



Dædalus

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Inside front cover: Preview of a warming planet: a lone Gentoo penguin (*Pygoscelis papua*), adrift on a blue iceberg, Gerlache Passage, Antarctic Peninsula, Southern Ocean, Antarctica. See Camille Parmesan on *Where the wild things were*, pages 31–38: “As sea ice gets thinner and shrinks in area, so too shrink animal populations for which ice is their home: from the polar bear and the ringed seal in the Arctic, to the Adelié and Emperor penguins in the Antarctic. These animals are retreating toward the poles, and are rapidly reaching the end of the Earth as they know it.” Photograph © Momatiuk–Eastcott/Corbis.

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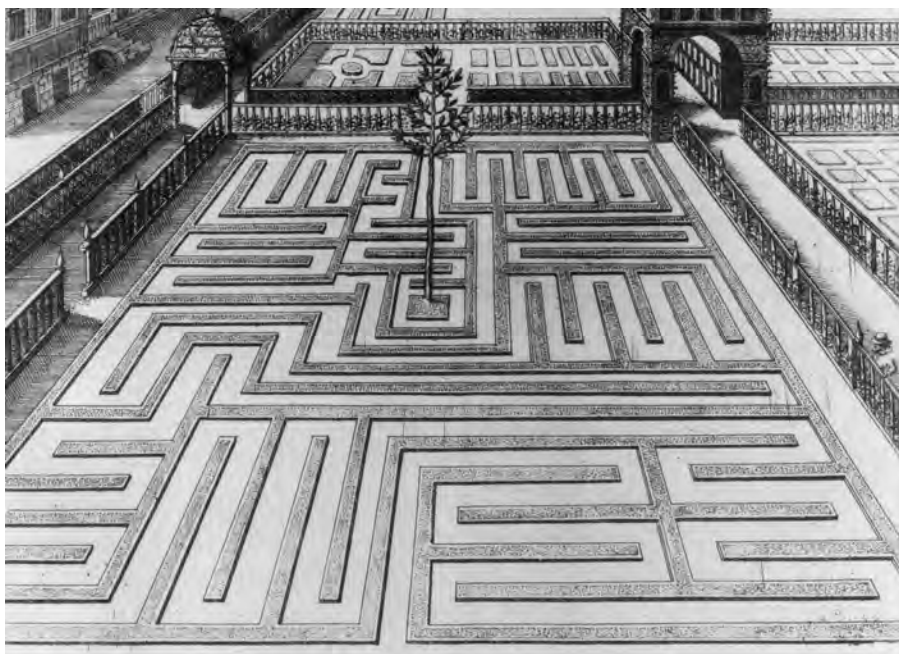
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*The contested Earth: science, equity
& the environment*

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Because We Have Been Here Before

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Body and Soul

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Leo Marx

The idea of nature in America

The idea of nature is – or, rather, was – one of the fundamental American ideas. In its time it served – as the ideas of freedom, democracy, or progress did in theirs – to define the meaning of America. For some three centuries, in fact, from the founding of Jamestown in 1607 to the closing of the Western frontier in 1890, the encounter of white settlers with what they perceived as wilderness – unaltered nature – was *the* defining American experience.

By the end of that era, however, the wilderness had come to seem a thing of the past, and the land of farms and villages was rapidly becoming a land of factories and cities. By 1920, half the population lived in cities, and as the

natural world became a less immediate presence, images of the pristine landscape – chief icon of American nature – lost their power to express the nation’s vision of itself.

Then, in the 1970s, with the onset of the ecological ‘crisis,’ the refurbished, matter-of-fact word *environment* took over a large part of the niche in public discourse hitherto occupied by the word *nature*. Before the end of the century, the marked loss of status and currency suffered by the idea of nature had become a hot subject in academic and intellectual circles. Reputable scholars and journalists published essays and books about the ‘death’ – or the ‘end’ – of nature; the University of California recruited a dozen humanities professors to participate in a semester-long research seminar designed to “reinvent nature”;¹ and the association of European specialists in American studies chose, as the aim of its turn-of-the-century conference, to reassess the changing role played by the idea of nature in America.²

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1 The essays they produced are reprinted in *Uncommon Ground: Toward Reinventing Nature*, ed. William Cronon (W. W. Norton: New York, 1995).

2 This essay derives from a paper presented at the conference of the European Association

What are we to make of the purported demise of nature? Can it be that the venerable idea is no longer meaningful? If that seems improbable on its face, it is because *nature* is our oldest, most nearly universal name for the material world, and despite the alarming extent of the transformation – and devastation – we humans have visited on it, that world is still very much with us. But why, then, is the general idea of nature – nature in all its meanings – falling into disuse? What other reasons might there be for the seeming end of nature? With these questions in mind, I want to reconsider the idea's changing role in American thought.

But, first, these preliminary caveats. I do not mean to suggest that the imminent disappearance of nature – if that is what we are witnessing – is a peculiarly American development. But in view of the crucial role played by the idea over the course of American history, a reassessment of critical stages of that history may prove to be revealing. I say 'stages' because limitations of space – the subject calls for a long treatise rather than an essay – make it necessary to focus on a few significant points along the historical trajectory traced by the idea of nature in American thought.

