

Minding Nature

expanding our natural & civic imagination

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Alexander von Humboldt's Expedition, 1799-1804

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Science, Values, and Ecological Vision

BRUCE JENNINGS

In 1958, just five years after Watson and Crick revealed the molecular structure of DNA, the philosopher Hannah Arendt warned presciently of the growing alienation that science was causing between humankind and the natural world. This warning came in her book *The Human Condition* at a time when the “biological revolution” was still nascent, and well before the dawn of contemporary genetic engineering and biotechnology. “The human artifice of the world,” Arendt writes, “separates human existence from all mere animal environment, but life itself is outside this artificial world, and through life man remains related to all other living organisms. For some time now, a great many scientific endeavors have been directed toward making life also ‘artificial,’ toward cutting the last tie through which even man belongs among the children of nature.” And she concludes, “The question is only whether we wish to use our new scientific and technical knowledge in this direction, and this question cannot be decided by scientific means; it is a political question of the first order and therefore can hardly be left to the decision of professional scientists or professional politicians” (p. 2-3).

Several points suggested in these remarks are fundamental to this issue of *Minding Nature*.

First, Arendt, who is not usually categorized among environmental philosophers, has in fact an ecological vision of the relationship between humans and nonhuman nature, which are interconnected in the relationality—the web or “tangled bank”—of life itself. She goes further and argues that it is within this web of life—as one among many “children of nature”—that human experience of the world has developed, and that we have come to comprehend, not only the natural environment, but also ourselves. To understand nature and life on the one hand, and meaning and humanity, on the other, are not conflicting projects, but are inextricably bound together.

Second, she identifies the essential paradox of human being as residing in the fact that we are at once dependent on the world of natural life and powerful enough to break away from it by creating an artificial world and a technological simulacrum of natural life. Heretofore in history manifested only in limited ways and on local scales, this human power to create the unnatural has reached the threshold of world transforming potential on a global scale. This, for Arendt, is a truly radical possibility not only because it may bring about the loss of biodiversity on a massive scale, but also because it will fundamentally transform our way of being in the world. It will obliterate our humanity. How is that conceivable? It is because “humanity” is not an essence; for Arendt it is a particular condition of body and thought rooted in our connection to the earth, in what she terms our “natality.”

Finally, Arendt associates “science” with this radical, and radically dangerous, transformative power. Science unlocks the inner workings of nature so that nature can be “forced,” in Francis Bacon’s memorable metaphor, to serve human needs and desires. But again it is the step beyond Baconian science that most concerns Arendt, the step that will not merely use or manipulate nature, but replace it, particularly in the biological sphere. Science as power has no value dimension; it is amoral. As such it must be directed by a value-laden vision and control mechanism, which is what Arendt calls the political.

Now notice one last twist. It is a commonplace for Arendt to say, as she does, that professional scientists do not have the political, value-laden vision to control the power of science on behalf of society and nonhuman nature. More striking is her assertion that the political problem of the governance of science is beyond “professional politicians,” as well. This is a saber thrust against the form of government we know as representative democracy and interest group liberalism. The values and the vision of the political domain reside with ordinary citizens at large, and Arendt here implicitly (elsewhere more explicitly) calls for the participatory or deliberative democratic governance of science. Left to themselves, scientific elites and political elites will not be up to the task; and the stakes are too high for us to continue technocratic business as usual. The fundamental direction of science—the use of bio-power in the face of life—is at stake. Although she never uses such a phrase, it seems to me that what we call “ecological democratic citizenship” here at the Center for Humans and Nature is not altogether foreign to what Hannah Arendt had in mind 50 years ago.

But nature is a stranger yet;
The ones that cite her most
Have never passed her haunted house,
Nor simplified her ghost

— Emily Dickinson,
“What Mystery Pervades a Well”

The essays in this issue of *Minding Nature* converge in various ways on the theme of science and values. Reminding us that disciplined observation of the natural world and rigorous thinking that finds the systematic connections between isolated observations and data—in a word, science—need not be Baconian in intention or effect, Laura Walls and William Forbes reflect on the distinctive scientific work of Alexander von Humboldt and Aldo Leopold. The work of each thinker was influenced in important ways by their encounters with the complex ecosystems of South America. Professor Walls’ essay is drawn from her important new book on Humboldt, *The Passage to Cosmos: Alexander von Humboldt and the Shaping of America* (2009). The relationship between science and values in the work and career of Leopold were also the topic of a conference at the Yale School of Forestry, on the centennial of his graduation from that school. My CHN colleague Curt Meine and I made brief presentations at that conference.

The type of science that Humboldt pioneered and Leopold practiced is a far cry from the amoral exercise of mechanistic power that Arendt seems to have in mind. Not all of science and not all scientists should be tarred with a Baconian brush. Moreover, if scientific knowledge, properly construed, has a vision of nature and a value orientation embedded in it—not just inadvertently but constitutively—then professional scientists as well as humanities scholars, social scientists, and ordinary citizens have something to contribute to the normative governance of science as well. Ethical professionalism and ecological democratic citizenship can go hand-in-hand.

If a non-reductionistic, scientific understanding of nature does contain an education in values, then everything turns on getting those values right. Here we offer a powerful statement by William Vitek of the values we must embrace today and the changes in our conduct that we must make tomorrow to realize those values. He shares, I think, something of Arendt’s own sense of the radicalism of the question of life that is before us now, and he understands what effort it will take to preserve our humanity and that of future generations.

Finally, an investigation of the ethical principles that should guide freshwater management, and how these principles can be rooted in an ecological vision of both the water cycle and public health, has been conducted by CHN in 2009. Some of the results of that inquiry are presented in this issue.



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Introducing Humboldt's Cosmos

LAURA DASSOW WALLS

Until 1845, Humboldt was known in the United States mostly as an explorer and recorder of the exotic American tropics and one of Europe's leading scientists. It had been nearly twenty years since a major new work by Humboldt had appeared in English.¹ Then he began to publish *Kosmos*, and everything changed. A raft of book reviews

alerted the intelligentsia that something new was afoot. Suddenly translations issued by both British and American publishers flooded the market: three competing versions of *Kosmos*, one cheap and pirated, one elegant and expensive, and one for the mass market; two competing translations of *Ansichten*; a new and updated translation of *Personal Narrative*, conveniently packaged in three trim volumes; Thrasher's expurgated *Island of Cuba*; and two new biographies, all in the space of a decade, attended with a torrent of reviews and notices. Major new works on or by Humboldt continued to appear for another fifteen years or so, capped by the authoritative life-and-letters biography of 1873. In the United States, the 1850s were the decade of Humboldt, and his popularity approached cult status.

Humboldt's *Kosmos* did important cultural work for America. Though the multi-volume book published in English as *Cosmos* is known today (if it is known at all) as a popular science book about stars, that's a little like saying Darwin's *Origin of Species* is a book about breeding pigeons. Such a view miscalculates the broad impact Humboldt had on American literature and art. In memorializing his friend, the political scientist Francis Lieber caught the developing tension when he protested that, while "high authority" stated that the works of Humboldt presented

"Nature in her totality, unconnected with Man," really Humboldt comprehends nature "in *connexion* with man and the movements of society, with language, economy and exchange, institutions and architecture." Humboldt's status as an icon was so great that for some years after his death a high-stakes game was played over how to define his legacy, and "high authority" made sure that what survived of Humboldt was safe, nonthreatening, and obsolete: his science, stripped of all its human connections. Cutting Humboldt down to size was a necessary move in the modernization of scientific knowledge, but it obscured the social and aesthetic dimensions of Humboldt's thinking, and it invited later generations to assume that his turn to *Cosmos* was a retreat from the tortuous and repressive politics he found himself helpless to influence.²

Humboldt did think of the study of nature as a kind of escape, to a zone of freedom where local discords were ultimately resolved into harmony. But this Utopian vision was not a retreat but an advance that drove his social critique, which went on unabated in the pages of *Cosmos*. For the study of nature was, for Humboldt, inseparable from the study of the mind in its material, social, and cultural context. This reflexivity of mind, society, and nature became his overriding argument in *Cosmos*, which

was, for Humboldt, the culmination of one of his oldest ideas—indeed, the idea that had propelled him from war-torn Europe to witness the harmonies of nature in the New World, where European empires were dying and new nations being born. As he put it as soon as he returned, such studies “make us live in both past and present times, gathering around us all that Nature has produced in the various climes, bringing us into communication with all the peoples on Earth.” And from past and present such studies project us into the future as well, by enabling us to “erect forever the laws to which Nature submits. It is in undertaking these researches that we prepare ourselves for an intellectual delight, a moral freedom that strengthens us against the blows of destiny, and which no external power could possibly destroy.”³ In short, the study of nature creates and bonds the human community and gives us the strength to resist the social pathologies that would tear us apart.

That “moral freedom” was written into the very fabric of nature encouraged Americans, busy inventing themselves as “Nature’s Nation,” to think of themselves as the privileged inheritors of nature’s sublime power and beauty, which they cast, almost universally, into religious terms: in the United States, Humboldt’s Cosmos was made to glow with a penumbra of Providential national destiny, of prophetic vision, giving it a supernal beauty that wove science and poetry and art, religion and morality, together as expositors of the New World, God’s most exceptional Creation. Humboldt’s Cosmos seemed made for America, and Americans adopted it into their founding mythology.

Cosmos was born, Humboldt said, on the slopes of the Andes and first took shape in the 1805 *Essay on the Geography of Plants* that he dedicated to Goethe; but the idea had been with him since those formative years at Jena and Weimar and even before, in those heady conversations on the Rhine with Georg Forster. After this long foreground, the catalyst was a moment of crisis. Humboldt loved Paris, the center of the scientific world, where he was free to work as he pleased and love whom he pleased. But in 1827, his freedom ended when, having spent himself into poverty publishing his great scientific works, his King reminded him of his debt and recalled him to Berlin. In Paris he had recently given a series of lectures to a circle of friends exploring the “reflective influence” nature exerted on the mind; when he arrived in Berlin (then, according to Alfred Dove, quite the cultural dustbin), he announced he would give a course of lectures on physical geography. From November 1827 through April 1828 he delivered a series of sixty-one lectures at the University of Berlin, speaking extemporaneously from a loose outline to a room so crowded that he soon announced a second series, which

was held in a music hall before an audience of thousands, free to all comers. The reception was ecstatic. Initially skeptics had grumbled that Humboldt was so Frenchified he had probably forgotten his native German; for his part, Humboldt aimed his lectures at the heart of German provincialism, particularly what he saw as the corrupting flatulence of Hegel and the ignorant mediocrity of Schlegel. Goethe loved it: “The mighty conqueror of the world of science is perhaps the greatest orator,” he wrote; to a

The reader struck with awe or moved by beauty will want to learn more. This had political consequences.

friend he mentioned “the great pleasure which Humboldt’s magnificently rich colloquium on the miracles of nature gave me.” To another friend he reflected that Humboldt made him feel “like an ancient mariner” who had spent his life skipping from isle to isle, but who now sees “that the immeasurable abyss has been fathomed . . . that the great work, beyond all belief, has been truly done.” Historians credit Humboldt’s lectures with jump-starting German science, which went on to surpass even the French in brilliance, and with demonstrating that the true value of science lay not in its coterie appeal to an elite few, but in its power to raise and educate the many.⁴

Publishers pressed Humboldt with offers, but he resisted, declaring that his off-the-cuff lectures were hardly fit for print. By 1834, though, he was ready: as he wrote to Varnhagen, “I begin the printing of my work (the work of my life). I have the extravagant idea of describing in one and the same work the whole material world—all that we know to-day of celestial bodies and of life upon the earth—from the nebular stars to the mosses on the granite rocks—and to make this work instructive to the mind, and at the same time attractive, by its vivid language.” The long introductory essay was finished and to his friend he outlined the rest, regretting that he could not concentrate the whole in one single “magnificent” volume. There was, though, the problem of what to call it. Already twenty years before, in the introduction to his *Personal Narrative*, he had worried over what name to give his new science: natural history of the world? Theory of the earth? Physical geography? None quite fit. With Varnhagen he fretted over the problem once again: all the obvious possibilities—“Physical Description of the Earth,” “The Book of Nature,” “Physical Geography”—were too vague or too narrow. He considered, and rejected, “Gaea” (now spelled “Gaia,” as

in James Lovelock's "Gaia hypothesis"), which had been recently used by another author. So, taking a deep breath, he declared, "The title shall be 'Kosmos.'" Yes, it sounded pretentious, but the ancient Greek word gave him what he needed, heaven and earth *together*; and Wilhelm, with his deep learning in classical languages, approved. So there it was. Would Varnhagen do him the kindness of a preliminary reading, kind but tough-minded? "And do also ease my mind as to the title." Evidently Varnhagen did, for "Kosmos" it remained.⁵

The work grew as he wrote. It would gather together two generations of scientific research and discovery: into more than a dozen boxes Humboldt sorted his notes on scraps of paper, which he pasted together by their corners to form what his nineteenth-century biographer called "the most wonderful serpent-like structure of erudition." Information came in from his hundreds of correspondents, from all over the globe: this was nothing less than the great in-gathering of the Humboldt Network, dispersed across the planet but united by Humboldt's concentrated vision. The German scholar Petra Werner has recently "disaggregated and interrogated" the portion of Humboldt's vast correspondence that went into *Cosmos*, showing "the extraordinary extent" to which he relied on friends and admirers; "In a real sense," adds Nicolaas Rupke, "Humboldt, in writing the description of the physical universe, acted as the editor of a large, international, collaborative team," cajoling their cooperation by offering each of his correspondents in return "his much valued praise and patronage." Humboldt was again at the center of the world, in his walk-up flat in the heart of Berlin, stacked with boxes, books, papers, maps, and mementoes. "Glorious old man!" exclaimed Richard Stoddard: "We love to think of thee and thy immortal task." Next to blind old Milton dictating *Paradise Lost*, "we know of no grander spectacle than the white-haired Humboldt writing 'Kosmos' at midnight!" Stoddard wrote that Humboldt finished the last page of the fifth and last volume on September 14, 1858, his 89th birthday. "His friends assembled at his house and congratulated him," laughing off Humboldt's presentiment that he would not outlive the following spring.⁶

Cosmos was the scientific bestseller of the age. In 1845, the first edition of the first volume sold out in two months; by 1851, Humboldt estimated that 80,000 copies had been shipped. He himself superintended the French translation, and by 1846 it had also been translated into English, Dutch, and Italian. His publisher wrote in 1847 that the demand for the second volume was "epoch-making": "Book parcels destined for London and St. Petersburg were torn out of our hands by agents who

wanted their orders filled for the bookstores in Vienna and Hamburg. Regular battles were fought over possession of this edition, and bribes offered for priorities." As Cedric Hentschel notes, our post-Darwinian perspective obscures the intense enthusiasm with which the first two volumes of *Kosmos* were received. Scores of thoughtful and laudatory reviews of the five successive volumes of *Cosmos* circulated in England and America, stoking the fires of enthusiasm, and in 1851 Humboldt's bust was given a place of honor at London's Crystal Palace. King Friedrich Wilhelm IV had a commemorative medal struck featuring a profile of Humboldt on one side and a sphinx on the other, under the legend "ΚΟΣΜΟΣ." Humboldt himself was rather bewildered by it all. "How has it happened that Kosmos is so popular beyond expectation?" he wondered to Varnhagen. It must be, he thought, in the imagination of the reader, or the fortuitous richness of the German language—as if the age itself were writing through Humboldt, making him its instrument.⁷

Humboldt had worked hard to capture the public imagination, and in his opening pages he mounts a defense of popular science, directed to both the general reader and to his colleagues in science who needed to be shown how to bind their research to society. The great Romantic traveler offers to lead his readers on a "journey" not to a far-distant land but "through the vast range of creation." As we set out, we may "distrust . . . our own strength, and that of the guide we have chosen," and indeed, he worries he may lose us in the jungle of dry details, or strand us on a mountaintop of abstractions. Like all guides who delight in leading others "to the summits of lofty mountains," he fears he may have erred "in describing the path before us as more smooth and pleasant than it really is," praising the view when all we can see is clouds. If so, blame, then, he begs, not the landscape of the sciences but "the unskillfulness of the guide who has imprudently ventured to ascend these lofty summits." For the journey is worth the risk: "Nature is a free domain" that can be truly delineated only by "exalted forms of speech, worthy of bearing witness to the majesty and greatness of the creation."⁸

To skeptics who doubted that the ignorant public could ascend to the heights of science, Humboldt answered that while they may not catch every detail, the journey itself will "enrich the intellect, enlarge the sphere of ideas, and nourish and vivify the imagination." After all, detail was like scaffolding—it must be removed if the edifice is to have "a striking effect." And it was the "effect" Humboldt was after. The reader struck with awe or moved by beauty will want to learn more. This had political consequences. Francis Bacon had said that "in human societies, knowledge is power. Both must rise and sink together." But to

Humboldt this meant not that the powerful must claim knowledge but that knowledge must be “the common property of mankind.” Societies that shared knowledge across “all classes of society” would rise and prosper, strong and invigorated by their arts and sciences even if poor in natural resources. Conversely, societies that did not value public education would “diminish,” even though erected on mines of gold. For, Humboldt reiterated, “the knowledge that results from the free action of thought is at once the delight and the indestructible prerogative of man.”⁹

