct experience, and dream or vision, and on the sanctity of the relationship established over time with particular environments. "Authority, if we are to use that word at all in the context of Native science, resides in individuals and their direct experience rather than some social establishment" (Peat 1996: 265).

**Place:** Particular places are endowed with special energy that may be used, but must be protected. This sentiment extends from the notion of sacred space and the understanding that the earth itself is sacred. The role of people is to respect and maintain the inherent order and harmony of the land.

**Initiation:** There are both formal and informal pathways to certain levels of Native science. For instance, in the Midewiwin Society of the Ojibwa, there are four stages of initiation, each involving extensive training, learning of songs, ceremonies, stories, interpretation of special scrolls, and petroglyphs (Peat 1994: 267-8).

**Cosmology:** All philosophies are founded on an elemental idea of how the universe was created along with humankind's emergence into the world, and Native science is connected to the origins and migrations of people through the American landscape

and to notions of time-space, sacred cycles, astronomy, art, myth, ritual, and dance. Cosmology is reflected in the cycles of community celebrations, rites of renewal, and stories, and serves the important function of validating Native peoples' way of life, core values, and social ecology.

**Representations:** Signs and formulas of thought appear in many forms, records in stone, clay, birch bark, hides, structures, and hundreds of other forms. These representations record key thoughts, understandings, and stories important to remembering aspects of Native science. The structures and symbols of Native science serve as bridges between realities. In archaic Plains Indian traditions, the "medicine wheel" was a structure that brought inner and outer realities of nature together. Many Native symbols are representations of the nonhuman realities of nature.

**Humans:** People play a key role in facilitating knowledge about the natural world in conscious thinking and tool-making. Given this role, humans have special responsibilities to the natural world and to other living things. Native science is the study of learning and carrying out these responsibilities. Native science is about stewardship and the practice of deep ecology.

**Ceremony:** Ceremony is both a context for transferring knowledge and a way to remember the responsibility we have to our relationships with life. Native ceremony is associated with maintaining and restoring balance, renewal, cultivating relationship, and creative participation with nature.

**Elders:** Elders are respected as carriers of knowledge, wisdom, and experience. Therefore, they are utilized as the first line of teachers, facilitators, and guides in the learning of Native science.

**Life energy:** Life energy is acknowledged throughout the expressions of knowledge, understanding, and application. All things have life force. There is a natural energy moving all things that must be understood and respected.

**Dreams and visions:** Dreams and visions are a natural means for accessing knowledge and establishing relationship to the world. They are encouraged and facilitated.

**Paths:** Predetermined systematic activities of learning are viewed as ways to search for and find knowledge. All of nature has these inherent patterns of trajectories, "right paths" which reflect the unfolding of natural pathways through which it may be understood. The "Good Red Road," "Dream-time Path," "Earth Walk," and "Pipe Way" are some of the ways Native peoples have referred to the directed path in the quest for knowledge, meaning, and understanding.

## NATIVE SCIENCE PRACTICE

Native science practice tries to connect the "in-space," our human intelligence, a microcosm of the intelligence of the earth and the universe, with the heart and mind. Art and language, through story, song, and symbolic dance are used to simultaneously explore relationships to the in-scape and the land.

Exploring the in-scape may be considered a "first step" in Native science practice. This is another way of saying that the practice of Native science begins with setting forth specific intentions to seek knowledge from participation with the natural world and then exploration of intuition and creative imagination, which are integral founda-

tions of the metaphoric mind, the mind without or before words – a natural tendency all people intuitively exhibit when confronted with new learning and knowledge. Native science builds upon and encourages this creative and instinctual way of learning.

The world of nature is in constant flux; therefore, Native science does not attempt to categorize firmly within the domains of ideas, concepts, or laws formed only through an analysis bent on a specific discovery, as is the case in Western scientific analysis. Rather, Native science attempts to understand the nature or essence of things. This does not mean the exclusion of rational thought, but rather the inclusion of heart and being with rational perception to move beyond the surface understanding of a thing to a relationship which includes all aspects of one's self.

Sanction of knowledge through the appropriate ritual and tribal society acknowledgment, and commitment to gain and share knowledge are important, since knowledge of the natural world and how best to relate to it is not just a matter of individual understanding but is gained and shared for the benefit and perpetuation of the community. Sanction and commitment acted as foundational safeguards for both individual and tribe and formed a kind of "check and balance" for important knowledge.

The maintenance of dynamic balance and harmony with all relationships to nature is the foundational paradigm of Native science. Reality is based on mutual reciprocity, the rule of "paying back" what has been received from nature. The world operates on a constant flow of give-and-take relationships. Hunting rituals are performed before, during, and after traditional Native hunting to acknowledge the transformation of the deer's life, spirit, and flesh into that of the human. The Native hunter and community know well that this gift from Nature and the game spirits will have to be "paid back" at some time in the future by humans in the universal cycle of death, birth, and rebirth.

This transformation of energy is also exemplified in the continual transformation of energy to matter and back again. Electrons continually borrow energy from the universe to transform themselves into different kinds of atoms. What has been borrowed from the universe must eventually be paid back, and this happens when an electron "dies" back to the field of energy from which it came to provide energy for the creation of new electrons and atoms.

Native science reflects a celebration of renewal. The ultimate aim is not explaining an objectified universe, but rather learning about and understanding responsibilities and relationships and celebrating those that humans establish with the world. Native science is also about mutuality and reciprocity with the natural world, which presupposes a responsibility to care for, sustain, and respect the rights of other living things, plants, animals, and the place in which you live. This is reflective of one of the oldest ecological principles practiced by Indigenous people all over the world, past and present, principles that have been incorporated as metaphysical, and practical, rules for human conduct. In addition to responsibility there is also celebration of life, a key element in seeking to understand how to live a good life. Native scientific philosophy reflects an inclusive and moral universe. All things, events, and forms of energy unfold and infold themselves in a contextual field of the micro and macro universe. In other words, Native science is inclusive of all the ways that humans are capable of knowing and understanding the world.

Today, with the creative influence of chaos theory and quantum physics, a new scientific cultural metaphor has begun to take hold. The insights of this new science parallel the vision of the world long held in Indigenous spiritual traditions. Because of this undeniable parallel, Indigenous thought has the potential to inform a contemporary understanding of chaos. Such understanding allows modern consciousness to encompass the primal wisdom of Indigenous thought and with this to understand the fallacy of scientific and societal control. Rather than seeking to control natural reality, Native science focuses its attention upon subtle, inner natures wherein lie the rich textures and nuances of life. This is exactly what chaos theory shows us: small, apparently insignificant things play major roles in the way a process unfolds.

Spurred by the development of quantum physics with its view of the universe as one indivisible whole, even Western scientists have begun to change their orientation from conviction of an absolute, to one of relative, truth among many truths and possible orientations. They have become more open to consideration of other cosmologies.

The ideas and processes of Native science are conceptual wellsprings for helping to bring about the integration of science and spirit, that marriage of "truth," the ideal goal of science, with "meaning," the ideal goal of spiritual practice. The unity of knowledge now dominates theoretical debate in the philosophies of both science and theology. A new world philosophy of science, designed to meet the environmental challenges of the future which will require a totally different way of living in nature, would draw from the knowledge, understanding, and creative thinking of past and present. As we enter the first decade of a new millennium, Native and Western cultures and their seemingly irreconcilably different ways of knowing and relating to the natural world are finding common ground and a basis for dialogue, the integration or the lack thereof will determine the direction of contemporary society in the twenty-first century.

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