But it also should be said that the word *nature* is a notorious semantic and metaphysical trap. As used in ordinary discourse nowadays, it is an inherently ambiguous word. We cannot always tell whether references to *nature* are meant to include or exclude people. Besides, the word also carries the sense of *essence*: of the ultimate, irreducible character or

quality of something, as for example, 'the nature of femininity' or, for that matter, 'the nature of nature.' When this meaning is in play, the word tacitly imputes an idealist or essentialist – hence ahistorical – character to the particular subject at hand, whether it be femaleness or nature itself. The word's multiple meanings testify to its age: its roots go back (by way of Latin and Old French) to the concept of origination – of being born. As Raymond Williams famously noted, *nature* is probably the most complex word in the English language.³ And when, moreover, the idea of nature is yoked with the ideologically freighted concept of American nationhood, as in the historian Perry Miller's sly allusion to America as *Nature's Nation*, the ambiguity is compounded by chauvinism.⁴

Contemplating the nature of nature in America has led many scholars, of whom the historian Frederick Jackson Turner is the exemplar, to adopt the contested idiom of 'American exceptionalism.'⁵ And not without good reason. However wary of chauvinism one might be, it would be foolish to deny that when Europeans first encountered American nature, it truly was, and to some extent still is, exceptional – perhaps not unique

3 Raymond Williams, *Keywords* (New York: Oxford University Press, 1983), 219.

4 Miller first used the phrase in his 1953 essay, "Nature and the National Ego," in *Errand into the Wilderness* (Cambridge, Mass.: Harvard University Press, 1967), 209. Elizabeth W. Miller and Kenneth Murdock later used it as the title of a posthumous collection of Miller's essays, *Nature's Nation* (Cambridge, Mass.: Harvard University Press, 1967).

5 In his seminal 1893 essay, "The Significance of the Frontier in American History," Turner argued that American nature, in the form of free land, in effect determined the "peculiarity of American institutions."

for American Studies, in Graz, Austria, April 14 – 17, 2000. See Hans Bak and Walter W. Holbling, eds., "*Nature's Nation*" Revisited: *American Concepts of Nature from Wonder to Ecological Crisis* (Amsterdam: VU Press, 2003).

but, like Australia, a continent even less developed at the time of contact, surely exceptional. It was exceptional in its immensity, its spectacular beauty, its variety of habitats, its promise of wealth, its accessibility to settlers from overseas, and, above all, in the scarcity of its indigenous population. Hence the remarkable extent of its underdevelopment – its wildness – as depicted in myriad representations of the initial landfall of European explorers on the Atlantic seaboard of North America. In that stock image, the newly discovered terrain appears to be untouched by civilization, a cultural void populated by godless savages, and not easy to distinguish from a state of nature.

In the beginning, then, Europeans formed their impressions of American nature in a geographical context: it was a place, a terrain, a landscape. But they invariably accommodated their immediate impressions of American places to their imported – typically religious – preconceptions about the nature of nature and the character of indigenous peoples. Thus all of the significant American ideas of nature are hybrids, conceived in Europe and inflected by New World experience. And each ideology that served as a rationale for one or another colonial system of power contained such a hybrid Euro-American conception of nature and of the colonists' relations with it.

A revealing example is the Pilgrim leader William Bradford's well-known description of the forbidding Cape Cod shoreline as seen from the deck of the *Mayflower* in 1620. He depicts it as "a hidious and desolate wildernes, full of wild beasts and wild men." Here the bias inherent in the Christian idea of nature as fallen – as Satan's domain – effectively erases the humanity of the indigenous

Americans. To Bradford they are more like wild beasts than white men.

The concept of satanic nature provided a useful foil for the sacred mission of the Puritan colonists.⁶ In 1645, for example, John Winthrop, lieutenant governor of the Massachusetts Bay Colony, used it as an ideological weapon to defend his theocratic authority. His enemies had charged him with infringing on their liberty, and in his uncompromising response in the General Court he develops the distinction between two kinds of liberty: natural and civil. Natural liberty, "common to man with beasts and other creatures," is the liberty, he argues, we enjoy in a state of nature, namely, to do evil as well as good; civil liberty, on the other hand, is moral, hence available only to the truly regenerate, only to Christians redeemed from sin by the reception of divine grace.⁷ According to Calvinist doctrine, only those rescued from the state of nature may enjoy the God-given liberty to do what is good, just, and honest. Here, on the coast of a vast, unexplored continent, the idea of an ostensibly separate realm of wild nature – a separateness underscored by the contrast with the tamed state of nature in Europe – was a valuable rhetorical asset for the colony's leaders. Allusions to wild nature served to reinforce the doctrinal barrier between themselves, the elect, and the unregenerate, whom they consigned to the realm of natural lawlessness.

In the lexicon of Protestant Christianity in America, the essential character of

6 William Bradford, *History of Plimoth Plantation*, in Perry Miller and Thomas Johnson, eds., *The Puritans* (New York: American Book Company, 1938), 100–101.