Humboldt had a well-honed sense of how words and thought act on each other and how both in turn interact with wider society. Reintroducing an archaic word into the modern lexicon was an ambitious act, a deliberate intervention intended to change the intellectual and emotional landscape of modern knowledge. It would take Humboldt five volumes to fully define “Cosmos,” but he dropped a hint in his second paragraph, calling it a “harmoniously ordered whole.” When a few pages later he was ready to pull back the veil a little more, he addressed himself to citizens of the planet itself: his “*science of the Cosmos* recalls to the mind of the inhabitant of the earth” that his horizon is much wider than any nation or region: it embraces “the assemblage of all things with which space is filled, from the remotest nebulae to the climatic distribution of those delicate tissues of vegetable matter which spread a variegated covering over the surface of our rocks.” From the farthest nebulae to the lowliest lichens—in this way his “picture of the world may, with a few strokes, be made to include the realms of infinity no less than the minute microscopic animal and vegetable organisms.” No other existing word—universe, earth, *monde*, world—captured the reach of the harmonies observed from the heavens to the

speaks to the observed fact that the physical universe, quite independently of us, exhibits regularities and patterns that we can identify as laws. Beauty, “adornment,” however, is perceptual, literally in the mind of the beholder. This is the double side of Humboldt's Cosmos: first, the physical universe exists quite apart from us; as Margarita Bowen says, “The concept of the pre-existing universe is essential to Humboldt's philosophy.” But that is not the complete story: it exists as a *Cosmos*, both ordered *and* beautiful, through the human mind. Humboldt's Cosmos is thus fundamentally developmental and dynamic. It emerges and grows as human conceptions of nature and the depth of human feeling about nature enlarge and deepen. As a narrative, Cosmos is still being written. Or, in Humboldt's favorite metaphor, Cosmos is a “picture” which comes into being as we paint it and view it. Without art—taking the word in its broadest sense to include science, technology, exploration, literature and the visual arts, gardening and the painting of landscapes—there may be a perfectly fine universe, but there will never be a Cosmos.¹¹

To represent this double-sided aspect of Cosmos, Humboldt divided his book into two parts, to be read stereoscopically, each in light of the other. The first volume (following his lengthy introduction) shoots into the outermost reaches of deep space then leads the reader gradually back to earth, visible now in the most profound way as a *planet*, one small globe spinning in pulsing, swirling, limitless space. The journey continues across the face of the planet and into its superheated interior, to show the earth, too, pulsing and swirling with energy; then concludes with the life on its surface, in all its astonishing multiplicity, including the races of men who, like all else, are united by virtue of their very diversity into the “one

The Cartesian dualism that separates spirit from body, mind from matter, humans from nature, was in Humboldt's day as now so dominant as to seem intuitive and inevitable. Humboldt's history, though, integrates mind and material nature by showing how humans and nature together create the Cosmos.

earth under our feet. Thus he will reintroduce the word that originated with Pythagoras and Aristotle: *Cosmos* “is the assemblage of all things in heaven and earth, the universality of created things constituting the perceptible world.”¹⁰

As Humboldt soon adds, *Cosmos* signifies both the “*order of the world*, and *adornment* of this universal order.” Herein lies his distinctive use of the word: there are two aspects of the Cosmos, “order” and “adornment.” The first

great whole . . . animated by the breath of life.” Once he has concluded this outer or “objective” journey through the external world of the senses, Humboldt next takes us, in the second volume, on an inner or “subjective” journey through mind, “the inner, reflected intellectual world.” He means not psychological exploration, but something more Wordsworthian, the emergence and growth of mind-in-nature, “the reflection of the image impressed by the sense upon the inner man, that is, upon his ideas and feelings.”

Where the first volume journeys through space, the second journeys through time—historical time, from the earliest civilizations nestled in the Mediterranean basin, through the ramifying globalization of the sphere of the mind as nations launch onto the oceans or caravan across continents to meet, merge, mingle, separate, each era and each people contributing something to the growing Cosmos: words, poetry, gardens, concepts, the compass, rice and sandalwood, telescopes and paintings, ships, treatises, and scriptures. Born in awe and wonder before nature's power and beauty, the human mind reaches out from itself to grasp nature through words and tools, and through the millennia nature and mind develop each other in an ever-diversifying historical process.¹²

This was not quite like anything that had ever been done before, and Humboldt patiently clarifies what he is not doing. He is not, first off, writing “a mere encyclopedic aggregation” of the results of science. He is, rather, trying to find their unifying thread, “to show the simultaneous action and the connecting links of the forces that pervade the universe.” A contemporary reviewer caught the spirit of Humboldt's work when he wrote that *Cosmos* was like “a burning-glass” that reflected the investigations of science “on the mind of the reader in a cleared state and united in an organic whole.” Nor is he writing “science” in the strict sense—that is, he has no wish “to reduce all sensible phenomena to a small number of abstract principles, based on reason only.” This is the distinction that Franz Boas would seize on for his own intellectual program: whereas science seeks laws, cosmography romances the phenomena. At one point Humboldt put it this way: the spirit of his project, “physical cosmography,” “arises from the sublime consciousness of striving toward the infinite, of grasping all that is revealed to us amid the boundless and inexhaustible fullness of creation, development, and being.” “Grasping” the fullness of creation aspires to connection, to touch and hold and explore, and Humboldt worries about those who, in striving toward the infinite, abandon the physical world. This impulse has deluded seekers through the ages into thinking they have reached their goal, found the single great commanding principle that unifies all. But that, Humboldt ventures, will never happen. The sheer complexity and diversity of nature will always outrun the scientist: as Thoreau would say, “The universe is wider than our views of it.”¹³

Thus—sounding a little defensive—Humboldt fends off his reductionist friends: “Devoid of the profoundness of a purely speculative philosophy, my essay on the *Cosmos* treats of the contemplation of the universe, and is based upon a rational empiricism,” or “facts registered by science.”¹⁴ Humboldt is drawing a crucial distinction here.

Both science and cosmography, as Boas recognized, are empirical, based on facts; both share a conviction that the universe forms “one great whole,” and that human reason can aspire to understand the truths of that whole—but exactly where science then leaps beyond the physical to the abstractions of law and principle, Humboldt instead turns back to “contemplate” the staggering beauty of the Cosmos. His motion is thus parabolic, not linear. He wants his feet to burn on the steaming rocks of volcanoes, his soul to be riven by the bleak fierce llanos, his mouth to taste the Otomacs unctuous earthen baked clay, his heart to be moved by the song of the capirote. Here is his harmony, his song; not in the austerity of the laws of science, but in the way all these things seem to him to be one great thing, infinite and infinitely interconnected. In such a view, oneness cannot be seized by a law—only sung by a poet.

The poetry of Humboldt's prose will not be evident to readers of English until better translations become available, and even then, Humboldt apologized repeatedly for his faults of style. Yet if he seldom managed to write like a poet, he always thought like one. The American nature writer John Burroughs recognized this when he wrote that Humboldt's “poetic soul, shines out in all his works and gives them a value above and beyond their scientific worth . . . His ‘Cosmos’ is an attempt at an artistic creation, a harmonious representation of the universe that should satisfy the aesthetic sense as well as the understanding.” To accept Humboldt as a poet means to view poetics, as Humboldt did, in the Aristotelian sense as *poiesis*, “making,” emphasizing the process of making over the finished product; and in the Romantic sense as original creation rather than imitation, an art that grows organically from an inner impulse that arises ultimately from nature. In this work, which he called in his subtitle a “sketch” of the physical universe, he first paints his own picture of the Cosmos (recalling his skill as a portrait painter and landscape artist), then outlines an historical narrative showing humans and nature “making” a Cosmos. In effect, he did in language what he had done long ago in his Chimborazo cutaway, his thumbnail Cosmos—used his double vision to give an aesthetically pleasing image of nature framed, literally, with the supporting reams of scientific data. In *Cosmos*, the imagination of the viewer—whether poet, artist, or scientist—fused information into a new and beautiful whole. As Kropotkin exclaimed, out of the confusion of facts and the fog of guesses, a “stately picture” emerges from their mist like an Alpine chain glittering under the sun; Kropotkin thought a copy of *Cosmos* should be given to every schoolchild. Humboldt too wanted this exhilaration not for the few but for the

many. The “contemplation of nature” makes self, nation, and nature into a coherent world, and is a necessary part of the “*Bildung*,” or growth and integration, of the self in the world.¹⁵

Making that world, for Humboldt, had one very specific requirement: it must be based on accurate causal connections as established by modern science. The abuse of sheer reason or “speculative philosophy” had, he believed, misled the “noble but ill-judging youth” of Germany

Cosmos is thus fundamentally developmental and dynamic. It emerges and grows as human conceptions of nature and the depth of human feeling about nature enlarge and deepen.

“into the saturnalia of a purely ideal science of nature . . . signaled by the intoxication of pretended conquests” and a “scholastic rationalism, more contracted in its views than any known to the Middle Ages.” His disgust with idealists who abandoned actual nature to spin metaphysical fantasies brought him closer to the empirical materialism of his French colleagues. Yet while he approved and drew heavily on the results of their science, he was after something else, a “cosmical presentation awakened in me by the aspect of nature in my journeyings by sea and land.” One could call what he was after *grounded imagination*.¹⁶

For instance, one of the keenest passages of the *Personal Narrative* describes the working of imagination: barely six weeks after landing in the New World, entering the mountains above Cumana, Humboldt is watching night fall and the southern stars come out. “The tree under which we were seated, the luminous insects flying in the air, the constellations that shown toward the south; every object seemed to tell us, that we were far from our native soil.” Then the ringing of a cowbell or roaring of a bull from the valley below would suddenly awaken a remembrance of home: “They were like distant voices resounding from beyond the ocean, and with magical power transporting us from one hemisphere to the other. Strange mobility of the imagination of man, eternal source of our enjoyments, and our pains!” While the body is grounded it is the imagination that connects, that can be in many places at once. Humboldt attests that the mind of “the most savage nations” is moved to awe at nature’s power and beauty, forming “a bond of union, linking together” the visible world with the higher world of spirit. The deep emotions thus awakened, the sense of “intimate communion with nature,” lead first

to worship and deification; then, awakening reflection allows the developing mind to separate ideas from feelings. “Vague presentiments” of nature’s harmonious union are no longer enough. The mind moved by awe and wonder succeeds to reflection, to understanding, to doubt and investigation—to science.¹⁷

Does science then turn on and kill the imagination that gave it birth? On the contrary, argues Humboldt: the prejudice that science must kill the feelings is wrong. The excitement of discoveries, of “mysteries to be unfolded” and the “inextricable net-work of organisms,” carries thought forward. Wonder and the pleasure of discovery feed the desire to know, and knowledge leads back to wonder, in an ascending spiral fed by imagination at every turn that ever enlarges and will never end. Nature is without limit, “ever growing and ever unfolding itself in new forms,” and even “when thousands and thousands of years have passed away,” the surface of the earth, its interior, its oceans, its atmosphere, will forever “open to the scientific observer untrodden paths of discovery.” As Thoreau wrote in the full flush of his excitement after reading Humboldt, “the sun of poetry & of each new child born into the planet has never been astronomized, nor brought nearer by a telescope. So it will be to the end of time. The end of the world is not yet.”¹⁸

It seemed to Humboldt that our feeling for nature has two different dimensions. First is the impact of the whole. Nature in its sheer allness, “the image of infinity” revealed by “the starry vault of heaven,” the “far-stretching plain,” or “the vast expanse of ocean,” awakens us to an intuition of “the order and harmony pervading the whole universe.” But there is also nature in its eachness, its individuality. Here Humboldt revels in his memories. His language turns to poetry, as he recollects:

the calm sublimity of a tropical night, when the stars, not yet sparkling, as in our northern skies, shed their soft and planetary light over the gently heaving ocean; or . . . the deep valleys of the Cordilleras, where the tall and slender palms pierce the leafy veil around them, and waving on high their feathery and arrow-like branches, form, as it were, ‘a forest above a forest;’ or I would describe the summit of the Peak of Teneriffe, when a horizontal layer of clouds, dazzling in whiteness, has separated the cone of cinders from the plain below, and suddenly the ascending current pierces the cloudy veil, so that the eye of the traveler may range from the brink of the crater, along the vine-clad slopes of Orotava, to the orange gardens and banana groves that skirt the shore.

In such scenes, the heart is moved not by nature's general charm but by "the peculiar physiognomy and conformation of the land, the features of the landscape, the ever-varying outline of the clouds," by the irreplaceable uniqueness of each place, each different way of being. In a deep insight into Humboldt's language, David Kenosian observes that to him, "South American ecosystems were not so much unconnected sentences . . . as they were poems."¹⁹

It is this "physiognomy" that most entrances Humboldt, for it is here, at this threshold, that nature interpenetrates mind. Painters casually refer to "'Swiss scenery' or 'Italian sky,'" but Humboldt takes such phrases seriously and tries to identify the individual elements that compose these painterly impressions: "The azure of the sky, the effects of light and shade, the haze floating on the distant horizon, the forms of animals, the succulence of plants, the bright glossy surface of the leaves, the outlines of mountains, all combine to produce the elements on which depends the impression of any one region." Yet how is it that such elements of sky and light and form "impress" themselves on nations, peoples, individuals? Why do we rejoice at the simple appearance of fields and woods? How does the look of vegetation influence "the taste and imagination of people," and more, how does it impress "the soul of those who contemplate it"? Humboldt thinks that nature moves us, shapes us, creates us, in ways that art seeks to capture and repeat but that we have never really thought about. In his *Essay on the Geography of Plants* this insight opens a flood of questions:

What is the moral cause of these sensations? Are they produced by Nature, by the grandeur of masses, the contour of forms, or the haven of plants? How can this haven, this view of Nature more or less rich, more or less pleasant, influence the mores and, primarily, the sensitivities of peoples? Of what consists the character of the vegetation of the tropics? What difference in physiognomy distinguishes plants from Africa from those of the New Continent? What analogy of forms unites Andean alpine plants with those found on the summits of the Pyrennées? These are questions little broached to at present, and doubtless deserved to occupy the physicist.

Doubtless they do, but as he added some years later, while science can measure and tabulate and compare, it cannot by these means communicate the character of nature. "What speaks to the soul, what causes such profound and various emotions, escapes our measurements, as it does the

forms of language."²⁰

Here, then, where it matters the most, science must necessarily fail. Thus Humboldt turns to art. Where science must weigh and measure, abstract and bring away, art can make present to the senses and the imagination the fundamental experience of contemplating nature in its wholeness, generating a similar emotional impact. As Joan Steigerwald explains, Humboldt uses his measurements "as instruments of judgment" which translate the phenomena of the natural world into a total impression, seeking, in reconciling "the opposing requirements of scientific precision and painterly effect," a new figurative vocabulary, "a new graphic form of representation." When it came to fine art, he encouraged the artist to become a cosmographer, analyzing the whole into its component parts: "in the sphere of natural investigation, as in poetry and painting, the delineation of that which appeals most strongly to the imagination, derives its collective interest from the vivid truthfulness with which the individual features are portrayed."

Here is the heart of Humboldt's aesthetics: art can incorporate and surpass science in conveying the perceptual truth of the whole, but only if the artist paints the truth of particulars. By truth Humboldt means natural historical truth. The artist cannot paint just "plants," but must become botanist and know each species, its growth and habits; clouds are not puffs of pigment but studies in meteorology; mountains are visual embodiments of geological principles, water of hydrology. Landscapes become not static portraits but dynamic historical ecologies. Literature, too, acquires life as it approaches individual truthfulness: just as a painter must first sketch in the field, Humboldt felt his Orinoco journal, "written while the objects we describe are before our eyes," had a more vital "character of truth."

In *Views of Nature* he further generalized his literary aesthetics: "Speech acquires life from everything which bears the true impress of nature, whether it be by the definition of sensuous impressions received from the external world, or by the expression of thoughts and feelings that emanate from our inner being." Write what you know, he might have said, whether your gaze turn outward or inward. In his artistic and literary realism, accuracy and imagination will not cancel out but reinforce each other, resonating together, and the higher the subject, the simpler and more truthful must be the writing. As he concludes, the poet who "knows how to represent with the simplicity of individualizing truth that which he has received from his own contemplation, will not fail in producing the impression he seeks to convey; for, in describing the boundlessness of nature, and not the limited circuit of his own mind, he is enabled to leave to others unfettered

To Hold: Sustainability of the Cast

COLLEEN LYONS

A whisper and snap as the line slices and whips the air. The hush, as the dry fly gently lays upon the water, attempting to lure a fish to the surface. A fish. Pure anticipation sublimates the work-a-day rhythm of casting and stripping. The glorious jolt of a strike is a sweet interruption. Casts are not discreet acts but transform into a lineage, priesthood, of a single metaphysical cast, transcendent of space and time. Before the Seventh Day, the Anglers song began in a whisper, crescendoed in a snap and tapered to the dust of a kiss in a perfectly presented fly.

The Anglers song has spawned enough casts to circle the globe, again and again. Enough line to five times lasso the tip of the crescent moon, ending in a neat little clinch knot. A gentle tug at each wrap, tips the moon, ever so slightly. Tides stutter, fish gasp and wonder, for a moment. The man-boy perched on the south horn of the crescent, tugged and flicked off balance, falls from sky to earth, morphing into gold dust, setting creeks and oceans to shimmer.

Indeed, fly lines and crescent moons are a whimsical notion. Yet, there is little whimsy in climate change and no romance in dead streams. The environment is an extraordinarily complex matrix of physical and abstract dependencies and its scope burdens the imagination. Healthy streams and rivers, the home for our beloved fish, are an essential part of a flourishing environment. Prudent management of these waters requires a passion for patience in nudging their appropriate evolution. As a result, humility, brutal science, mystical art and a dose of courage are crucial to cultivating natural resiliency in ecosystems. The polemics of politics and our occasional, collective inability to address the environment writ large has inhibited a satisfying policy outcome. The time is well past for phronesis—practical wisdom—in environmental policy.



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freedom of feeling.”²¹

To the physical scientist, the face of nature is superficial and shallow, a mask that, like Ahab, he must strike through to reach the hidden truth. But for Humboldt the face of nature did not hide but revealed the depths within. Those depths were temporal, for all objects encode their past: “We cannot form a just conception of their nature without looking back on the mode of their formation.” This is most obvious in the case of sedimentary rocks, which, laid down in successive ages, entomb the remains of organic worlds long since destroyed: “The different superimposed strata thus display to us the faunas and floras of different epochs.” The notion that one could “read” strata like the leaves of a book was already a commonplace, but Humboldt’s notion is rather different: “In tracing the physical delineation of

the globe, we behold the present and the past reciprocally incorporated, as it were, with one another; for the domain of nature is like that of languages, in which etymological research reveals a successive development.” Just as language reveals to the linguist a long history of linguistic evolution, so does the face of nature speak, like a language, of its own past, “reciprocally incorporated” into the present, which as Lyell recognized itself bespeaks the very mechanisms of change.²²

In this deepening narrative of origins, Humboldt links up the dispersal and diversification of languages and cultures with geological time, the upthrust of continents and mountains, the draining of valleys, the formation of deserts, all the way back to the first formation of rocks and landforms by volcanic activity. Wherever Humboldt

looked, whatever he looked at, he saw spatial patterns of distribution and change pointing back in an unbroken continuum through human history to the deep geological and even deeper astronomical past. This was the lesson he urged across the pages of his last volumes. All this could be “read” in the present by those who knew the language of nature, that most ancient of storytellers. The face of the land told its own story, its features “animate the scenery by the associations of the past which they awaken, acting upon the imagination of the enlightened observer like traditional records of an earlier world. Their form is their history.”²³

Wilhelm had seen his historical method as a logical extension of his brother's scientific method. Now Alexander turns the tables by calling his own method a kind of “historical composition,” citing his brother Wilhelm. Where the physical scientist can discount “accidental individualities, and the essential variations of the actual” in his attempt to reduce all to a “*rational* foundation,” the historian/cosmographer must turn to and treasure exactly those individualities and variations, as Boas had recognized. But there is yet another dimension to the telling of history: it is, in Humboldt's word, a “composition,” not a transparent transcription of Truth but a selection made from a particular and necessarily limited point of view. As Humboldt realized in his moment of bedazzled frustration on the sides of Tenerife's volcano, what lies around us is a jumbled chaos of apparently isolated facts. Some facts and connections are easy to see, others are cryptic or obscured, others still are lost forever and cannot be traced. None of them assemble themselves into a narrative in any obvious way: this is the work of the teller of stories. As the historian Michel-Rolph Trouillot observes, “history” has in this sense a double meaning: “In vernacular use, history means both the facts of the matter and a narrative of those facts, both ‘what happened’ and ‘that which is said to have happened.’”²⁴ Human beings, not nature, write histories, and human authors cannot simply transcribe revolutions—planetary or political—onto the page. They must select, foregrounding some elements, silencing others, teasing out of the chaos a meaningful pattern, a causal narrative.

If histories are “compositions,” does this mean they are fabrications, mere fictions? As Trouillot points out, this claim itself has a long history, but Humboldt would have rejected it. He required his cosmography to follow strict rules of evidence: just as landscape artists should not make up fantastic or stereotyped plants but portray real ones, so must the cosmographer be constrained by truth. Not everything his correspondents sent him went into *Cosmos*, only what Humboldt judged would deepen and refine our understanding of the causal interconnectivity of

the universe. And while no one was more fascinated by the marvelous, Humboldt wanted his marvels to be real, not isolated pointless curiosities but causally connected to the great whole: a man who gives milk, a people who can live on dirt, Amazon warriors, eels that electrify their prey, all were woven into his causal narrative, “accidental individualities” that yet evidenced something important. He applied the same standards to historical questions: Had this valley once been a lake? Had these fossil seashells high in the Andes been deposited on the ocean floor? Had the Indians of the Americas migrated from Asia? The standards of science constrained his conclusions, and he took care to make those constraints visible: yes, I think so, and here are the reasons why. Constrained, then, by truthfulness, he nevertheless assumed the freedom to tell his narrative in his own distinctive way, and his frequent self-conscious reflections on the way he is constructing his narrative show he understood his alliance with *poiesis*: truth is made, not transcribed. And this includes the scientist.

As Trouillot points out, no one actually remembers history, for no one living now experienced it: “the collective subjects who supposedly remember did not exist as such at the time of the events they claim to remember.” Sadly, no one can really remember the Alamo, or Wounded Knee, or slavery, and soon, no one will remember the Holocaust. What we do remember is what we were told: we believe Columbus discovered America because that is the narrative we hear from childhood onward. Insofar as we all do believe that narrative, we constitute ourselves as a collectivity, a people who share a common past and identity and sentiment of destiny. As Trouillot continues, “the past” is thus a creation of the present, and “their constitution as subjects goes hand in hand with the continuous creation of the past. As such, they do not succeed such a past: they are its contemporaries.”²⁵

If Trouillot is correct, then the writing of the past is not innocent: it has tremendous consequences. If resurrecting the ancient word “Cosmos” was calculated to make the concept of Cosmos thinkable, actionable—real—then telling the history of Cosmos was another calculated intervention. The Cartesian dualism that separates spirit from body, mind from matter, humans from nature, was in Humboldt's day as now so dominant as to seem intuitive and inevitable. Humboldt's history, though, integrates mind and material nature by showing how humans and nature together create the Cosmos. In effect, Humboldt is trying to rewrite history as ecological history—or as historical ecology. If science had thrown out history, as Boas would argue, Humboldt would put it back. How we tell our story about nature constitutes who we are as a people. If we tell it as dualistic, violent, and exploitative, we revalidate

those qualities as our essential truth. But if we can learn to tell it as integrated, cooperative, and sustainable, we will advance our rough-edged and imperfect civilization to a higher level.²⁶

In Humboldt's experience, the edges were rough indeed: he lived with warfare, reactionary politics, stark exploitation and brutal inequalities, even as he had grown up with utopian ideals of peace, liberty, equality and cosmopolitan brotherhood. He pours those ideals into his telling of the Cosmos: "Nature is a free domain," he asserts, and "the view of nature ought to be grand and free, uninfluenced by motives of proximity, social sympathy, or relative utility"—it must start, in other words, from the viewpoint of the stars and the planet earth, not our petty "human interests." Where humans constrain and limit, that which is most wild is most free, like the capirote, "which no effort has been able to tame, so sacred to his soul is liberty." In a society that assumes—as we still do—that only humans speak while nature is silent, Humboldt revels in the voices of nature, whether the heartrending song of the capirote, the raucous jungle chorus that awakes him at night, or the silence that only seems:

Yet, amid this apparent silence, when we lend an attentive ear to the most feeble sounds transmitted by the air, we hear a dull vibration, a continual murmur, a hum of insects, that fill . . . all the lower strata of the air. Nothing is better fitted to make man feel the extent and power of organic life. Myriads of insects creep upon the soil, and flutter round the plants parched by the ardour of the Sun. A confused noise issues from every bush, from the decayed trunks of trees, from the clefts of the rock, and from the ground undermined by the lizards, millepedes, and *cecilias*. These are so many voices proclaiming to us, that all nature breathes; and that, under a thousand different forms, life is diffused throughout the cracked and dusty soil, as well as in the bosom of the waters, and in the air that circulates around us.

To those who deny animals intelligence or even agency, as if they were no more than wound-up machines, Humboldt depicts the deep intelligence of mules: "When the mules feel themselves in danger, they stop, turning their heads to the right and to the left; the motion of their ears seems to indicate, that they reflect on the decision they ought to take. Their resolution is slow, but always just, if it be free; that is to say, if it be not crossed or hastened by the imprudence of the traveller." The mule-drivers, unconfused by metaphysics, know this well: "Thus the mountaineers

are heard to say, 'I will not give you the mule whose step is the easiest, but him who reasons best;' *la mas racional*. This popular expression, dictated by long experience, combats the system of animated machines, better perhaps than the arguments of speculative philosophy."²⁷

Where humans believe themselves to be separate from or above nature, Humboldt constantly uses metaphors of permeation: "the mind is *penetrated* by the grandeur of nature"; natural scenery leaves an "*impression*" on the mind; the physical world "is *reflected* on the inner susceptible world of the mind," in a "mysterious *communion* with the spiritual life of man"; the physical "*influences*" the moral world, in "a mysterious *reaction* of the sensuous on the ideal"; clarity and serenity of mind "*correspond* with the transparency of the surrounding atmosphere"; we are "*moved*" with emotion; majestic scenes of nature "*minge* with all our feelings of what is grand and beautiful." The body of the world has stolen through our senses into the deepest recesses of our mind, where it shapes our thought and language at the most fundamental level.²⁸

The variety of landscapes and seascapes under every-varying clouds opens the imagination's creative powers in a free play of mind: "Impressions change with the varying movements of the mind, and we are led by a happy illusion to believe that we receive from the external world that with which we have ourselves invested it." In Coleridge this insight provoked a mood of despair: "O Lady! we receive but what we give, / And in our life alone does Nature live." But this is not quite what Humboldt is saying. Where Coleridge collapses nature into mind, imprisons himself in an unhappy illusion that all nature is no more than a screen on which he projects his despairs and desires, Humboldt escapes this trap by insisting on *difference*, on the very fact that nature is *not* human. It is that very independence that allows nature to "impress" us so deeply. Only difference can "impress," like the bite of the printers' plate pressing the receptive paper. Humboldt's mentor Georg Forster put it this way, in recalling their travels on the Rhine: "the object, whatever it may be, that exists without the cooperation of man, that is, and was, and ever will be independent of him, impresses itself deeply upon the mind with a clear and sharply defined image." In some moods Humboldt found this power, this difference, shading into an indifference to the human. When he turned away from the tombs of the extinct Atures Indians, his dark thoughts gave him a curious kind of hope: "Yet when every emanation of the human mind has faded—when in the storms of time the monuments of man's creative art are scattered to the dust—an ever new life springs from the bosom of the earth. Unceasingly prolific nature unfolds her germs,—regardless though sinful man, ever at war with himself, tramples

beneath his foot the ripening fruit!"²⁹

By asserting that nature is independent of humans in a difference that is profoundly generative, Humboldt is trying to bridge the impasse reached by Kant, who had deepened the Cartesian dualism of mind and nature into an unbridgeable abyss by arguing that the non-human or "noumenal" world could never be reached or conceived. We could see only its phenomenal shadow, the mask, what little was open to the human senses. As Margarita Bowen details, Humboldt bridged this Kantian impasse by showing how humans developed their concepts over time, in a historical process by which they "are generated, tested and incorporated into the sphere of ideas." Through this historical process, ideas forged in the crucible of physical nature made the world of thought part of the process of nature. As Bowen observes, Humboldt sees the very gulf between mind and nature "as the locus of the sciences."³⁰

We are back, many pages later, standing on Humboldt's bridge, spanning the gulf between mind and nature. Humboldt wrote that while nature may be opposed to intellect, "as if the latter were not comprised within the limits of the former," and while nature may be opposed to art "when the latter is defined as a manifestation of the intellectual power of man," these "contrasts," though reflected "in most cultivated languages," must not be allowed to stand. We must not "separate the sphere of nature from that of mind, since such a separation would reduce the physical sciences of the world to a mere aggregation of empirical specialties." This was the very point at which Boas felt science had in fact arrived, by 1887: fragmentation into a variety of scientific specialties had abandoned the crucial problem of their union, which to Boas was not reductive but perceptual: we *see* that nature forms a whole, though science in its fragmentation no longer allows us ways to approach that sense of wholeness. Boas's solution was to resurrect Humboldt's "cosmography" because Humboldt started from the very perspective that science had eliminated in order to professionalize and specialize: the subjectivity of the observer. Humboldt thus ran exactly counter to the developing ideology of science, the objectivity which

to a rational understanding; it is mind directed toward nature." One simply cannot take mind out of the scientific equation. The external world exists for us only in the image reflected to mind by the senses, and so, "as intelligence and forms of speech, thought and its verbal symbols, are united by secret and indissoluble links, so does the external world blend unconsciously to ourselves with our ideas and feelings."³¹

Humboldt has returned here to his analogy with language: thought is to language as mind is to nature. Language both interprets thought and paints the objects of the world, mediating intellect and nature. At the same time, "it reacts . . . upon thought, and animates it, as it were, with the breath of life. It is this mutual reaction which makes words more than mere signs and forms of thought." Words push back on wordless thought, animating it with unexpected energies; nature too pushes back on mind, enabling and limiting it, shaping and "animating" it even as we invest it with qualities that we then imagine were there all along. The process is recursive, reactive, reciprocal—as Charles Sanders Peirce would discover when he put down his Humboldt and took up semiotics. Humboldt's point is simpler: thought, feelings, language, nature, are all inseparable. Language is the medium of thought, as nature is the medium of mind. The teller is part of tale she tells, a truth from which the scientist is not exempt. We are all standing on Humboldt's bridge, fishing into the gulf below, casting thought into words, casting words out into the world and reeling back what they have captured, even if it is only, as Thoreau says, "some horned pout squeaking and squirming to the upper air." Humboldt himself, rather less poetically, recruits a phrase from his nemesis Hegel: "External phenomena . . . are in some degree translated in our inner representations." Or as Humboldt continues, "The objective world, conceived and reflected within us by thought, is subjected to the eternal and necessary conditions of our intellectual being." Science might cast out subjectivity in its search for truth, but cosmology would bridge and build exactly on the abyss that science had created.³²

In a society that assumes—as we still do—that only humans speak while nature is silent, Humboldt revels in the voices of nature...

sought to purify science by removing subjectivity altogether. Ironically, in Humboldt's view, eliminating subjectivity to render nature as pure object actually rendered true science impossible: "Science begins where the mind takes hold of matter and attempts to subject the mass of experiences

Humboldt felt he had not finished this work—had really only begun, offering "a first imperfect attempt" that would incite rather than satisfy. But he did hope that his science of the Cosmos would someday unite "both spheres of the one cosmos—the external world, perceived

by the senses, and the inner, reflected intellectual world.” This has not happened, for the path which Humboldt indicated remains to be explored. When it is, we will better understand Humboldt's home truth, that the products of our “spiritual labor belong as essentially to the domain of the Cosmos as do the phenomena of the external world.” Humboldt is reaching here to a concept we are just beginning to grasp: as Ian Hacking observes, “philosopher and historian alike are part of the ecosystem that has been transformed by bearers of that vision in their interactions with nature as they saw it.” Gregory Bateson wrote of this insight as the “ecology of mind,” and Margarita Bowen calls it the “*ecology of knowledge*,” which acknowledges that “all knowledge occurs not only in society but in the dynamic space-time context of the earth ecosystem; the observer—and the scientist is no exception—thus must be considered always as part of the system being observed, the ideas and actions that issue from such observation are themselves incorporated in the dynamic system, to become part of the future environment.” As Bowen concludes, if as Humboldt says thought is really part of the Cosmos, it too has a carbon footprint: “the act of reading these words can be considered then as part of the carbon cycle,” the complex system of energy flow that links the organic and inorganic worlds. (The man who paused in his discussion of meteorology to point out that the air every animal breathes also carries speech and thus thought, “maintaining social intercourse,” would have gleefully agreed.) Bowen continues, “Humboldt's concept of nature incorporated human thought and culture; continuing that tradition, the ecology of knowledge affirms that all knowledge occurs within the functioning ecosystem and itself forms an integral part of that system, at least while mankind survives.”³³

We might not—as Humboldt reflected when he turned away from the graves of the vanished Atures. The Cosmos offers no guarantees. What humans have helped build, they may wholly destroy. High in the Andes, in the privacy of his journal, Humboldt felt a moment of despair: “Mountains of the moon and of Venus! When will we undertake that journey, propagating our culture over other planets—that is, our combination of vices and prejudices—devastating them as the Europeans have depopulated and sacked both Indies?”³⁴ Cosmos was not an accomplishment but a prospect—a viewpoint from which Humboldt could sustain a critique of a Western civilization that had, for good or ill, inherited the legacies of hundreds of nations across the millennia of cosmic progress. To reach that prospect, the Cosmos needed every one of Humboldt's many readers.