7 John Winthrop, "Speech to the General Court, July 3, 1625," in Miller and Johnson, eds., *The Puritans*, 206.

primal nature was conveyed by epithets like ‘howling desert’ and ‘hideous wilderness,’ and by the malign names – savage, cannibal, slave – assigned to indigenous peoples. In Winthrop’s argument, accordingly, the unarguable existence of a separate (unredeemed) state of nature helps to justify his a priori condemnation of the unregenerate, who constitute a potential threat of lawlessness, anarchy, and misrule. Their geographical location underscored the theological argument: the only escape from natural unregeneracy open to them was the reception of divine grace.

By the time Thomas Jefferson wrote his draft of the Declaration of Independence, the theological notion of a dual nature – part profane, part sacred – was being supplanted by the unitary character of Newtonian science and Deism. Here, the initial identification of American nature with the landscape expanded to embrace the natural processes, or laws, operating behind its visible surface. Because the newly discovered celestial machinery obeys physical laws accessible to human reason, Newtonian physics had the effect of bringing humanity and nature closer together. Besides, the mathematical clarity and precision of the new physics made the old images of a dark, disorderly nature repugnant. Alexander Pope summed up the change in the prevailing worldview in the couplet engraved on Newton’s tomb in Westminster Abbey:

Nature and nature’s laws lay hid in night.
God said, “Let Newton be!” and all was light.

By 1776 it made sense for a rhetorician as gifted as Jefferson to extend the hypothetical reach of nature’s laws – or, to be more precise, of principles analogous to them – to the unruly sphere of politics.

To justify the colonists’ acts of treason and armed rebellion, he had merely to describe them as the means – indeed, the only possible means – of claiming the independent status to which they were entitled by “the Laws of Nature and of Nature’s God.” Nature, as our free-thinking president conceived of it, was not so much the work of God as God was a constituent feature of Nature. By invoking a secularized idea of nature on behalf of a quintessentially political cause, Jefferson helped to narrow the gulf separating humanity and nature.

But for that purpose, the idiom of the natural sublime was even more effective. Nine years later, in *Notes on Virginia*, Jefferson invoked the sublime to account for the unsurpassed beauty of one of American nature’s most cherished creations – Virginia’s Natural Bridge. An ardent practitioner of the neoclassical aesthetic, Jefferson credits the beauty of the Bridge to its symmetrical form, or, as it were, to the strikingly close approximation of its form to ostensibly natural principles of order and proportion. He begins his description of the bridge with a detailed analysis of its exact dimensions, as if reported by a detached observer writing in the third person. But then, partway through, he abruptly puts himself into the scene, climbs the parapet, and, shifting to the second person, describes how “you” inescapably would react if you too found yourself standing on the narrow ledge looking “over into the abyss”:

You involuntarily fall on your hands and feet, creep to the parapet and peep over it If the view from the top be painful and intolerable, that from below is delightful in an equal extreme. It is impossible for the emotions arising from the sublime to be felt beyond what they are here; so beautiful an arch, so elevated, so light, and

springing as it were up to heaven! The rapture of the spectator is really indescribable!⁸

As this passionate Wordsworthian apostrophe suggests – it was written about fifteen years before the preface to the *Lyrical Ballads* – Jefferson already was prepared to enlist in the Romantic movement. But even after the triumph of Romanticism, the separateness of nature remained a largely unchallenged if unstated premise of public discourse. Since no authoritative biological counterpart to the Newtonian laws of nature had yet been formulated, supernatural explanations of the origin of life were not yet vulnerable to the challenge of scientific materialism. By the same token, pantheism retained its status as a Christian heresy, and dutiful communicants were advised to be wary of the feeling of oneness with nature.

In 1836, four years after resigning his pastorate in the Second (Unitarian) Church of Boston, Ralph Waldo Emerson anonymously published the essay *Nature*, which came to be known as the manifesto of Transcendentalism, a New England variant of European Romanticism. The essay begins as a lament for the loss of humanity's direct relations with nature. "Why," Emerson asks, "should not we also enjoy an original relation to the universe?"

Like his title, the question rests on the assumption that nature was – and should once again become – a primary locus of meaning and value for Americans. What followed was Emerson's first and only attempt to formulate a systematic theory of nature, and in it he probably came as close as he ever would to repudiating the

orthodox theological assumption that humanity and nature belong to separate realms of being. To illustrate the potential effect of being in "the presence of nature," Emerson describes an epiphany that is patently irreconcilable with the idea of nature's separateness. One gloomy afternoon, while crossing the town common, he was suddenly – unaccountably – overwhelmed by a sense of immanence, or, as he puts it, of "being part or parcel of God." It was a largely secularized variant of the Protestant conversion experience, and it suggests the possibility, as Emerson puts it, of an "occult relation" – or state of oneness – with nonhuman nature. The balance of *Nature* may be read as an effort to devise a reasoned explanation, or justification, for this transformative experience.