Notes

1. However, a biography had appeared: William McGillivray's *The Travels and Researches of Alexander von Humboldt* (New York: Harper, 1833).
2. Stoddard, *Life* 432-33.
3. Humboldt, “Essay on the Geography of Plants” 56-57.
4. Bruhns 2:112, 308; 1:87-88, 114; 1:173-75; quoted in Buttimer, “Beyond” 114. For Humboldt's *Cosmos* and popular science, see E. R. Brann, *Alexander von Humboldt: Patron of Science* (Madison, WI: E. R. Brann, 1954), 9-10; Bruhns 2:123-24; and Andreas Daum, “Science, Politics, and Religion: Humboldtian Thinking and the Transformations of Civil Society in Germany, 1830-1870,” *Science and Civil Society*, ed. Lynn K. Nyhart and Thomas H. Broman, *Osiris* 17 (2002): 107-40.
5. Humboldt, *Varnhagen* 35-39.
6. Bruhns 2:366; Rupke, Rev. of Petra Werner, *Himmel und Erde. Alexander von Humboldt und sein Kosmos* (Berlin: Akademie Verlag, 2004), in *Annals of Science* 62.4 (October 2005), 554; Stoddard, *Life* 437, 475. *Kosmos* clearly was never finished. The fifth and final volume, which is mostly index, has never been translated into English.
7. Quoted in de Terra, *Humboldt* 359; Cedric Hentschel, “Alexander von Humboldt's Synthesis of Literature and Science,” *Alexander von Humboldt 1769/1969* (Bonn: InterNationes, 1969), 124; Humboldt, *Varnhagen*, 197.
8. *Cosmos* 1:50, 54-55, 23. For a useful analysis of *Kosmos*, see Gisela Brude-Firnau, “Alexander von Humboldt's Sociopolitical Intentions: Science and Poetics,” *Traditions of Experiment from the Enlightenment to the Present* (Ann Arbor: University of Michigan Press, 1991), 45-61.
9. *Cosmos* 1:47, 53, 77, 51, 53.
10. *Cosmos* 1:24, 68, 79-80, 69-71. Not everyone was convinced by Humboldt's neologism: a London reviewer grumbled, “we venture to think his introduction of the word *Cosmos* into our vocabulary, and the word itself, after all, indefinite.” (Review of *Cosmos* vol. I, *Quarterly Review* 77 [December 1845]: 154-91, p. 164).
11. *Cosmos* 1:79; Bowen, *Empiricism* 257.
12. *Cosmos* 1:24, 3:5.
13. *Cosmos* 1:55; “Alexander von Humboldt's Cosmos,” *Broadway Journal*, 12 July 1845; *Cosmos* 1:49; 3:10-11; Thoreau, *Walden* 320.
14. *Cosmos* 1:49.
15. John Burroughs, “Science and Literature,” in *The Writings of John Burroughs, Vol. 8* (Boston: Houghton Mifflin, 1904), 49-74, pp. 64-65; Kropotkin, *Memoirs* 211.
16. *Cosmos* 1:76, 162-63. Humboldt is referring to his associates, some of them his friends, in the German school of *Naturphilosophie*, with which he is sometimes erroneously categorized.
17. PN 3:90-91; *Cosmos* 1:37-38. Humboldt did worry about offending Schelling and Hegel, as his letters to Varnhagen made clear; he intended his aspersions for their followers, the sort who would practice “Chemistry, without so much as wetting one's fingers,” and write such delicious nonsense as, “The diamond is a pebble arrived at consciousness” (101-07).

18. *Cosmos* 1:40-41; Thoreau, *Journal* 4:416-21 (2 April 1852).

19. *Cosmos* 1:25, 26 (the expression in quotations is taken from Bernardin de Saint Pierre's *Paul and Virginia*); David Kenosian, "Speaking of Nature," *Alexander von Humboldt: From the Americas to the Cosmos*, ed. Raymond Erickson et al. (New York: Bildner Center, City University of New York online publication), 506.

20. Humboldt, *Views* 217-18; Humboldt, *Essay on the Geography of Plants* 55; PN 4:133-34. In *Views* Humboldt notes an interesting example of bioregional imprinting on personal character: on his first sight of a pine forest, Montúfar, who had been born in Quito and had therefore never seen needle-leaved trees, felt that the trees were leafless, "and because we were journeying towards the cold north, he thought he recognised already, in the extreme contraction of the organs, the impoverishing influence of the pole" (*Views* 328-29).

21. Steigerwald, "Figuring Nature" 69-70; *Cosmos* 1:34; PN 4:419; *Views* 192; *Cosmos* 1:81. Many commentators presume a connection between Humboldt and the similar precepts of the British art critic John Ruskin. However, when asked if he had drawn on Humboldt's *Cosmos*, Ruskin huffed defensively that he had glanced at it and tossed it aside: "certainly I owe it absolutely nothing." (*Modern Painters*, 5 vols. [London: George Allen, 1897], 3:361). Ruskin in general found American landscapes too historically shallow to be interesting. Tropical landscapes struck him as grotesque, incapable of developing the mind or heart: "It would be difficult to conceive of groves less fit for academic purposes than those mentioned by Humboldt, into which no one can enter except under a stout wooden shield, to avoid the chance of being killed by the fall of a nut" (*Modern Painters* 5:151-52). Bernard Smith makes a case for the influence of Humboldt on Ruskin in *European Vision and the South Pacific* (New Haven: Yale University Press, 1985), 205-6.

22. *Cosmos* 1:72.

23. *Cosmos* 1:72.

24. Michel-Rolph Trouillot, *Silencing the Past: Power and the Production of History* (Boston: Beacon Press, 1995), 2.

25. Trouillot, *Silencing* 16.

26. There is a scientific field called "historical ecology," which according to one of its founders, William Balée, "seeks a synthetic understanding of human/environmental interactions within specific societal, biological, and regional contexts. In other words, the focus of historical ecology is a relationship, not an organism, species, society—not a 'thing.'" As the name of the field suggests, its practitioners follow changing ecological relationships, putting humans as key ecological actors at the center of explanations of ecological change across historical time. Its pioneers have done much of their empirical work in Humboldt's old haunts, the Amazon and Orinoco river basins, and they trace the roots of their field to Boas and, at least implicitly, to Humboldt. For an overview, start with William Balée, ed., *Advances in Historical Ecology* op cit; the quotation from Balée appears as an epigraph on p. 213.

27. *Cosmos* 1:83; PN 1:195, 4:505-6, 3:105-6.

28. *Cosmos* 1:25; *Views* 153-54, 219; PN 1:185, 5: 139. Humboldt's line of metaphors bears comparison with the work of George Lakoff and Mark Johnson, starting with their classic

work *Metaphors We Live By* (Chicago: University of Chicago Press, 1980).

29. *Cosmos* 1:26; Coleridge, "Dejection: An Ode," *Poetical Works*, ed. Ernest Hartley Coleridge (Oxford: Oxford University Press, 1967, 1973), 365; Bruhns 1:88; *Views* 173.

30. Bowen, *Empiricism* 255-57. I would argue that in this respect Humboldt's philosophy anticipates that of the French sociologist of science Bruno Latour. A Latourian analysis of Humboldtian science would be a very productive project.

31. *Cosmos* 1:76; first quotation as translated by Bowen, *Empiricism* 257 (nowhere than in this passage is the need for a modern translation of *Cosmos* more evident). I have treated the problem of Humboldt and scientific objectivity in "The Birth of the Two Cultures," *Alexander von Humboldt: From the Americas to the Cosmos*, ed. Raymond Erickson et al. (New York: Bildner Center, City University of New York online publication), 247-58.

32. *Cosmos* 1:56; Thoreau, *Walden* 175; *Cosmos* 1:76. The connections between Humboldt and Charles Sanders Peirce remain to be explored; for a promising start, see Bradley Ray King, "The Entanglement of the Rainbow: Henry David Thoreau, Charles Sanders Peirce, and the Meanings of Nature in Nineteenth-Century America," M.A. Thesis, University of South Carolina, 2008.

33. *Cosmos* 3:9 (as translated by Bowen, *Empiricism* 257); *Cosmos* 3:7; Hacking quoted in Tristram R. Kidder, "The Rat that Ate Louisiana: Aspects of Historical Ecology in the Mississippi River Delta," in Balée, *Advances*, 144; Bowen, *Empiricism* 272; *Cosmos* 1:311; Bowen, *Empiricism* 274.

34. Villegas, *Route of Humboldt* 2:138.

This article is drawn from the author's book, The Passage to Cosmos: Alexander von Humboldt and the Shaping of America (Chicago: University of Chicago Press, 2009). Reprinted by permission.

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Revisiting the “River of the Mother of God”: Aldo Leopold’s Symbol of Global Wilderness

WILLIAM FORBES

The River of the Mother of God, or Río Madre de Dios in Spanish, extends from the base of the Andes Mountains through the Amazonian lowlands of southeastern Peru and northern Bolivia where it meets the Madeira River. This essay provides an update on the area as seen through the lens of geographic research, since Aldo Leopold wrote his short essay in 1924 on the river as a symbol of shrinking global wilderness.

Most readers of this journal need no introduction to 1909 Yale forestry graduate Aldo Leopold. Co-founder of numerous conservation movements, pioneering founder of wildlife ecology and restoration ecology, and champion of the first officially designated wilderness area, Leopold is best known for his remarkably concise and prosaic essays in *A Sand County Almanac*, the most famous being “The Land Ethic.”¹

Almost every reader of *A Sand County Almanac* has one essay that is a personal favorite. Mine is “Escudilla,” about a looming monolith of a mountain on the border of Arizona and New Mexico and the loss of its last grizzly bear. This story to me is intensely geographical in that it illuminates a sense and spirit of place. It also evokes a mixture of reflexive thinking about humans’ role in nature, touched with occasional levity:

...top out on a ridge and you at once became a speck in an immensity. On its edge hung Escudilla... There was, in fact, only one place from which you did not see Escudilla on the skyline: that was the top of Escudilla itself...

No one ever saw the old bear, but in the muddy springs about the base of the cliffs you saw his

incredible tracks. Seeing them made even the most hard-bitten cowboys aware of bear. Wherever they rode they saw the mountain, and when they saw the mountain they thought of bear...

We spoke harshly of the Spaniards who, in their zeal for gold and converts, had needlessly extinguished the native Indians. It did not occur to us that we, too, were the captains of an invasion too sure of its own righteousness. Escudilla still hangs on the horizon, but when you see it you no longer think of bear. It’s only a mountain now.²

Leopold is well known for these essays formed by experience in the US Southwest early in his career. Yet he also wrote about other places in “Latin” America, if we accept the US Southwest within Joel Garreau’s liberal boundaries of that region.³ Some of these locales were just across the US-Mexican border, in the Colorado River Delta of Baja and Sonora (“Green Lagoons”), or the Rio Gavilan of Chihuahua (“Song of the Gavilan” and “Guacamaja”). These three essays, along with “Clandeboye” set in Manitoba, Canada, helped add international perspective to *A Sand County Almanac*. Yet we must turn to other works by Leopold to find one of his most concise and

insightful essays on our relationship to the condition of global wildlands.

South American exploration

“The River of the Mother of God” was written in 1924 when Leopold was well into his career in the US Southwest, formalizing in that year the world’s first official wilderness area within the Gila National Forest, primarily for recreational purposes. The short piece was actually rejected by the *Yale Review*, a literary magazine. Noted Leopold scholars J. Baird Callicott and Susan Flader, while going through a collection of previously unpublished Leopold writings, brought the “yellowed, slightly edited typescript” from the depths of Leopold’s archives for the first time. The editors were so enamored with the essay they also made it the title of the 1991 collection.⁴

From an early age Leopold was interested in global exploration. One of his favorite books in preparatory school was *A Naturalist’s Voyage Around the World* by Charles Darwin.⁵ No doubt Leopold would have loved, and may have even read, Humboldt’s journals about 19th century travel in South America. “The River of the Mother of God” shows Leopold’s fascination with deep time, geographic setting, and the unique character of wilderness travel to “unknown places”:

The river has been in my mind so long that I cannot recall just when or how I first heard of it. All that I remember is that long ago a Spanish Captain, wandering in some far Andean height, sent back word that he had found where a mighty river falls into the trackless Amazonian forest, and disappears...ever since some maps of South America have shown a short heavy line running eastward beyond the Andes, a river without beginning and without end, and labeled it the River of the Mother of God...

That short heavy line flung down upon the blank vastness of tropical wilderness has always seemed the perfect symbol of the Unknown Places of the earth. And its name, resonant of the clank of silver armor and the cruel progress of the Cross, yet carrying a hush of reverence and a murmur of the prows of galleons on the seven seas, has always seemed the symbol of Conquest, the Conquest that has reduced those Unknown Places, one by one, until now there are none left.

...I know the time is not far off when there will no more be a short line on a map, without beginning and without end, no mighty river to fall from far Andean heights into the Amazonian wilderness,

and disappear. Motor boats will sputter through those trackless forests, the clank of steam hoists will be heard in the Mountain of the Sun, and there will be phonographs and chewing gum upon the River of the Mother of God.⁶

So what has become of this Unknown Place of South America (Figure 1) in the 85 years since Leopold’s essay? In the spirit of addressing deep time, as Leopold often does, let us take a look back before 1924 to get long-term perspective on its status.

There are still un-contacted natives in Madre de Dios.

Deep time and place

Over the millennia, including periods of climatic warming and glacial cooling, the western Amazon is thought by paleobotanists to have acted as a refuge for species. This, combined with the steep gradient of the Andean range formed by plate tectonics, and the subsequent deposition of nutrient rich soil in lower elevations, has produced a landscape of remarkable biological productivity and species diversity.⁷

Geographer William Denevan conducted research deep in the Brazilian Amazon that has revealed, rather than a non-human “pristine” rainforest, evidence of an unexpectedly long human history, even in the most remote locales.⁸ Known human history in the Rio Madre de Dios region includes the Incas, who early in the second millennium extended communication networks of their empire down slope to the Amazon Basin. The ancient Incan capitals of Machu Picchu and Cuzco lie on the 15,000 foot “Mountain of the Sun” that Leopold refers to, less than 150 miles west of the Rio Madre de Dios as the crow (or macaw) flies. More localized tribes include the Yura and the Machiguenga, who speak an Arawak language similar to those found in the Caribbean when Columbus arrived.⁹

The conquest that Leopold refers to occurred as early as 1567, when Maldonado claimed the area for Spain. However, due to disease and the resistance of hostile tribes (including the Machiguenga), the Spanish struggled to control Peruvian Amazonia. More remote Machiguenga can still be daunting to visitors today; some practice traditional ethnobotany and slash and burn agriculture, while others work in modern industries and receive vaccination and

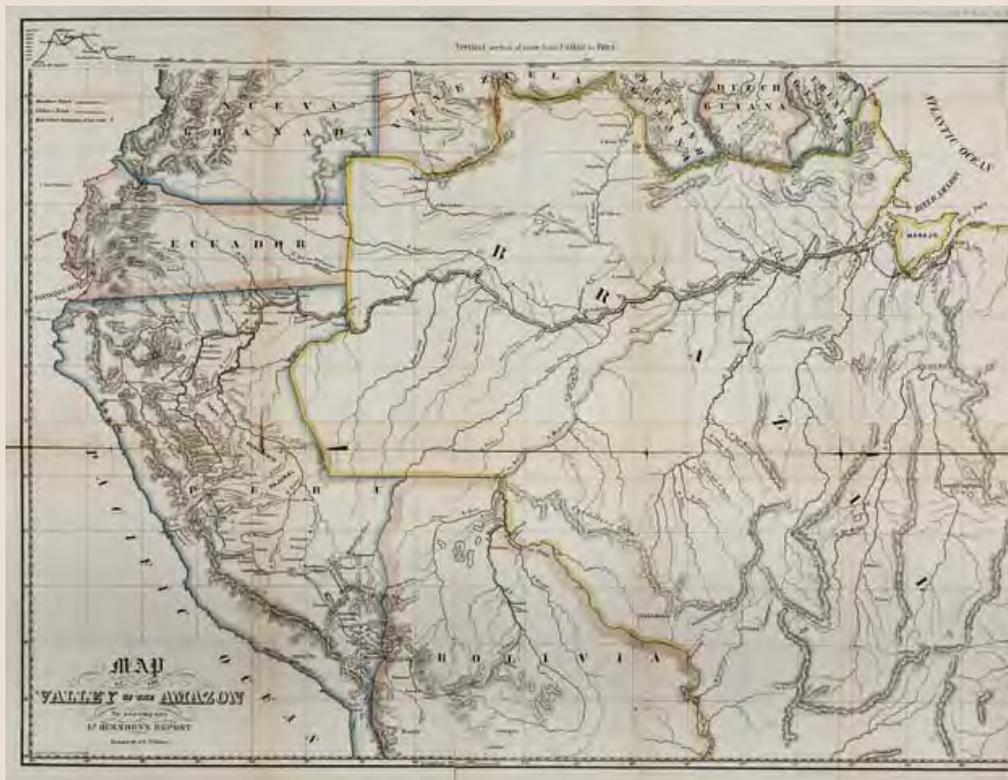


Figure 1: Map of the Valley of the Amazon.

Elliott, H.C. Date: 1853. Publisher, A. Hoen.

This 1853 map shows the Rio Madre de Dios in southeastern Peru with Leopold’s “short line,” i.e., no outflow connection to neighboring watersheds, signifying lack of knowledge about the area. From the University of Florida World Map Collections, a PALMM collection (palmm.fcla.edu/map).

schooling. Many of the Machiguenga did not receive their first contact with Westerners until the 1960s, more than three decades after Leopold’s essay. They have an estimated total population of over 10,000. Since the 1970s, many have moved to permanent settlements abandoning traditional, temporary slash and burn agriculture.¹⁰ There are still un-contacted natives in Madre de Dios.

Leopold provides some clues to local resource extraction, mingled perhaps with a measure of irony and remorse, when he writes:

I am conscious of a considerable personal debt to the continent of South America...It has given me, for instance, rubber for motor tires, which have carried me to lonely places on the face of Mother Earth...¹¹

Charles Goodyear developed the process to produce rubber from trees in 1839. By 1880, Peru was exporting 8,000 tons of rubber annually and this number more than tripled by 1900. The Rio Madre de Dios area acted as a primary source. The 1982 Werner Herzog film “Fitzcarraldo” is a fictional elaboration of the attempts of a Peruvian rubber baron, Carlos Fermín Fitzcarrald, to create a passage between two watersheds to allow easier water transport of rubber from the Madre de Dios area in 1890. As soon as 1915, however, competition from Southeast Asian sources led to the decline of rubber export from the Madre de Dios area.

Biodiversity

Leopold would likely be delighted to know that the biological richness of the area became a prominent focus in the latter half of the 20th century. Peru signed an agreement

with other American nations in 1967 to establish parks to conserve regional flora and fauna, including “every biotope from the riverside forests of the Amazon’s main tributaries.”

The next year much of the upper Rio Madre de Dios area became a National Reserve, and in 1973 the area was designated Manu National Park, named after the upper tributary, the Manu River. A local resident, Celestino Kalinowsky of Quince Mil, played a major role in its establishment. An even larger area (4,648,546 acres or 1,881,200 hectares) is now designated as Manu Biosphere Reserve, which incorporates human land uses within sensitive buffer zones around preserved areas. Manu National Park, like many protected areas in developing nations, is set up differently than US national parks. The Park itself includes indigenous tribes and wildlife that is hunted by them. The Manu Reserved Zone outside the Park contains ecotourism and hunting restrictions that result in more tame wildlife that is more easily observed by travelers. A third part of the Biosphere Reserve, the Manu Cultural Zone, incorporates human settlement.