Emerson's account of the epiphany reveals his ambivalence about the relative validity of religious and scientific conceptions of nature. On the one hand it expresses his growing skepticism, on both theological and scientific grounds, about the received idea of a separate nature. As a Unitarian, to be sure, he already had repudiated most supernatural aspects of Christian doctrine, including the divinity of Jesus. A few years before writing *Nature*, he had resigned his pastorate on the grounds that he no longer could in good conscience perform the – to him, excessively literal – sacrament of the Lord's Supper. At that time, moreover, he was studiously keeping abreast of the latest advances in geology and zoology, which provided empirical evidence in support of various emerging theories of evolution. When *Nature* was reissued in 1849, in fact, he appended a new verse epigraph depicting humanity's origin:

A subtle chain of countless rings
The next unto the farthest brings;

8 Thomas Jefferson, *Notes on the State of Virginia*, ed. William Peden (Chapel Hill: University of North Carolina Press, 1955), 55.

The eye reads omens where it goes,
And speaks all languages the rose;
And, striving to be man, the worm
Mounts through all the spires of form.⁹

But though Emerson, like many of his contemporaries, was receptive to evolutionary thinking long before the publication of Darwin's *Origin of Species*, he was not prepared – for reasons he never quite made explicit – to abandon the idea of nature's separateness. That traditional assumption is built into the conceptual structure of *Nature*. In defining his key terms, he postulates a universe made up of all that exists except for one thing: the human soul. All being, he asserts, "is composed of Nature and the Soul," and he goes on to specify that "all that is *separate* from us, all which Philosophy distinguishes as the NOT ME, both nature and art, all other men and my own body, must be ranked under this name, NATURE."¹⁰ Though he tacitly repudiated the major tenets of the Christian faith, and though he was prepared to embrace the theory of evolution, he continued to define nature as a discrete entity, eternally separated from human beings and their immortal souls.

But the theory of evolution, as definitively set forth by Darwin in 1859, made the age-old belief in nature's separateness scientifically untenable once and for all.¹¹ On that score the logical import of evolutionary biology is clear and conclusive. If *Homo sapiens* evolved through

a process of natural selection, if our species is inextricably embedded in a global web of biophysical processes, then there can be no such thing – on the planet Earth at least – as a separate domain of nature.

But the logic of science is one thing, and ancient habits of mind are another. Despite the passage of some 145 years since Darwin's theory first caught the world's attention, and despite the confirmation it has received, first and last, from an international consensus of scientists, its import has yet to be incorporated in prevailing assumptions about the nature of nature. To this day, the 'nature' commonly invoked in our public and private discourse – even by those of us who claim to 'believe in' evolution – seems to be a discrete, almost wholly independent entity 'out there' somewhere. In ordinary usage the word rarely conveys a sense of humanity's ties with other living things. As the historian of science, Lynn White, Jr., noted in his influential 1967 essay, "The Historical Roots of our Ecological Crisis," "Despite Darwin, we are not, in our hearts, part of the natural process."¹²

But that is putting it mildly. As everyone knows, the publication of the *Origin of Species* aroused intense public hostility, especially among churchmen and religious believers. There was no way, after all, to disguise the simple truth: Darwin's theory flatly contradicts the Biblical account of the creation. Besides, people of all persuasions, many non-believers among them, were – still are – revolted by the notion that we are kin to

9 Ralph Waldo Emerson, *Nature, Addresses, and Lectures* (Boston: Houghton Mifflin, 1884), I, 8.

10 *Ibid.*, 10 – 11. Emphasis added.

11 In *Origin of Species*, though Darwin's theory of evolution by natural selection remained incomplete until the publication of the *Descent of Man* in 1871.

12 Lynn White, Jr., "The Historical Roots of our Ecological Crisis," in Paul Shepherd, ed., *The Subversive Science; Essays Toward an Ecology of Man* (Boston: Houghton Mifflin, 1969), 369. See also Leo Marx, "American Institutions and Ecological Ideals," *Science* 170 (November 27, 1970): 945 – 952.

the higher primates. It makes them feel, as the saying goes, 'tainted by bestiality.' So does the idea that humanity reached the pinnacle of the food chain by winning a long, murderous struggle, "red" – in the poet Tennyson's phrase – "in tooth and claw."¹³ But the repugnance aroused by evolutionary theory did not surprise its wisest proponents. Years before he published the *Origin*, for example, Darwin had begun to fear that it would raise the specter of atheism. He clearly understood – and empathized with – the widespread impulse to deny, or gloss over, the disturbing implications of his theory. But he urged readers of the *Origin* to resist the impulse. "Nothing is easier," he warned,

than to admit in words the truth of the universal struggle for life, or more difficult – at least I have found it so – than constantly to bear this conclusion in mind. Yet unless it be thoroughly engrained in the mind, the whole economy of nature . . . will be dimly seen or quite misunderstood.¹⁴

But the perceived antireligious import of Darwinism was not the only reason for its failure to win acceptance in America. Equally if not more important was the largely unremarked yet fundamental conflict between the evolutionary view of humanity's embeddedness in natural processes and the nation's chief geopolitical project: the settlement and economic development of the continental landmass. As Tocqueville observed, most European settlers were "insensible" to the beauty and wonder of the wilderness. "Their eyes," he wrote, "are fixed on another sight: [their] . . . own

13 "In Memoriam" (1850), which he had begun writing in 1833.

14 Charles Darwin, *On the Origin of Species* (New York: Mentor, 1958), 74.

march across these wilds, draining swamps, turning the course of rivers, peopling solitudes, and subduing nature."¹⁵ That westward march, aimed at transforming the continent's natural resources into marketable wealth as rapidly as possible, was executed under the aegis of such slogans as 'Manifest Destiny,' the 'Conquest of Nature,' and, above all, 'Progress.'

The belief in 'progress,' a shorthand label for a grand narrative of history, was post-Civil War America's most popular secular creed. It held that our history is, or is rapidly becoming, a record of the steady, cumulative, continuous expansion of knowledge of – and power over – nature, a power destined to effect an overall improvement in the conditions of life. On this view, nature has a critical role in the unfolding of material progress – but a role largely defined by human purposes. Because it is an indispensable source of our knowledge and our raw materials, nature is most productively conceived as wholly Other – an unequivocally independent, separate, hence exploitable entity. The combined authority of the progressive ethos and the Christian faith accounts for much of nineteenth-century America's aversion to the Darwinian view of nature and, by the same token, the popularity of Social Darwinism. Though seemingly an offshoot of evolutionary biology, Social Darwinism was in fact a perversion of the new science. It turned on the idea of "the survival of the fittest," a catchphrase given worldwide currency by Herbert Spencer, the most influential popularizer of evolutionary theory. It was Spencer who did most to transform the idea of biological evolution into a

15 Alexis de Tocqueville, *Democracy in America*, ed. Phillips Bradley (New York: Alfred A. Knopf, 1946), II, 74.

full-fledged rationale – Social Darwinism – for the ruthless practices of ‘free market’ capitalism, as exemplified by the robber baron generation of American businessmen.¹⁶

The massive incursion of white settlers into the Western wilderness enacted the American belief in nation-building progress. In the popular culture, the successive stages of that great migration were represented by an imaginary boundary – a *moving* boundary – separating the built environment of the East from the expanse of undeveloped, ostensibly unowned – or, as it was called, ‘free’ – land of the West. Never mind that the land already was inhabited; the westward movement of the boundary represented the serial imposition of a beneficent Civilization on an unruly Nature, including its ‘savage’ inhabitants. The boundary’s westward movement was a gauge of national progress, and in tacit recognition of its ideological significance, it was given a proper name – *the frontier* – and accorded iconic status as an actual line – usually a broken or dotted line – imprinted on maps and documented by demographic data regularly collected, revised, and published in official reports of the United States Census. Eventually the word and the icon were compressed into a single term, ‘the frontier line,’ visual marker of the ‘conquest of nature.’ *Conquest* was an accurate name for it. After comparing America’s treatment of nature with that of

other nations over the ages, one historian concluded that “the story of ... [the United States] as regards the use of forests, grasslands, wildlife and water sources is the most violent and most destructive in the long history of civilization.”¹⁷

It is not surprising that a people busily plundering that Western cornucopia had little use for Darwinism. The ravaging of the West was not easily reconciled with the view that human life is inextricably enmeshed in natural processes. What made the conventional idea of a separate nature especially popular, under the circumstances, was its hospitality to either of the reigning – and contradictory – conceptions of the national terrain. Most Americans, it would seem, regarded that terrain as a hostile wilderness, a state of nature tolerable only insofar as it could be subjected to human domination. At the same time, however, a vocal minority took the opposite view. A cohort of gifted artists and intellectuals, many of them adherents of European Romanticism, regarded Nature as the embodiment of ultimate meaning and value. Landscapes embodying that Romantic conviction were represented in the paintings of Thomas Cole, Frederic Church, and the other members of the Hudson River School; in the writings of Emerson, Thoreau, and a host of other poets, essayists, novelists, and philosophers; and in the work of conservation activists like John Muir, Gifford Pinchot, and Teddy Roosevelt. In the press and the popular arts of mid-century America, a sentimental, quasi-religious cult of Nature helped to vent the pathos aroused by the spectacle of ravaged forests, slaughtered bison, and ‘vanishing Americans.’

17 Fairfield Osborn, *Our Plundered Planet* (Boston: Little Brown, 1948), 175.

16 Richard Hofstadter, *Social Darwinism in American Thought, 1800 – 1915* (Philadelphia: University of Pennsylvania Press, 1944); Ronald L. Numbers, *Darwinism Comes to America* (Cambridge, Mass.: Harvard University Press, 1998); Leo Marx, “The Domination of Nature and the Redefinition of Progress,” in Leo Marx and Bruce Mazlish, eds., *Progress: Fact or Illusion?* (Ann Arbor: University of Michigan Press, 1996), 201 – 218.