The River of the Mother of God is no longer such an “Unknown Place,” but for positive reasons Leopold could not predict. Rio Madre de Dios is today a highly research locale. Botanical publications from the area alone number 492, accomplished through approximately 50,000 plant collections since the late 1800s.¹² Nigel Pitman’s recent study found a remarkable total of 2,202 publications have been written on the area in the past 450 years.¹³ After initial efforts by local Celestino Kalinowsky, Duke University professor John Terborgh has provided much of the scientific foundation for biodiversity assessment since 1973, working out of the Cocha Cashu Biological Station.¹⁴ Results of various studies are striking, leading to some to believe that the Rio Madre de Dios area may well harbor the highest species diversity on the planet.

Flowering plant species in Manu National Park are believed to number from 5,000 to 15,000. The Park is roughly the size of the state of Connecticut, which by comparison has approximately 2,600 plant species. Manu hosts approximately 1,000 bird species and more than 200 mammal species (about half of which are bats). The only park in South America to rival these species numbers is Madidi National Park, just over the border in Bolivia.¹⁵

The Botanical Research Institute of Texas (BRIT) has recently conducted five years of continuous field studies outside the Park, including training of locals and systematic transects, which contrasts with shorter-term studies of other programs. Partly due to methods and partly due to site differences at the 400,000 acre Los Amigos Conservation Area, the BRIT program has in some cases come up with

twice as many species as other studies. Plant species at their site number more than 2500, with 510 species of wetland plants. Tree species alone number approximately 1500, while fern species number 208.¹⁶

Leopold was remarkable in his perception of issues long before they became prominent in natural resource management. Issues he noted, well before others did so, include, but are not limited to: the relationship of increased grazing to fire suppression, brush encroachment, and increased soil erosion in the arid Southwest; the mixing of genetic stocks of trout in the US West, causing loss of locally adapted species; and the link between predator removal and deer population explosions (irruptions). Could Leopold also have had some intuition that the Rio Madre de Dios, this “Unknown Place,” is among the most biologically diverse places on the planet? There is no clear evidence to support that, although at the time it was fairly common knowledge among biologists—thanks in no small way to Darwin and Humboldt—that the tropics did contain more species than temperate biomes.

Good roads?

Unfortunately, one thing Leopold did predict accurately is the next chapter in the history of The River of the Mother of God. Again, at the time Leopold was promoting wilderness for its unique recreational value, and the second half of his essay is devoted to criticism of the transportation infrastructure that destroys this:

The thing that is choking out the wilderness is not true economics at all, but rather that Frankenstein which our boosters have built, the “Good Roads Movement.” This movement, entirely sound and beneficial in its inception, has been boosted until it resembles a gold-rush, with about the same regard for ethics and good craftsmanship. The spilled treasures of Nature and of the Government seem to incite about the same kind of stampede in the human mind.¹⁷

Leopold in this passage is specifically referencing the forces at work in the forests of the US Southwest (and beyond). South America is in many respects going through the same expansion Leopold was critiquing that occurred in the US West in the 19th and early 20th century. Rondonia, Brazil was widely publicized in the 1980s as an example of westward expansion for settlers that destroyed the rainforest. Such large projects are less prevalent now, and indigenous areas have more political protection, but the continent is currently in the midst of its own “Good Roads Movement.”

National Geographic journalist Ted Conover recently chronicled the construction of the East-West Amazonia Highway through the city of Puerto Maldonado, Peru, which adjoins Manu National Park and contains lower portions of the Rio Madre de Dios. Conover writes:

Like many in the developed world, I am enchanted by roadless places. The Earth has so few of them left, and glorious creatures like toucans depend on them. Many thoughtful people believe that the fate of the Earth itself depends on keeping nature unpaved.

But Peru is mad for new highways. Just as the north-south Pan-American Highway was the infrastructure project of the 20th century for South America, many people see an east-west Carretera Transoceanica—a road joining the Pacific to the Atlantic—as the project of the 21st.¹⁸

Amazon Basin country takes up roughly half of Peru, yet only five percent of Peruvians live there. Improved road access could change those numbers. Yet the rationale is not so much settlement as profit and development from reduced transport costs, building a more traditional connection with the fast-paced global economy. Amazon goods could reach Pacific ports in two days instead of a week. What goods would they transport? Currently this could include timber (mahogany), gold, cattle, soybeans,

boom in 1998, some 2 percent of the world’s annual gold production may have come from this mine.” The mining does not employ local residents as much as it does tens of thousands of poor immigrants from the highlands, many of whom are exposed to mercury contamination. The most important impacts of Amazonian road building and improvement can be the unintended consequences of immigration, settlement, and forest clearing.

As the Peruvian government has recently leased oil and gas rights throughout its Amazonian region, drilling and pipeline supplies may soon be transported on the Transoceanica. While more sensitive oil and gas roads may be include restricted access and post-project closure, the pressure of poverty can still bring illegal settlement.

Recently indigenous tribes in northeastern Peru have rebelled against these leases, leading to violence covered in global news.¹⁹ The Peruvian government claims the tribes do not have rights to special benefits from oil and gas leases, the revenue should be shared among all Peruvians. The tribes protest that the leases threaten biological diversity and cultural integrity.

“Deep” future – unintended consequences

Eighty-five years ago Aldo Leopold considered deep time along the Rio de Madre de Dios. It is apt now to inquire about the “deep” future. What will become of the River of the Mother of God over the next eighty-five years? Will its rich biodiversity still signify the area in 2094?

The larger, more educated indigenous population gained increased political power to protect their reserves from encroachment by non-natives.

and illegal wildlife. Harvest of each of these products has its own direct and indirect impacts in southeastern Peru.

Peru leads the world in mahogany exports. Up to 90 percent is logged illegally, with almost half of these exports going to the U.S. for furniture and coffins. Big-leaf mahogany is covered under the Convention on International Trade in Endangered Species of Wild Fauna and Flora. Loggers make only six dollars a day. Their camps have impacts that may rival the actual logging, including hunting for bush meat and conflicts with indigenous communities.

The new Carretera Transoceanica (Trans-Amazon Highway) enabled gold miners to bring a thousand earth-moving machines to the unlicensed Huaypetue strip mine in the 1990s. The mine covers 40 square miles (100 square kilometers). Conover notes that “at the peak of the gold

Clearly, the present scale and rate of impacts are well beyond the rubber tapping of the 1890s, from which the Rio Madre de Dios recovered. Indirect impacts such as immigration, clearing, hunting, and indigenous conflict can rival the direct impacts of logging and mining. Although Manu National Park and Reserve are in place, “paper parks” are notoriously suspect to illegal encroachment throughout the developing world.

Father Paul McAuley, co-organizer of the Loreto Environmental Network in the Amazonian region of northeastern Peru, sees the issue as one of indigenous rights and official corruption. Without strong protection of indigenous land rights, with corresponding cultural protection, McAuley sees a future Peruvian Amazon as a “museum for native groups who acted in the past.”²⁰

Illegal logging is one of the symptoms of this condition.

Even though 20,000 cedar logs were stopped from export by CITES enforcement, the Peruvian government liberated them on the market without records. McAuley’s Network also won a case in Lima in 2006 to protect 700,000 hectares from new logging concessions that violated indigenous rights. By 2009, illegal logging was proceeding in the area: “there are powers much bigger than the legal system at work.”

A new free trade agreement exists between the US and Peru. Although a forestry chapter exists in the agreement, the primary goal of the Peruvian government is to open the country to investors so they can work with minimal problems. McAuley believes “The challenge is to have management that includes locals as actors, not just workers... World Bank aid can’t go to corrupt governments like Peru.”

McAuley suggests that payments for ecosystem services to mitigate climate change should go to the local people in these locales, not federal governments, to ensure forest protection. He puts the responsibility on the markets, many of which are driven by the US: “The moral weight now is with the United States and those who claim they care about democracy, those who care about climate change, to put pressure on the Peruvian government.”

Leopold, at the start of his essay, also suggests responsible relations with remote, wild South America:

I am conscious of a considerable personal debt to the continent of South America. It has given me, for instance, rubber for motor tires...it has given me coffee...it has given me rare woods, pleasant fruits, leather, medicines, nitrates to make my garden bloom, and books about strange beasts and ancient peoples. I am not unmindful of my obligation for these things. But more than all of these, it has given me the River of the Mother of God.²¹

Our new US administration promotes change and has a full agenda of projects to implement it, including efforts involving Afghanistan, Iraq, health care, and economic recovery. With regard to Latin America, President Obama remarked about the recent coup in Honduras:²² “We do not want to go back to a dark past,” in which military coups override elections... “We always want to stand with democracy.”

One of the current projects of the Center for Humans and Nature is to investigate the role of democracy in environmental protection. Fareed Zakaria’s recent book warns against simple political solutions, and cautions that democracy may not be a global panacea.²³ Indeed,

the two major forces that have reinvigorated the field of geography in recent decades are: (1) technology, allowing more sophisticated analysis through the use of computerized geographic information systems, remote sensing, and global positioning systems (see Figure 2)²⁴; and (2) political ecology, a mode of inquiry that allows for more sophisticated analysis through examination of not just the symptoms of globalization, but the drivers and influences of change, many of which lie in remote places and policies.²⁵

An example of remote influence is the global soybean crop. Rising ethanol prices recently caused US farmers to grow more corn relative to soybeans. The global soybean market was met by Brazilian farmers increasing their soybean production, thus increasing their acreage within former Amazonian forest habitats. Such unintended consequences are a recurring theme within the research agenda of political ecology.

Another example of surprising results is support for birth control among indigenous tribes within Amazonian reserves, a seemingly logical goal of remote, environmental NGOs seeking to stabilize the incidence of slash and burn agriculture in areas of high biodiversity. However, the result of increased access to contraceptives was twofold: (1) indigenous women used them to space out births, leading to healthier babies and ultimately *larger* families; and (2) despite this, the larger population did not lead to direct impacts, as many in the growing population sensed lack of space and migrated to earn cash. The larger, more educated indigenous population gained increased political power to protect their reserves from encroachment by non-natives.²⁶

Stephen Perz’s research just across the border in Brazil also illustrates the complexity of spatial drivers of road-building in the western Amazon. Climate change adds pressure to traditionally mobile Amazonian tribes, such as the remote Machiguenga and interior Brazilian groups, who now have less territory to adapt in.²⁷

Fortunately, several organizations and researchers are addressing indigenous land rights in the western Amazon. Alaka Wali of the Field Museum of Chicago is investigating the effects of protected areas on indigenous communities. Other anthropological work in the region includes foundational work by Glenn Shepard on the Machiguenga and more recent work by Rick Stepp and Marianne Schmink. Efforts to use ecotourism to empower local, semi-modern tribes, through Charles Munn and others, have had some success.²⁸ The NGO InkaNatura is deeply involved in this activity. Perhaps the most effective organization for local indigenous land rights in Peru is the Centro para el Desarrollo del Indigena Amazonico

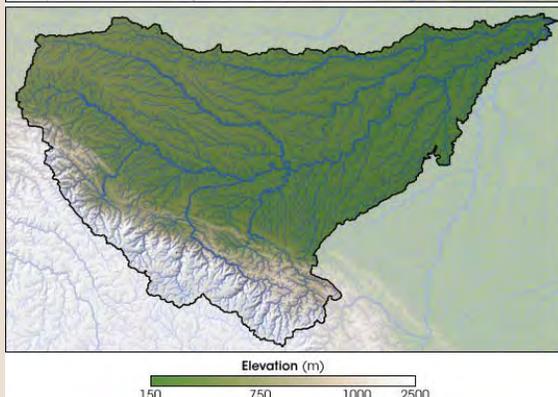
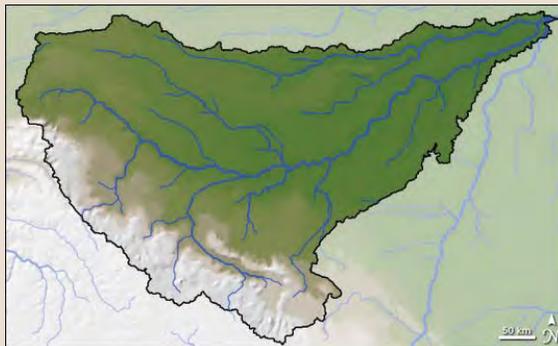


Figure 2. The Rio Madre de Dios watershed in Peru and Bolivia.

Images courtesy of NASA's Earth Observatory.

Advances in geographic technology have allowed more detailed hydrological maps to be generated by the World Wildlife Fund (<http://earthobservatory.nasa.gov/Features/HydroSHEDS/>).

(CEDIA), which has worked to gain rights to 500,000 hectares for 30 Machiguenga communities. Conrad Feather, co-organizer of the NGO named Shinai (NGO), also won a prestigious St. Andrews prize for his work on indigenous land rights for the Machiguenga.

World Wildlife Fund (WWF) contacts for the area include Mariana Panuncio, Senior Program Officer; George

Powell, Senior Conservation Scientist working with reserve design in the southwestern Amazon; and Rodrigo Tello, a graduate student with the University of Maryland. More broadly, senior scientist Michael Mascia of WWF leads a social science movement within biodiversity conservation through the Society for Conservation Biology's Social Science Working Group, which highlights research in this growing and critical arena. Human-wildlife conflict researcher Tara Teel is their newest president.

Despite the abundance of research and organizations addressing this formerly “Unknown Place,” they still have limited power in the context of Peruvian national sovereignty. Given the complexity of people and politics in biodiversity issues, a cursory analysis of the Rio Madre de Dios suggests “standing with local democracy” in the Peruvian Amazon could mean promoting the bottom-up policies that so many organizations are adopting globally, including the Border 2012 program²⁹ and the World Bank project in the Chaco region of Colombia.³⁰ While many movements are calling for change, in strongly suggesting to Peru that its indigenous communities retain control over their environment, the Obama administration likely has an opportunity for one of its greatest environmental accomplishments in supporting such movements.

This is not just a matter of importance within the time frame of a four-year presidential term, a century, or even the history of a nation. As Richard Leakey states in *The Sixth Extinction*, it is important within the time frame of the history of the planet. We are the first biological agent of a mass extinction. One of the main premises of “The Land Ethic” was Leopold’s call for humans to become “plain citizens” of the biotic community, one of many species. There is perhaps no better place to contemplate this thought than in a river basin he wrote fondly of, home to more species than anywhere else on earth.

Leopold warned in a 1944 essay, “Green Lagoons,” about his 1922 visit to Mexico’s Colorado River Delta: “It is part of wisdom never to revisit a wilderness, for the more golden the lily, the more certain that someone has gilded it.” He was correct in this case. Upon visiting the Delta in 2002, Aldo Leopold Foundation director Buddy Huffaker and I found Leopold’s “milk and honey” wetlands wilderness to be largely overtaken by non-native tamarisk, and occasionally burned over in crown fires that blackened the monocultural landscape. Cienega Santa Clara, the healthiest remnant wetland, was fed not by a natural, continental-scale river, but by a canal diverting water from a desalinization plant in Arizona that was too costly to operate. Conservationists were struggling with US powers to obtain a mere 1% of the Colorado River’s flow to support wetlands and associated delta species.

Leopold attempted to set aside another Mexican wilderness, the Rio Gavilan in Chihuahua, as a control for healthy land in a proposed continent-wide study of deer population explosions. It was here that Leopold “first clearly realized that the land is an organism, that in all my life I had seen only sick land, whereas here was a biota still in perfect aboriginal health.” Leopold’s proposed research with renowned University of California-Berkeley geographer Carl O. Sauer never materialized in the late 1930s and early 40s, likely due to the looming priorities of World War II. The Rio Gavilan today, although in many respects still in moderate condition, is highly altered through post-World War II grazing, logging, and subsequent soil and stream erosion.³¹ Of the three outstanding Latin American wildlands Leopold wrote of, the Rio Madre de Dios has perhaps the best chance to preserve a biota “still in perfect aboriginal health.”

Conclusion - remote responsibilities

J. Baird Callicott and Susan Flader note that one reason Leopold’s land ethic and other writings were revolutionary is that they were not based merely on a visual esthetic that had supported our early national parks movement. Rather they were based on:

a refined taste in natural objects, and esthetic experience...as cerebral as it is perceptual...For him, the esthetic appeal of country, in other words, has little to do with its adventitious colors and shapes – and nothing at all to do with its scenic and picturesque qualities – but everything to do with the integrity of its evolutionary heritage and its ecological processes...Thus, as one consequence, Leopold is able to appreciate esthetically country that he has never seen but only imagined. In “The River of the Mother of God,” for example, he reflects on an unexplored river in the wilds of Amazonia.³²

Most of us will never see the Rio Madre de Dios, yet we can appreciate, through Leopold and others, its unique place on the planet. Indeed, the U.S. urban population had just gone above 50% for the first time in the 1920 census (by 2000 it was 78% urban), and its total population had just gone above 100 million in 1915. Urban sustainability efforts such as green building and open space planning are now proliferating globally.

Yet this cannot replace the critical concern for places where impacts are greatest, these still-remote locales with an “integrity of evolutionary heritage” like the Rio Madre de Dios. Despite demographic and scientific changes,

Leopold’s land ethic is still highly relevant today,³³ especially when properly negotiated with, and nurtured by, local, indigenous environmental ethics, rather than imposed universally.³⁴ Whereas the sustainability movement calls for extending our ethics to future generations, global warming (regardless of the level of human influence in warming) and the scale and scope of global ecological drivers adds to this responsibility, with a call for extension to those newly understood, remote locations that are experiencing unprecedented changes.