The ambiguity inherent in the idea of nature is central to the apocalyptic outcome of *Moby-Dick*, Herman Melville's epic account of America's violent assault on the natural world. Melville was so impressed by the irrational ferocity of the assault, in fact, that he instructs his narrator, Ishmael, to seek out its origin and its consequences. The inquiry rests on two assumptions: first, that the relations between American society and nonhuman nature are typified by whaling, a technologically sophisticated, for-profit industry devoted to killing whales; and, second, that the psychic roots of the enterprise are exemplified by Captain Ahab's obsession with wreaking revenge on a particular sperm whale whose distinguishing feature is his preternatural whiteness. (The sperm whale, not coincidentally, is the largest living embodiment of nature on the face of the earth.) What is it about the whiteness of this whale, Ishmael asks, that provokes Ahab's ungovernable hatred? Melville devotes an entire chapter to the inquiry – a chapter without which, Ishmael insists, the whole story would be pointless.

After an exhaustive analysis of every meaning of whiteness he can think of, it occurs to Ishmael that the uncanny effect of the color – or is it the absence of color? – is not attributable to any one of its meanings, but rather to its affinity, like that of material nature itself, with myriad, often antithetical meanings – or, in a word, to its ambiguity. At times, he observes, whiteness evokes disease, terror, death; and at others, “the sweet tinges of sunset skies and woods, and the gilded velvets of butterflies, and the butterfly cheeks of young girls.” But then, Ishmael recalls, the beauty of natural objects is no more inherent in their physical properties than their color is; actually, he realizes that their seeming

beauty is the product of “subtle deceits” of light and color, and that in fact “all deified nature paints like a harlot, whose allurements cover nothing but the charnel-house within.” All of which leads him to conclude that Ahab's obsession is in large measure attributable to the maddening blankness – the essential illusoriness – of nature, its capacity to provoke yet endlessly resist his rage for meaning. In the end, the mad captain's anger overwhelms his reason, and the tragic outcome, as Ishmael interprets it, reveals the incalculable cost – and futility – of the human effort to grasp the ultimate meaning of nature.

The year 1970 is when the ecological ‘crisis’ caught up with the idea of nature. Public anxiety about the devastation of the natural world had grown steadily in the aftermath of Hiroshima and the onset of the nuclear arms race. But it was not until 1970, the year of the first Earth Day, that the threat to the human habitat attracted nationwide attention. And it was in 1970 that the emerging environmental movement first displayed its political power. In was then that President Nixon proposed, and Congress enacted, the National Environmental Policy Act, the Clean Air Act, and the act establishing the Environmental Protection Agency. A large cohort of scientists and engineers was recruited to work on the problems involved in the accelerating rate of air and water pollution, climate change, and species extinction. At about that time, it became evident that the word *environment* was supplanting the word *nature* in American public discourse.

This was no coincidence. Natural scientists had long recognized the ambiguity and instability inherent in ordinary language, especially in words, like *nature*, used to describe the biophysical world. For centuries, after all, ‘Nature’

conceived as a separate entity had served as an all-purpose metaphysical Other. It had been depicted as the creation of God and the habitation of Satan, as harmonious and chaotic, beneficent and hostile, as something to be revered and something to be conquered. Over its history, indeed, the word *nature* had been encrusted with a rich deposit of meaning and metaphor, and practicing scientists often found themselves looking for ways to avoid, or circumvent, the imprecision and ambiguity.

In a revealing passage of the *Origin*, for example, Darwin feels compelled to defend himself for having alluded to natural selection as “a ruling power or Deity.” It is difficult, he explains, “to avoid personifying the word Nature,” and besides, “everyone knows what is meant and is implied by such metaphoric expressions.” But Darwin is not apologizing. An accomplished writer of English prose, he appreciates the beauty and power of figurative language, and he is not about to dispense with it. Nonetheless, as if to prove that he knows what the word *nature* actually means in scientific practice, he grudgingly offers this stripped-down, or positivist, definition: “I mean by Nature,” he writes, “only the aggregate action and product of many natural laws, and by laws the sequence of events as ascertained by us.”¹⁸

Darwin’s recourse to this bloodless, ungraspable, if scientifically unobjectionable definition of nature was prophetic. It prefigured the partial eclipse of *nature* by *environment* in our time. The signal merits of *environment*, as compared with *nature*, are its unequivocal materiality, and what might be called its ideological neutrality or objectivity. It refers to the entire biophysical surround – or *environ* – we inhabit; it implies no distinc-

tion between human and other forms of life; it encompasses all that is built and (so to speak) unbuilt, the artificial and the natural, within the terrain we inhabit. Besides, as the related verb, *to environ*, indicates, most environments palpably are products of human effort. It is not difficult to understand, then, why this matter-of-fact word proved to be more acceptable than *nature* to people coping with the practical problems created by the degradation of ‘nature.’ But there is a troubling irony here. What recently has proven to be a serious shortcoming of the idea of a separate nature – its hospitality to a virtually limitless range of moral, religious, and metaphysical meaning – had for centuries been the reason for its immense appeal as a subject of art and literature, theology and philosophy, or, indeed, virtually all modes of thought and expression.

But to return to the final decades of the twentieth century when, as I noted at the outset, the loss of status and currency suffered by the idea of nature became obvious. In those years the work of avant-garde artists and intellectuals was filled with predictions of nature’s imminent demise. In an influential 1984 essay, Fredric Jameson, a prominent theorist of postmodernism, argued that the disappearance of nature was a necessary precondition for the emergence of the postmodern mentality. “Postmodernism is what you have,” he asserted, “when the modernization process is complete and nature is gone for good.”¹⁹ With characteristic postmodern tendentiousness, Jameson assumes that nature is a cultural construction – a mere product of ‘discourse’ – and emphatically *not* an actu-

19 Fredric Jameson, *Postmodernism, or the Cultural Logic of Late Capitalism* (Durham, N.C.: Duke University Press, 1991), ix.

18 Darwin, *Origin of Species*, 88.

al topographical or biophysical entity. From his idealist perspective, the dominant American idea of nature – nature primarily conceived as a terrain or other biophysical actuality – is meaningless. In Jameson’s view, that usage, with its implicit claim to unmediated knowledge of the material world, is epistemologically naive. Nature in that sense, he is saying, is gone for good because it epitomizes the age-old illusion that it is possible to arrive at a direct, wholly reliable relation with material reality.

In *The Death of Nature* (1989), Carolyn Merchant laments the demise of a widely accepted idea of nature, but in her view it died some four centuries ago. The authentic, biologically grounded concept of an organic nature actually was supplanted – though perhaps only temporarily – by the mechanistic, male-oriented Newtonian-Cartesian philosophy that accompanied the seventeenth-century Scientific Revolution. The basic model for that philosophy was the machine, and it has

permeated and reconstructed human consciousness so totally that today we scarcely question its validity. Nature, society, and the human body are composed of interchangeable atomized parts that can be repaired or replaced from outside. The ‘technological fix’ mends an ecological malfunction The mechanical view of nature now taught in most Western schools is accepted without question as our everyday, commonsense reality The removal of animistic, organic assumptions about the cosmos constituted the death of nature.²⁰

But Merchant, a committed environmentalist, leaves open the possibility of

20 Carolyn Merchant, *The Death of Nature: Women, Ecology, and the Scientific Revolution* (San Francisco: Harper, 1989), 193.

resurrecting and refining the premodern, organic idea of nature. Perhaps, she implies, the desperation induced by the accelerating ecological crisis will lead mankind to repudiate the mechanical view of nature and reaffirm a humane organicism.²¹

Among the prominent obituaries for the idea of nature, however, the most pertinent to my argument is Bill McKibben’s *The End of Nature* (1989). He contends that nature came to an end, both as a discrete biophysical entity and as a meaningful concept, when the Earth’s atmospheric envelope was penetrated – and its filtering capacities damaged – by greenhouse gases and other manufactured chemicals.²² By encompassing all of Earth’s space, the expanding technological power of modern industrial societies has rid the planet of unaltered nature. The last remaining patches of pristine wilderness are now wrapped in a layer of man-made atmosphere.

In McKibben’s view, however, the most serious consequences of the degradation of material nature are conceptual. They are at once psychological, moral, and spiritual. What chiefly concerns him is the impoverishment of human thought. “We have killed off nature,” he writes, “that world entirely independent of us which was here before we arrived and which encircles and supported our human society.” It is as if the real meaning and value of the ancient concept of nature only became apparent after technological ‘progress’ had made it obsolete. We “have ended the thing

21 Carolyn Merchant, *Radical Ecology: The Search for a Livable World* (New York: Routledge, 1992).

22 Subsequent observations of ‘global warming’ are widely accepted in the scientific community as evidence of the man-made transformation of Earth’s atmospheric envelope.

that has defined . . . nature for us,” he writes, “– its separation from human society.”²³

The importance McKibben assigns to the erasure of nature’s separateness distinguishes *The End of Nature* from other laments about the disappearance of nature.²⁴ To my knowledge, he is the only writer who attaches vital significance to this seldom noted, seemingly banal attribute of the received idea of nature. But exactly why is the independence of nature so important? Although McKibben does not adequately answer this hovering question, he provides a telling clue to its profound significance for him. “We have deprived nature of its independence, and that is fatal to its meaning,” he writes. And why is that? Because, he asserts, “nature’s independence is its meaning, without it there is nothing but us.”²⁵ It is an astute observation and a poignant confession: without nature there is nothing but us. For McKibben, like many ardent environmentalists, nature is at bottom a theological or metaphysical concept. In his vocabulary, nature refers to the foundational character – the ultimate meaning – of the cosmos. But if the idea of nature is to continue serving as an effective repository of that belief, he is saying, it must not be deprived of its traditional status as a separate, discrete entity. To compromise its independence, as Darwinism inescapably does, and as McKibben movingly testifies, is to expose its devotees to the skeptical in-

fluence of cosmic loneliness or – in a word – atheism.