Leopold was remarkable in his perception of issues long before they became prominent in natural resource management.

Back in Peru, the Botanical Research Institute of Texas has moved their research efforts from the rich Los Amigos riverine wetlands area to a more elevated site in the watershed near Quince Mil, on the road from Puerto Maldonado to Cuzco. This new location allows for the study of tropical rainforest and cloud forest, including habitat of the Andean spectacled bear. Unlike the grizzly of the essay Escudilla, the spectacled bear is a gentler citizen of the cloud forest. Such creatures invite affection through comical movements, joining the comedic ranks of the sloth, otter, tapir, macaw, and Leopold’s thick-billed parrot of Mexico. It’s almost as if evolution had looked into the future to read Strachan Donnelly’s call for levity in environmental issues.

Escudilla Mountain is thousands of miles away from Peru. Nonetheless, I think we can understand that, without the spectacled bears and their fellow members of to surrounding biological community, the Rio Madre de Dios in another eighty-five years will not be a place of deep evolutionary heritage and ecological process. It will just be a river.



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Principles of Water Ethics

BRUCE JENNINGS, PAUL HELTNE & KATHRYN KINTZELE

The significance of water for life and health is fundamental and can scarcely be overstated, and hence the pertinence of ethics to water utilization and management is clear in a general sense. It is important for everyone involved in water resource management and in public health to have a well-reasoned understanding of the moral values and obligations that correspond to that significance. In the domain of ethics, questions of scientific knowledge come

together with aspects of cultural meaning and perception; questions of conservation, sanitation, and health promotion come together with questions of justice, equity, and human rights; questions of sustainability and biodiversity come together with questions of democratic governance, law, and policy.

Access to clean water and adequate sanitation is a growing problem for many parts of the world. More than one billion people are in need of clean water, and 2.6 billion lack access to basic sanitation. Water intensive agricultural, manufacturing, and land use practices throughout much of the world are drawing down or contaminating groundwater at an alarming rate.

Many questions confront the world today. How can we ensure that an adequate supply of clean water is available, both for today and for coming generations? How equitable will access to it be? How should it be managed, and by whom? What will the implications of climate change be on the quality and quantity of fresh water? Is clean water destined to become for the twenty-first century what petroleum was for the twentieth, a source of geopolitical power and conflict? Will social change concerning water

use come through technological innovation or through cultural and value change, or some combination of both?

Concurrent with the ecological dimensions of the water crisis are public health dimensions, including, but not limited to, the spread of water-borne diseases, particularly in the developing world. Existing systems need to be modified, or new systems need to be created, so as to achieve more just access to clean drinking water, as well as to provide for effective societal responses to public health concerns. From a systems perspective, water is more than simply a medium for vectors of infectious disease; it is a foundation for maintaining the social determinants and human capacities that sustain and promote health and well-being. Water is not so much a “resource” as it is a lynchpin in the entire web of planetary life. The focus of ethics is therefore not on water in isolation, but on the water cycle and how the cycle connects the land and the atmosphere. The notion of a “watershed” has this connotation, connecting water, the soil, and the biotic community.

Water is dynamic, elusive, determined, and a fecund source for the human moral and spiritual imagination. We

talk about water as a medium of disease transmission, as a fluid essential for biological functioning, and as a thing to be manipulated with wells, pumps, sluice gates, dams, and dikes. When we talk about the scientific and engineering aspects of water, we should not lose sight of the fact that water is also a vital source of cultural meaning, which not only sustains our biological life but also our imagination and spirit. No culture or tradition known to us is indifferent to it. It is a symbol of purification, rebirth, and reconciliation, even as it is also a source of animosity and conflict. Water, with its close connection with fertility and life, figures deeply in religious and metaphysical worldviews of virtually all peoples. There is a prototypically two sided aspect to the way water is represented and imagined in most traditions.

Principles of Water Management Ethics

- » equal respect for human dignity
- » equity and proportionality
- » solidarity
- » the common good
- » right relationship or responsible stewardship
- » inclusive and deliberative participation

Water is the place from which order comes, but it is itself without form. It is life nurturing and yet unshapeable, uncontrollable at the same time. If the creator could manage it, human beings cannot. It is protean and relentless. It floods and recedes, indifferent to human constructions on a floodplain. It finds tiny fissures and eventually splits the hardest rock and enters the best sealed dwellings. Its changing physical state slowly reshapes the geology of the planet as ice sheets progress and recede, as sea levels rise, as rain falls, and as rivers find new channels. Human things are small by comparison. We move and channel water, to be sure, and we must use it (carefully), but effective, sustainable utilization of water is really more a form of accommodation than a form of control. We are not always honest with ourselves about our dependency on water, and our sheer frailty in the face of it.

Different ways of conceptualizing what water is and how human beings should use it have different ethical implications. Understanding water supplies as commodities

to be bought and sold, and as property to be controlled unilaterally by certain individuals or groups, has different implications for fulfilling the ethical principles (such as human rights and social and environmental justice) than does understanding it as a fragile ecosystemic component of an ecosystemic commons upon which we all depend in myriad ways. Of particular interest in the chapter, therefore, will be the convergence between ecosystemic and public health perspectives, on the one hand, and the appropriate ethical use of water to sustain and promote human and ecosystemic health, on the other.

Taken together the ethical values of efficiency, equity, and stewardship can form a basis of a set of ethical principles that can normatively guide water management and public health policy. Additional principles of water ethics will be based on procedural and decision-making process values, such as democratic governance rights, active participation, transparency, accountability, and public-private collaboration and partnership. Implementing these ethical ideals and obligations in practice is shaped by a number of factors: Who participates in the decision-making process? Is participation active and involved in formulating options or is it passive and reactive to proposals that are already well-developed? What kind of information is open to the public? How do professionals interact with non-professionals? Is there respect for cultural diversity and traditional beliefs and practices? And finally, how is a balance determined between the needs of human development and the need to preserve our natural resources?

With these ethical orientations and practical considerations in mind, we offer the following principles of water ethics. In each case there is a meaningful application of the principle to the relationship between humans and water and the effects of the various technologies of water utilization (purification, sanitation, groundwater mining, agricultural irrigation, and the like). Similar principles have been formulated by the Waters of Wisconsin Project and by UNESCO's International Hydrology Programme (IHP), intercultural and interdisciplinary working group on the Ethics of the Uses of Fresh water and by the COMEST Sub-Commission on the Ethics of Fresh Water Use.

The principle of equal respect for human dignity

This principle calls for the meeting of basic needs and the promotion of human health and well-being. It incorporates the underlying notion behind the framework of universal human rights. This is a fundamental principle of public health ethics; when construed in relational terms, the concept of human dignity is not at odds with respect

for other creatures and for nature and thus is fundamental to environmental ethics as well.

The principle of equity and proportionality

Meeting the needs and promoting the health of all persons is important, but equity and proportionate response are required in the face of limited resources to give priority to the least well off, those most immediately at risk, and those who are made vulnerable by past discrimination, exclusion, and powerlessness.

The principle of solidarity

Respect and equity should be pursued with a recognition of the limits of each individual's ability to determine the conditions of their own lives and of our mutual interdependency, and reliance on outside support, care, and assistance. The notion of solidarity and interdependence applies in a social context, among human individuals and groups, but it applies with equal importance and resonance in an ecological context, between human and biotic communities. In water ethics, solidarity reminds us of what may be called our "upstream and downstream interdependence."

The principle of the common good

This principle calls for the recognition of situations in which the pursuit of rational self-interest by each individual

leads to outcomes that are irrational and harmful to the interests of all individuals involved. The human interests served by water and by the biodiversity water makes possible are often not well served by behavioral strategies of individual interest maximization such as those fostered by libertarian property rights. Water and the technologies of its utilization often present "tragedy of the commons" type scenarios, for which a conceptualization of water as a common resource and sustainable water utilization as a common good provides the ethically appropriate response.

The principle of right relationship or responsible stewardship

The principles of solidarity and the common good call for collective action in relationship to public health and water management. The principle of right relationship addresses the substantive content and effects of such collective action. The responsible course of action is closely tied with the actual properties and circumstances of what is being responded to. In the case of public health, for example, failure to correctly identify a pathogen and the administration of the incorrect vaccine or medication would constitute public health and medical malpractice; the right relationship between the physician and the pathogen and the biological facts of the patient had not been established. Similarly, the unsustainable use of an aquifer or the biological degradation of a watershed and

A Perspective on Water Management and Ethics

First, the ethics we require should be built on a sense of shared purpose and in harmony with nature. Second, ethics must be based on a balance between traditional human values regarding conservation and the use of new technological advances. Rarely have either worked alone and it is time to stop pitting one against the other. Third, ethics, even in our advanced technological age, should seek to find a new harmony between the sacred and utilitarian in water, between the rational and the emotional. Water resources managers need to understand the wisdom encoded in traditional religious and secular symbols and rituals surrounding water.

Today, our technology tells us that there is enough water—if we co-operate. One of the most important elements for co-operation is something that experts in negotiation call 'superordinate values', meaning those that are beyond immediate utilitarian benefits and to which competing parties can subscribe. Rekindling the sense of the sacred in water, unquestionably a superordinate value, is one way to move the debate to higher levels and thus bear on the capacity to manage conflict and reach agreement. This balancing is not new—it is what humans have been doing throughout history as they constantly learn how to deal with environmental uncertainty. Talking of such a balance means to appreciate the intrinsic and profound value of water that is not captured in the traditional utilitarian calculus of transactions. It is to recognize that water is not only a means to other goals, it is essential as an end in itself.

— Lord John Selborne, Chair of the Commission on the Ethics of Scientific Knowledge and Technology (COMEST), Sub-Commission on the Ethics of Fresh Water.

Quotation from: "The Ethics of Freshwater Use: A Survey," p. 9 (2000).

Available at: <http://unesdoc.unesco.org/images/0012/001220/122049e.pdf>

its dependent ecosystems are forms of environmental malpractice. They do not establish right relationships between the human beings who use and affect water with artificial construction and technology, on the one hand, and the specific biological, chemical, and physical realities of water, on the other.

The principle of inclusive and deliberative participation

Just as the principle of right relationship and responsible stewardship addresses a substantive ethical standard for the content of public health and water management policies, so the principle of participation addresses the values inherent in the process of policymaking and decision making. Often the mechanisms and institutions of democratic governance are selective and rely on bargaining and interest maximization strategies by powerful, well-organized, and well-represented groups. This type of governance and decision making may not be well suited to the protection, conservation, and equitable distribution of common goods. More adequate governance mechanisms, from an ethical point of view, involve a deliberative and participatory process marked by transparency, universal access to information, inclusiveness, and individual and community empowerment so that all may take advantage of the open information and the participatory opportunities.

Ecologically informed and ethically responsible water management are essential for public health and are necessary to secure these resources for future generations of all life forms. Erring on the side of conservation is necessary in the face of our uncertainty regarding the regional impacts of global warming and many other factors in modern life. How do we assure that we consider our ecosystemic and intergenerational responsibilities adequately?

Perhaps a good place to start is for each of us to admit the following truth: "I am utterly dependent upon nature including its astonishing ability to provide fresh water. This is a dependence so deep that it maintains my life and that of every other living creature, not ultimately, but moment to moment, breath to breath, and in the case of water from sip to sip. This recognition of dependence leads to a second truth, namely that I am utterly responsible for maintaining that nature which so bountifully provides for life." This recognition entails a very strong ethical commitment.

Responsible behavior requires, at a fundamental level, acknowledgement that it is the diverse complexity (even seeming redundancy) of nature that provides for thriving and abundance and includes all living things and their landscapes, i.e., watersheds and water bodies. All water

cannot be considered ours for human uses. This conclusion rests on ethical principles, particularly the principle of right relationship and responsible stewardship, but it also rests on creating the proper social and political motivation to produce ethical policy and practice.

Here we pose the question of the relationship between the motivations and commitments that lead a democratic society to support a public health system and to support a system of ecological conservation and protection. Are not appeals to security, safety and shared interests analogous in the two cases? To support a public health system each individual must value not only their own health, but the health of others—it is more rewarding and fulfilling to live in a healthy society than an unhealthy one. Similarly, to support a system of environmental sustainability and conservation each individual must value not only their own comfort and convenience, but also the flourishing, diversity, and beauty of nature. To live in healthy ecosystems is more rewarding and fulfilling than to live in unhealthy ones.



This article is drawn from a longer report by the authors to be included in a forthcoming volume on Water and Public Health to be published by the American Public Health Association.

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These Revolutionary Times

WILLIAM VITEK

he language of revolution should be used as a last resort and against odds that can be beaten only with radical thought and action. It requires justification or, at the very least, explanation.

The reader should understand that I am not prone to tirades or behaviors that could be described as radical. I have never participated in a public protest, and refuse to sign most petitions.

In the classroom I offer both sides of a position and try to avoid showing my hand. I avoid confrontations and by disposition am a peacemaker—or, depending on one's perspective, a wimp. I have a stable job, a long-term relationship and four children. I hope to someday spend the money collecting in my retirement account. In British America in 1775 I most certainly would have been a loyalist. More likely I would have never left England in the first place.

But something happened this year. Imagine one of those ambiguous figures—the vase or the two faces, the young or the old woman, the duck or the rabbit—and our ability to switch images with little or no difficulty, one or the other, back and forth, back and forth. Now imagine suddenly being able to see only one image.

Perhaps it was triggered by feelings of ineffectiveness and frustration. As an applied or practical philosopher—I know that sounds like an oxymoron—I avoid the dusty attic of our civilization's past and prefer instead to spend time down in the basement where, like the basements of our own homes, all of the social, political and technological systems and foundations are located, and operate—or fail to operate—without our notice until it's rather late. I've

been down there now for two decades, and it seems to me that things are only getting worse, and ever more quickly.

I am also writing a book about the daunting social and cultural challenges we face in a world with too little carbon below the ground—in the form of oil and natural gas—and too much in the atmosphere—in the form of greenhouse gases, including carbon dioxide and methane. “Postcarbon” and “peak-carbon” are terms reflecting trends and discoveries that indicate the modern world will need to learn how to live without the vast pools of carbon energy that built and run it, and for which there is no equal. I live day-to-day with the exponential data of our times, and they have made me a student of the boundaries and limits of both living Earth and our human form.

And I just turned 50.

The birthday, the book and the frustration seem to have triggered a midlife crisis of the metaphysical sort that is probably not uncommon for philosophers. I have come to a perspective reluctantly, but of which I am now convinced and to which I am fully committed. We are living in revolutionary times!

I wish I could tell you that I was just exaggerating to focus your attention. My high school chemistry teacher,

Mr. Rizzo, would frequently tell us that we were the worst class he ever had. He finally admitted that to motivate students he told every class, every year, that they were the worst he ever had. But, he added, our class really was the worst. Like Mr. Rizzo, I believe that we really do face a challenge that will be transformative. Most of us are familiar with the phrase “up a creek without a paddle.” (The phrase is actually a bit more colorful than that.) I think the world and its inhabitants are up a creek—a post-carbon creek—with a paddle, the one that put us there in the first place. The paddle is the mindset of limitless expansion and consumption. This mindset won’t get us out of our predicament, and it actually makes matters worse. Meanwhile our boat—the living ark of Earth—is listing terribly.

What we must do instead is toss the paddle and begin to change our minds, our worldview and our everyday lives. We must learn how to function not just as individuals, but as whole civilizations, on the only Earth we will ever know, a living, complex and interconnected sun-powered ecosphere, complete with all of its, and our, limitations. This change of mind is not just a conceptual revolution: We would be naive to think it will happen without a good deal of active resistance and protest. It also likely will require change to a way of life as inconceivable to us as the invention of the modern factory or a heart transplant would have seemed to a peasant or professor in medieval Europe. The good news, if I can describe it that way, is that only by accepting this challenge in radical and revolutionary terms will our odds of success change from “fuggedaboutit!” to “long shot.”

Soon after that radical declaration in July of 1776, Richard Price, a British Unitarian minister, called the American Revolution the most important event in the history of the world since the birth of Christ. I believe that the revolution of our time is the most important event since the invention of agriculture nearly 12,000 years ago. Those first farmers in the Middle East’s Fertile Crescent began a mining operation that continues to this day: the mining of high-energy carbon. In breaking the sod those early farmers were breaking from nature, living by their own wits, and appearing—at least temporarily—to exceed the boundaries and limitations that govern all life, and Earth itself.

This story of the human break from nature is very familiar to us. In Genesis, Eve and Adam are tempted by a “tree” that, some scholars say, was not a tree at all, but rather a grass: wheat, one of the first wild grasses to be cultivated. Scholars also point out that the first farmers used snakes to guard granaries against rodents. The temptation that the serpent and wheat grass first presented to Eve, a name that

means life, was for a more secure and plentiful life outside of nature’s boundaries. And why wouldn’t the first woman, and soon-to-be first mother, want agriculture’s promise of plentiful food and security for her offspring, even if it meant, as the story tells us, more work for her husband and increased pain during childbirth for her and all women, no doubt a consequence of more and healthier, larger, babies?

We must learn how to function not just as individuals, but as whole civilizations, on the only Earth we will ever know, a living, complex and interconnected sun-powered ecosphere, complete with all of its, and our, limitations.

We are told that the human couple was expelled from nature’s garden, but it seems more likely that they left on their own accord—the original sin of willfulness—once they recognized their own powers to cultivate a grass that even today is the world’s second largest cereal crop. More important, I think, is the warning they ignored about the danger of succumbing to this temptation to live outside of nature’s boundaries—namely, that they “would surely die.”

Despite that ominous warning, Adam and Eve and their offspring never looked back. The soil of the Fertile Crescent was the first carbon pool to be tapped, and, as William Ruddiman writes in *Plows, Plagues and Petroleum: How Humans Took Control of the Climate*, it brought with it the first increases in human population and greenhouse gases—carbon dioxide and methane—released by the clearing of forests, biomass burning and irrigation, all common practices as early as 7,000 years ago.

The second high-energy pool, the stored carbon of Earth’s forests, furthered human dominance of the world and made the bronze and iron ages possible. Wood was the primary fuel for the first 150 years of European settlement in North America.

The third carbon pool—coal—fired the industrial revolution and exponential growth of the human population. It remains a critical source of energy. In 2004 the world used over 6 billion tons, and by 2030 the demand is projected to be almost 11 billion tons. Oil and natural gas are our most recently tapped carbon pools, and together they fuel the global economy. The world consumes 85 million barrels a day, and demand is expected to grow to 113 million barrels by 2020. The world used 100 trillion

cubic feet of natural gas in 2004, and is expected to need 150 trillion cubic feet by 2020.

Soils, forests, coal, oil and natural gas: These are the primary feedstocks of our modern civilization. And for those of us who have been alive these past 50 years in industrialized societies, particularly in America, it has been a wonderful ride, an amazing and blazing run on the carbon bank.

But as the data continue to come in, it appears that the processes driving our exponential growth may be at their peaks. Our parents' generation rode this exponential wave to the top, and it looks like ours is the first generation to live with the effects of what Wes Jackson calls "The Age of Rapid Depletion." Our carbon pools are drying up. Our carbon sinks are clogged. And we are told to expect at least 3 billion more human inhabitants in the next 40 years. Indeed, the warning in Genesis to avoid the temptation of a boundless self-sufficiency lest we surely die remains relevant today.

"Yes, but isn't revolution too much?" you say. "Why a change so radical? Who wants to take that risk?" Thomas Paine, in his pamphlet *Common Sense*, recognized this reluctance when he said that "until independence is declared, the continent will feel itself like a man who continues putting off some unpleasant business from day to day, yet knows it must be done, hates to set about it, wishes it over, and is continually haunted with the thoughts of its necessity." In our own time it is fair to ask why a revolution is necessary when we have progress, increased technological efficiency and the organic, environmental and sustainability movements to help with the change ahead.

Here's why.

What we commonly call progress has produced some of the very problems we expect progress to solve. Advances in agriculture and medicine have led to the exponential population growth, further stressing soil and water. Technological optimists promise solutions from greater efficiency, but efficiency has led to higher consumption and depletion of fossil fuels, and more atmospheric carbon. This is Jevons' Paradox, named after the man who showed that as 19th century Great Britain became more efficient with coal, it consumed more of it. Even if every car in the world was a hybrid, and every light bulb a compact fluorescent or LED, growing demand for cars and light bulbs would dwarf savings. And new forms of energy will take time to develop. The late Cornell physicist and Nobel laureate Hans Bethe noted that no form of energy, from the draft horse to coal to petroleum to atomic power, ever became a fuel for commonplace technology in less than 50 years.

Sustainability, now practically a household term, is starting to set things right with a path toward living well in a limited world. But in current form this movement doesn't require enough from us. It is too laden with a near fundamentalist belief in technological fixes, and stuck in old "the-Earth-is-a-machine" thinking. The problems it solves are inside the invisible cultural and social systems—the "isms"—that shape how we see the world and think about it, and that are rarely challenged except in times of social upheaval. These larger systems are off the sustainability table. Corporate giants Toyota, General Electric and Wal-Mart, for example, are touted for their eco-efficiency initiatives, but their profit motives and their use of advertising to increase consumption of their products are rarely questioned. Al Gore's Nashville home is carbon neutral, but it's also 10,000 square feet, sending the mixed message that extravagance can be sustainable. Without addressing deep structural changes in the larger systems, sustainability is like making one's first-class cabin on the Titanic watertight while the hallway begins to flood. It might seem prudent at the time, but if the tear in the ship's fabric is big enough and if the rivets are substandard—as historians now confirm—you will still end up at the bottom of the North Atlantic.

Sustainability itself is a tad presumptuous. The wise ones—*Homo sapiens*—have for 12,000 years whittled away at Earth's vital and sustainable forces, mistaking human cleverness for nature's creativity, and now insist that what the ecosphere has been providing all along is actually their job, that the great consumers of Earth can now become its benefactors without sacrifice of their high living standard. If Earth had eyes they would be rolling.

Central to the problems we face is our reluctance to see them as anything more than temporary downturns in the usual up and down cycles of economics and climate. They are not. World production of oil in the past three years has remained steady—85 million barrels per day—while the price has more than doubled in that time, and in early July had reached as high as \$145 per barrel. A human slave, on the other hand—of which there are now approximately 27 million in the world, more than at any other time in history—can be purchased for a mere \$40. Add another 3 billion people to the planet in 40 years while simultaneously trying to cut carbon dioxide emissions by 80 percent. Find livelihoods, food, fresh water and shelter, as well as education, health care and stable governments for these numbers without causing species extinction, soil degradation, civil wars, nuclear wars and mass migrations. Try running any of the world's major cities—their subways, waste water plants, transportation, lighting and heating—for even a few days on low density solar

and wind power. These facts and challenges blocked the switching mechanism that I discussed earlier in the essay, the one that allowed me to see both the radical and the status quo paths before us—the old woman and her young counterpart—with equal ease. I can no longer see the slower, tinkering-inside-the-paradigm option as anything more than a creative and attractive but delusional refusal to admit the enormity of the challenges before us.

It is time to be more truthful with our language.

We live in revolutionary times brought by substantial and sustained failures of current worldviews and global systems to provide everyday people with lives of health and freedom from want and fear, and with prospect of similar lives for their children. These failures are the self-evident truths of our time: that billions were promised improved lives only to see them degraded; mass extinctions of species; overheated climate; and unprecedented running down of

In such times we must recognize the signs of seismic social and cultural shifts that are under way, and engage fully our talents to bring forth an alternative worldview, a new Enlightenment that values the ecosphere, protects human freedom and dignity, and rejects the belief that we can master Earth and treat it as our supermarket, playground, laboratory and dumpster. We must live every day with, and deliver to others, the uncomfortable and terrifying facts about the failure of the current worldview to solve its own problems, and we must close off the usual psychological escape routes that keep too many of us in complacency.

In these revolutionary times we must organize and mobilize the likeminded at the “street” level—that is, at the level of action and application appropriate to one’s station in life. Such actions would include teach-ins, protests, boycotts, street corner pamphleteering and blogging,

Without addressing deep structural changes in the larger systems, sustainability is like making one’s first-class cabin on the Titanic watertight while the hallway begins to flood.

the ecosphere on which all life depends. The worldviews and systems responsible for these failures go by many names: individualism, capitalism, scientism, materialism, corporatism and globalism, to name a few. What they are called is not important. Important is that they share two bedrock beliefs that have become the intellectual DNA of our modern minds: first, that the natural world is without limit in energy and materials, and its sinks for wastes and pollution; and second, that the human intellect is sufficient to understand, control and operate Earth as a luxury-machine for the exclusive material happiness of human beings, again, without limit.

It is now necessary to overturn these false and dangerous beliefs, to limit the power of their many adherents, and to usher in a new way of thinking and living in the world. This is our revolutionary moment.

In such times we must refuse and reject attempts by the current systems and their defenders to make accommodations, reconciliations, excuses and minor concessions. The current systems can neither fix the problems they have created nor be made compatible with the emerging ecospheric perspective, any more than the British monarch could have been made compatible with independence-minded Colonial Americans, or medieval scriptural authority with 17th century scientific discoveries.

bringing the revolutionary message to every family reunion we attend and every board and committee on which we sit, and insisting that our elected officials, corporate executives and educational administrators confront the real problems of our time.

Active engagement and resistance does not have to be violent, but it must be as single-minded and insistent as someone yelling, “Fire!” in a crowded theater when there is, in fact, a fire. That’s not radical, that’s prudent and morally required. As Frederick Douglas said, “Power concedes nothing without a demand. It never did and it never will. If there is no struggle, there is no progress. Those who profess to favor freedom, and deprecate agitation, are men who want crops without plowing up the ground, and rain without thunder and lightning. They want the ocean without the awful roar of its many waters.”

We can make demands and resist without being rude or loud or violent; we can choose the path and tools that are most effective given our talents and dispositions. For example, I don’t stand up at public meetings and talk about revolution. But when I have been invited to speak to an audience this past year, I’ve made it clear that I’m only giving one talk these days: the one that you are reading now. I’ve been able to bring the revolutionary message to college students, church congregations, local government officials and even the New York Society of Professional

Engineers' annual convention. And while I praise the good intentions of individual and institutional efforts to become more sustainable, I end my praise with, "But it's not enough." I try to inject humor and levity when it can defuse tension without belittling the seriousness of the problems we face. And I'm putting the tools of philosophy to work on reconstructing our cultural and social systems to operate in an ecosphere.

To state unequivocally, "These are revolutionary times!" is recognition that the world is changing in ways that we would not necessarily choose; that it must change even if it goes against what we would otherwise choose; and that we can no longer choose to resist it.

It is so much easier to hope for a miracle. But our best and most realistic hope lies in embracing the revolution before us. With vigor and creativity we must help create the conceptual scaffolding necessary to build a new worldview—in the words of the American founder John Adams, "to start some new thinking that will surprise the world." Every category of human thought needs reorientation to recognize the boundaries of our sun-powered ecosphere. We need ecospheric science, spirituality and economics, ecospheric politics, education and technology, ecospheric justice, history and architecture, ecospheric engineering, agriculture and philosophy, and ecospheric conceptions of rights, property and happiness. Here's a rough draft of our ecospheric "to-do" list.

- Reduce the industrialized world's carbon footprint 80 percent by 2050.
- Reduce human population 80 percent from its current level without famine, war, viruses or the loss of human dignity by 2110.
- Eliminate the automobile as a form of personal transportation.
- Create political and social systems that run on a solar economy.
- Revise the scientific method so that it more accurately balances the goal of discovery with moral considerations and precaution.
- Devise viable models of happiness and success that do not require economic growth and increased consumption.
- Make the virtues of humility, cooperation, generosity, gratitude, kindness and thrift cool again, or hip, or bad, or the bomb, or whatever word or phrase you use to describe something really good and worth having.

This is the century where we get a couple of chances to move from the age of rapid depletion to something less rapid and less depleting. Ready or not, we will be carried as in a river overflowing with spring thaw. We will steer our lives and cultures at first with more hope than effectiveness, and with much fret and worry. We should consider it an exciting time, filled with opportunities to think big thoughts and to imagine wonderful alternatives;

In such times we must recognize the signs of seismic social and cultural shifts that are under way, and engage fully our talents to bring forth an alternative worldview.

to help create a worldview where humans can feel at home on a planet that is very much alive, interconnected, filled with morally valuable species and with precious limit to how much it can provide; where human ignorance—Stan Rowe's *Homo ignoramus*—about our living Earth will always exceed our knowledge; and where our curiosity promotes understanding—not subjugation—of Earth's complexity, beauty and resilience. It's time to accept the creative limits and boundaries that gave us the universe and the sun-powered Earth in the first place. As T. S. Eliot said in *Little Gidding*, "The fire and the rose are one."

It's time to change our minds and our lives.

The revolution is here.

It's time.



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ALDO LEOPOLD AT YALE

The Center for Humans and Nature was actively involved in the Symposium and Celebration Honoring Aldo Leopold's Graduation Centennial from the "Yale Forest School," Yale University School of Forestry and Environmental Studies, New Haven, CT, Friday, April 3rd, 2009. The following two articles are based on presentations delivered at the Symposium by Center directors Curt Meine and Bruce Jennings.

Conservation Science, Ethics, Policy, and Practice

CURT MEINE

Wes Jackson—sitting there four rows back—has said to Courtney White—sitting over there—that “We live in the most important moment in history.” I will leave it to Wes and Courtney later on in the day to explain that comment in greater detail. But it is in this spirit that I am going to open up this morning's discussion by placing Aldo Leopold's legacy in the large context of conservation history. And I'm going to start actually with an allusion to a place where my friend Peter Brown (on this side of the room!) has been working with his colleagues at McGill University in Montreal: the Cree village of Wemindji, along the east shore of Hudson Bay in Quebec.

I open with this because there's a nice connection here. When Leopold was a student here at Yale, he would return during his summers to the Midwest and to a vacation cottage that the family had in the Les Cheneaux Islands at the north end of Lake Huron. There he nurtured for many years a great dream: to take a long canoe trip from the Great Lakes up through the Soo and eventually to Hudson Bay. This was going to be his great wilderness experience. But he never did it. It always remained just a dream in his mind.

But many decades later Aldo Leopold did in a sense arrive on the shore of James Bay. In 2006 Peter helped organize a project meeting at Wemindji, and invited me along to speak about “Leopold's Land Ethics: Stories of

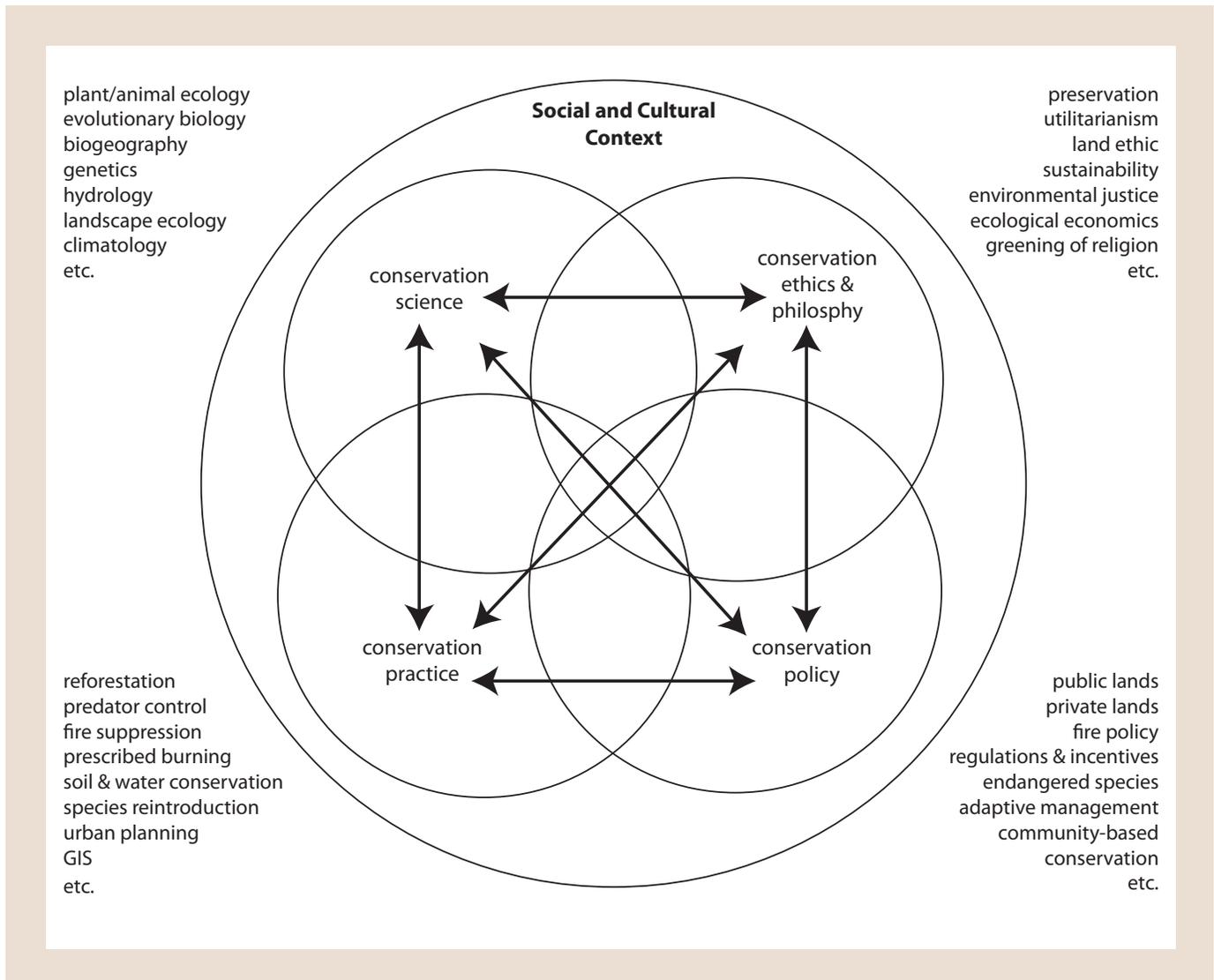
Wisconsin.” I have often used this as an example—and I could use many—of Aldo Leopold's legacy growing and evolving through connections that continue to be made across geographic, cultural, and disciplinary boundaries.

This February we had something of a “pre-union” of many of the people here today in Albuquerque, New Mexico. Several of us here were also involved in that gathering. Of course, after Leopold graduated from Yale he went on to take his first job with the U.S. Forest Service in the Southwest, and so our colleagues in that region are celebrating Leopold's arrival there in this centennial year as well. They kicked things off in February with a conference designed to consider the diverse cultural roots and expressions of the land ethic in the Southwest. And so, the discussion of Leopold's legacy at that meeting and in all the events this year provide an important opportunity to explore the continuing evolution of the land ethic as a vital idea.

With all this in mind, let me try in just a few minutes to put the morning's discussion into a very broad context. I'm going to use a simple Venn diagram that I often use to frame the large story of environmental history.

When I am asked if there is a single book that one should read to learn the entire story of conservation and environmental thinking, I always have to answer that such a book does not yet exist. To tell that story, one would need to know and integrate multiple fields of knowledge, and vast realms of detail within them. It's a large and complex task, and no one has yet taken it on. Lately I've used this diagram to frame and explain the challenge. I find this useful mostly for myself. Maybe you'll find it useful, too.

We have many exemplary books and scholarly articles that examine various aspects of the history of the conservation *science* (I use the term *conservation* here. You can plug in your preferred term—*environmental science*, or perhaps *sustainability science*.) There's obviously a history to the science, and the many fields of science involved. We can list some of many scientific disciplines relevant to conservation, each with their own rich intellectual history. And we could enjoy many long lectures and books on



each of these. We have quite an expansive bookshelf of material available on the history of various dimensions of conservation science, and our understanding continues to evolve.

But conservation is not a matter of science alone. Conservation science intersects with conservation *practice*—the application of that knowledge. In the realm of conservation practice, we can identify many particular activities and techniques and technologies—everything from historic reforestation efforts through things like predator control (so important, of course to Leopold’s story), from hydraulic engineering to the advent of GIS. These practices have their own rich history. Likewise, there is a rich and intersecting history of the development of conservation *ethics and philosophy*. These humanistic dimensions of conservation would again include a variety of fields, from literature to theology to environmental history and environmental ethics. And finally, there is the

realm of conservation *policy*. Within the policy arena we might include such endeavors as wildlife law, ecological economics, and land use policy, all of which, again, have their own rich history.

We are of course fortunate to have available many critical scholarly contributions that provide us with narratives of the developments in conservation science, practice, philosophy, and policy. But what is most interesting—and difficult—in grasping the large story of conservation history is how all of these realms interact in complex and dynamic ways. To write the ultimate comprehensive text in conservation history, one would need to examine all the complex feedback loops at work here. For example, a new advance in science may suggest a new ethical insight, which inspires a new practice on the ground, which might require a change in policy, which might in turn lead to a new ethical insight. Change in conservation ricochets around and around and around as history advances. And,

of course, all of this occurs within a complex and ever-changing social and cultural context. And beyond this is the world itself, the ever-changing natural world that includes all of the above.

Leopold for me has been such a rich and continuing source of insight and inspiration because he worked within all these realms. And one can track him bouncing around these circles, always in a critical and creative manner. That is what I have always found so amazing in Leopold's life story. It provides a unique transect across the history of 20th century conservation science, policy, philosophy, and practice. Understanding that story has helped me, at least, to get a better handle on where we are and where we're going.



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Leopoldian Professionalism

BRUCE JENNINGS

This session is entitled, “Looking Forward: Leopold For The 21st Century. What Would He Say To His Hundredth Anniversary Class Graduating This Year?” I’m going to take a slightly different approach to the question posed to our panel. I really don’t know what Aldo Leopold *would* say to the class of 2009. In good philosophical fashion I will dodge the scholarly question and instead address myself to what I think he *should* say, and probably would if he were looking at the human prospect through 2009 eyes.

One thing in particular caught my eye in looking through some of Leopold's writings for a clue to guide me. It was his emphasis on the importance and indeed the power of changing minds—not just manipulating “incentives” or motivations, but changing whole ways of

thinking and acting in the world; transforming outlooks, feelings, desires, intellectual understanding, imagination, values and commitments. He sometimes called this endeavor, “the development of an ecological conscience.” And he believed it went hand in hand with an education about the reality of nature as a system, as a pyramid, as an interdependent nexus or network of life and of energy. An ecological *conscience* goes hand in hand with an ecological *consciousness*.

“Ecological science,” he wrote, “has wrought a change in the mental eye.” That’s the sentence that I want to use as my jumping-off point for my remarks. This remark occurs in a passage where Leopold is saying that Daniel Boone understood nature and an ecosystem and the land in a certain intuitive way, but that we now today have a deeper understanding than he did. Boone lived on a surface; ecology allows us to see more deeply beneath the surface. And it actually dovetails nicely with the passage that was read at the beginning of this session by Mary Evelyn Tucker about how the ecologist is a lonely figure, because he or she can see things that most of the rest of us miss.

This sort of formulation leads me to ask the question, “Is ecology a profession?” What are schools of environment studies supposed to do? Are they creating a group of people with a special kind of education that we ought to refer to as a profession, and if so, what does that mean? And what should professionals be doing in our society today given the problems we’ve been talking about all day long?

I think Leopold would have said to us that he’s concerned in 2009 about the potential loss in our culture and our society of two essential things. (In a recent book Jane Jacobs actually has voiced this concern.) The first is a loss of an ideal or culture of professionalism, in particular ethical, civic professionalism. And the second, consequent to the loss of professionalism, is an atrophy of our society’s moral and natural imagination. Finally, with both a loss of civic professionalism and the atrophy of a moral imagination concerning the biotic community (the “land”) comes a crippling of our social capacity to realize anything like the land ethic in our policies and practices. This is nothing less than a crisis of ecologically responsible democratic citizenship.

Faced with this prospect, Leopold—and all intellectuals and educators in the conservation movement today—would and should charge the graduates of Yale FES to recover, recapture, and recreate that sense of ethical professionalism and that sense of moral imagination, and to help nurture and restore the vital connection between our land and our democracy.

Now, what do I mean by ethical professionalism, in what sense might ecology be a profession, and how should

professionals be educated? I suggest to you that we think in terms of the following three distinctions—which I believe are Leopoldian in spirit, if not in terminology or actual argumentation.

The three distinctions are as follows: (1) Education is not the same as training, or mastering a given body of information. (2) Being a professional is not the same thing as having technical or theoretical expertise. (3) Having a calling or a profession is not the same thing as having a career.

To develop a new kind of mental eye, as Leopold put it and explored it in the *Sand County Almanac*, is to develop a capacity for ethical judgment and discernment. It is also to develop a sense of commitment and responsibility. To have a profession is to have something to profess, and to have the qualities of mind and heart adequate to professing it with wisdom and finesse.

That's why there is a deep affinity, certainly in the Judeo-Christian tradition at any rate, between the notion of calling and the notion of profession. Leopold's writings are replete with narratives of calling. In the Bible Abraham, Moses, and other prophets were called by God into a relationship that established a moral transformation, a covenant. Leopold, echoing these traditional memories, describes himself being called by the voice of cranes and by the eye of a dying wolf. To be called is to be open to hearing or seeing a source of value larger and more fundamental than ourselves and our immediate interests. And such openness in turn leads one to embrace that higher value when it is confronted. That embrace is deeply transformative.

Precisely because calling and profession are so powerful, judgment and critical discernment are all the more crucial. There are true calls and false ones. In the practical application of knowledge to real-world decisions and actions, values are complex and subject to interpretation in light of context and circumstance. Values are often multiple and in conflict with one another.

So to respond to the call of a profession is not simply making a commitment per se; it is making a commitment critically, reflectively, with discernment. It entails a degree of mastering, of critical reasoning capacities and reasoned ethical judgment. *Education that does not make provision for and guidance toward such mastery is not education at all; it's technical training that prepares for a career, but does not enable a calling.*

Are we training, in our schools of environment studies, a cadre of individuals who have the specialized knowledge that gives them a new mental eye, but also that sense of professionalism or calling that shapes moral discernment and moral judgment? If we aren't, if we are not giving them

a Leopoldian mental eye of values as well as facts, where will we as society get such vision? If we are not training the next generation of ecological experts to be professionals, can we do without such ecological professionals? I think that in the years ahead we cannot do well without them; we need their vision and leadership and we can ill afford to be guided by technical experts lacking in ethical professionalism. Specialists without spirit, sensualists without heart, as Max Weber put it grimly.

Now, if we can educate and produce a new generation of ecological professionals what are they supposed to do? The essence of being a professional, I would argue, is really not the application of specialized knowledge to particular problems, so much as it is the practice of a kind of civic and moral education for the society as a whole.

And what is it that professionals educate society about? It is to develop in all of us as democratic citizens an expanded sense of moral and civic imagination. And in the case of ecology, natural imagination.

Physicians don't simply apply technical skill to cure a physiological problem. They shape our understanding of our own body and our own health. Similarly I contend that all professionals have this role of nurturing an expanded moral imagination and civic capacity. That's why it's a false opposition (alas often posed) to pit expertise against democracy; professional leadership against grassroots, participation and empowerment. Of course, technocratic elites often impede and undermine democratic governance, but Leopoldian professionals would not, they would nurture and educate and civil-ize it.



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“Way-Station Selves” Embedded in Biological Networks

RONALD BAYER

It is not surprising that when contemporary bioethics began to take form in the 1960s and 1970s questions posed by infectious disease were all but absent. This lacuna reflected the dominant thinking in medicine and even in public health. What little there was of even the first glimpses of an ethics of public health focused on the issues posed by concerns about chronic disease and “life style.”

And then there was AIDS. Bioethicists drawn to this new challenge at a time when its global dimensions were not even a specter on the horizon brought with them the conceptual apparatus that had served them well in considering issues of research and the clinical encounter. While the autonomy-

focused bioethical frame was very useful at a moment when concerns about coercion, stigma, and privacy and confidentiality were central, it became increasingly obvious, at least to some, that something more robust would be essential if an ethics of epidemic disease were to provide for a meaningful encounter with the real world of public health. That initial insight became all the more obvious in the early 1990s with the resurgence of concern about tuberculosis.

What began to emerge was a number forays into the ethics of infectious disease as part of the broader project of efforts to articulate an ethics of public health. But nothing until now approached the scope and depth of the *Patient as Victim and Vector* by Margaret Battin, Leslie Frances, Jay Jacobson, and Charles Smith. Accessibly, sometimes elegantly,

Margaret P. Battin, Leslie P. Francis, J.A. Jacobson and Charles B. Smith.
The Patient as Victim and Vector: Ethics and Infectious Disease.

Oxford University Press, 2009,
576 pages. \$31.95

written, cogent and provocative, this new book, the collective effort of philosophers and physicians, well serves as both a statement to the field

of bioethics and as a valuable text for students in medicine, public health and bioethics.

Battin and her colleagues begin with an insight that is both biological and socio-cultural. “Human beings all live together with each other in a web of potential and actual disease...Even when they are not currently overtly ill and not aware of the possibly of transmission...no matter how people try, they cannot avoid the fact not just that they are at risk of infection from others but that they in turn pose risks to others and thus perhaps to others far distant from themselves” (p. 80). We are thus “way-station selves” embedded in biological networks that have ineluctable ethical consequences. From this starting point it is not a long way to the framework that informs the *Patient as Victim and Vector* “ethical problems in infectious disease should be analyzed, and clinical practice and research agendas and public policies developed that always take into account the possibility that a person with communicable infectious disease is both victim and victor” (p. 7). More, this perspective serves as a foundation for their claim that much of bioethics and American ideology are too limited, cabined in a way that limits moral theory and its application to the world of “flesh and blood human beings.”

With care and unusual modesty Margaret Battin and her colleagues turn to a range of topics central to the practice of public health, such as surveillance, required testing, mandated immunization and the imposition of constraints in light of

infectious disease. SARS, tuberculosis, and the threat of pandemic flu receive sustained attention. In speaking of the burdens borne by those who may even be the legitimate subject of imposed constraint they display both care and humanity “there will remain the recognition that victims have had important moral interests overridden despite the justifiability of the choices made.”

At the end of the day this is a very fine volume. Perhaps most important it demonstrates again and again that formulaic responses to the threat of infectious disease are inadequate to the challenges they pose. It is a remarkable, and I think lamentable fact, that in recent years the still-nascent discussion of the public health in general and of epidemic disease more specifically, has all but been supplanted by the language of human rights. Human rights efforts can and have had important, morally significant outcomes, especially in the face of outrageous assault on human dignity. But too frequently the terms of human rights have been to blunt an instrument for engaging the extraordinarily difficult challenges of infectious disease. That, Battin and her colleagues have made abundantly clear. To watch the authors probe and struggle with the moral dilemmas we all face is more than worth the price of admission.



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Putting Nature Back Together Again

NINA LEOPOLD BRADLEY

Headlines on the front page of a Wisconsin newspaper this week stated “Can nature be rebuilt?” It went on to say, once an area is no longer a pristine ecosystem, can you really put nature back together again?

As I read this comment I was reminded of my brother, Carl Leopold, who was planning to restore a tropical rainforest in Costa Rica. A professor on the Madison campus said to Carl: “No way - you cannot restore a tropical rainforest!” Well today, the birds are coming back, monkeys are returning to the restored tropical rainforest, and the professor, with a smile, is impressed.

“Can you really put nature back together again?” If anyone can restore a ruined landscape, it is someone with the brash charm and frenetic energy of Steve Apfelbaum! In his own community and in his academic life, he has revolutionized the art of rebuilding ecosystems.

What a pleasure it is to read Steve’s book and to learn how Steve and his partner, Susan, have found an exciting and spiritual connection through their love of the land. With restoration ecology as their tool, they are working to pull together the natural world and its human communities.

As I read Steve’s book, page by page and chapter by chapter, my

thoughts kept returning to one of my favorite quotes from my father: he wrote, “There are two things that interest me - the relation of people to each other and the relation of people to land.” This book personifies these lovely and personal thoughts – Steve and Susan’s relation to each other and their relation to the land.

Survival of aboriginal people around the world has always depended on an intimate understanding of and respect for the land. Caring for the earth was caring for themselves.

Now, with the industrial revolution, our survival needs have been met in ways that do not require an intimate connection to the earth. We have become separated from nature, seasons, and the places we live, as our daily activities have moved indoors to schools, factories, offices and television.

The physical world is no longer as real to us as the economic world—we succor the economy—our politicians gear every decision to speeding further growth. The Earth has become abstract.

Wendell Berry writes that there

Steve Apfelbaum.
*Nature’s Second Chance:
Restoring the Ecology of
Stone Prairie Farm.*

Beacon Press, 2009, 242 pages.
\$25.95

is a real disconnection between economy and ecology, between human domesticity and the natural world. The two disciplines remain far apart and this lack of integration is a major factor in the downward spiral of global environmental health. As I read through Steve’s book, I realize that he is working in his own community

and even around the world, to change this status quo. For Steve, restoration has become a science and a vehicle for understanding the inter-connectedness of the natural system.

One of the earliest attempts at land restoration was in 1934 at the University of Wisconsin Arboretum. In Leopold's dedication speech he presented the concept of an arboretum that would be a sample of original Wisconsin—what did Wisconsin look like before we took it away from the Indians? He envisioned the arboretum as “a starting point in the long and laborious job of building a permanent and mutually beneficial relationship between civilized men and a civilized landscape.”

As the arboretum was being organized in the 1930's, the science of land health was yet to be born. There were no detailed plans, no experimental designs, or systematic treatments. What was accomplished rested upon first hand knowledge and insight and was marked by a personal and lifelong commitment to the task.

I have long wondered if my father's involvement with land restoration at the arboretum did not instigate his buying land in the sand counties of central Wisconsin. The 80 acres he selected had been exploited in every way—the land had been planted to corn, then a little rye, and then came weeds and cockleburrs.

He wrote, “On this sand farm in Wisconsin, first worn out and then abandoned by our bigger and better society, we try to re-build, with shovel and axe, what we are losing elsewhere.”

These acres and the old “shack” became a family enterprise, planting native species of prairie grasses and wildflowers, shrubs and trees. From April to October, year after year, scarcely a weekend went by that some one did not plant or transplant something.

Since those years, the 1930's and 40's, land restoration has become a science. Steve and Susan have used this science to influence our society to understand and improve man's relationship with the land. With their hands-on restoration over a period of years, they have transformed their 80 acres into a biologically diverse ecosystem of prairie, wetland, spring brook and forest. But that was just the beginning.

In the flow of chapters in Steve's book, the reader is caught up in a spirit of transformation—from worn out farmland to healthy, functioning ecosystems. “Nature's Second Chance” offers unique insights into the biological world, into the process of ecological recovery and how humans play a starring role in healing the planet by implementing Leopold's land ethic one farm, one watershed, or one community at a time.

In his final chapter, Steve writes “For nearly three decades at Stone Prairie Farm, I have redefined my relationship not only with the land, but to the land community. As global ecological systems deteriorate, all of us need ways to understand the larger context of our relationship to the earth.”

And so, Steve, in his book, offers a fresh, personal and intimate perspective on the application of restoration science to human values, renewing a sustainable relation to place, community and the natural world. He and Susan have reconstructed nature back into communities of life, forms that evolved together for thousands of years—and today have again achieved equilibrium.



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CHN BOOKSHELF

A regular feature calling attention to important books and articles that CHN staff, board, and collaborating scholars are reading and recommend. Quot libros, quam breve tempus.

John R. Ehrenfeld, *Sustainability by Design: A Subversive Strategy for Transforming Our Consumer Culture* (Yale University Press, 2008).

Eric T. Freyfogle, *Why Conservation Is Failing and How It Can Regain Ground* (Yale University Press, 2006).

Tara Lohan, ed. *Water Consciousness: How We All Have to Change to Protect Our Most Critical Resource* (AlterNet Books, 2008).

Bill McKibben, ed. *American Earth: Environmental Writing Since Thoreau* (Library of America, 2008).

Robert Glennon, *Unquenchable: America's Water Crisis and What to Do About It*, (Island Press, 2009).

Ben Minteer, *The Landscape of Reform: Civic Pragmatism and Environmental Thought in America* (MIT Press, 2006).

Ted Nordhaus and Michael Shellenberger, *Break Through: From the Death of Environmentalism to the Politics of Possibility* (Houghton Mifflin, 2007).

Eric D. Schneider and Dorion Sagan, *Into the Cool: Energy Flow, Thermodynamics, and Life* (University of Chicago Press, 2006).

Laura Westra, *Environmental Justice and the Rights of Unborn and Future Generations* (Earthscan, 2006).

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