The tenability of the idea of wilderness, the oldest and most popular American variant of the idea of nature, also was called into question at the end of the century. In a provocative 1995 essay, “The Trouble with Wilderness; or, Getting Back to the Wrong Nature,” William Cronon, a prominent environmental historian, precipitated a heated controversy by asserting that the popular notion of a pristine American wilderness, or ‘virgin land,’ embodies a racist or colonialist falsification of the historical record.²⁶ Cronon had established the empirical basis for this judgment in *Changes in the Land*, his seminal 1983 study of the transformation of the New England terrain, long before the arrival of Europeans, by the indigenous peoples of North America. But now, with his 1995 essay, he shocked many environmentalists, for whom the idea of the unsullied American wilderness is sacrosanct, with plain talk about its covert meaning. By the time of the alleged European “discovery” of the “new world,” he argues, there no longer was anything “natural” about it. Far from “being the one place on earth that stands apart from humanity,” he writes, the American wilderness is “entirely the creation of the culture that holds it dear.” Actually, the mythic image of a “virgin, uninhabited land” was an ideological weapon in the service of the white European conquest of the Americas, and it was “especially cruel when seen from the perspective of the Indians who had once called that land home.”

23 Bill McKibben, *The End of Nature* (New York: Random House, 1989), 96, 64.

24 Raymond Williams calls attention to the idea of nature’s separateness in “The Idea of Nature,” *Problems of Materialism and Culture* (London: Verso, 1980), 67 – 85.

25 McKibben, *The End of Nature*, 58.

26 Cronon, ed., *Uncommon Ground*, 69 – 90. For a comprehensive collection of the arguments, pro and con, including Cronon’s essay, see J. Baird Callicott and Michael P. Nelson, eds., *The Great New Wilderness Debate* (Athens: University of Georgia Press, 1998).

And yet Cronon, an ardent environmentalist and outdoorsman, cannot bring himself to repudiate the idea of wilderness. To be sure, he clearly explains what makes it objectionable. “Any way of looking at nature that encourages us to believe that we are separate from nature – as wilderness tends to do – is likely,” he concedes, “to reinforce environmentally irresponsible behavior.” But he also acknowledges that respect for wilderness entails respect for nonhuman forms of life. Like many environmentalists, in fact, he had responded to the prevalence of arrogant anthropocentrism – especially the unfeeling disregard for the well-being of animals – by embracing an ecocentric version of species egalitarianism. Now, seemingly contradicting himself, he concedes that the idea of the “autonomy of nonhuman nature . . . [may be] an indispensable corrective to human arrogance.” He admits that he is torn between his viewpoint as a disinterested scholar and as an environmental activist, or, put differently, between historically informed skepticism about – and reverence for – the contested idea of wilderness. In the end, Cronon fails to resolve his ambivalence. But his failure strongly suggests that the idea of wilderness, like the pre-Darwinian idea of nature as a separate, largely independent entity, is incoherent and irremediably unstable.

In the event, however, Cronon proposes a way to rescue the notion of pristine, unaltered nature. He urges American environmentalists to follow the lead of their patron saints, Henry Thoreau and John Muir, and replace the idea of wilderness with the simpler, less problematic idea of wildness. (After founding the Sierra Club in 1892, Muir had chosen Thoreau’s famous epigram “In Wildness is the preservation of the World” as its official motto.) The chief merit of wild-

ness as a locus of value and meaning, he notes, is that, unlike wilderness, it “can be found anywhere: in the seemingly tame fields and woodlots of Massachusetts, in the cracks of a Manhattan sidewalk, even in the cells of our own body.” Whereas wilderness is a particular kind of place (one that exhibits no signs of human intervention), wildness is an attribute of living organisms that may turn up anywhere; a blue jay or a daisy in a Manhattan park, he contends, is no less wild than its counterpart in the Rocky Mountains. As might be expected, Cronon’s critics were quick to note that there is something tenuous, even quixotic, about his notion that a change of vocabulary could resolve the debate about the value of wilderness. Still, his proposal does call attention to the critical shortcomings that the idea of wilderness shares with the idea of a separate nature. As he warns, and as the devastation of the American wilderness attests, the belief that we humans occupy a realm of being separate from the rest of nature encourages what he all-too-politely refers to as “environmentally irresponsible behavior.”

In recent years several ecologically oriented writers, including Cronon, have endorsed a promising way to salvage the venerable idea of nature.²⁷ They propose to rehabilitate the compelling distinction, favored by Hegel and Marx, between two fundamentally distinct, historically grounded states of nature, to be called first nature and second nature. In this usage, *first nature* is the biophysical world as it existed before the evolution

27 William Cronon, *Nature’s Metropolis: Chicago and the Great West* (New York: W. W. Norton, 1991), xviii; Janet Biehl, *Rethinking Ecofeminist Politics* (Boston: South End Press, 1991), 117–118.

of *Homo sapiens*, and *second nature* is the artificial – material and cultural – environment that humanity has superimposed upon first nature. On this view, manifestly, nature is all. Unlike the traditional idea of a separate nature, the first nature/second nature distinction is consonant with the received history of nature, and especially with the primacy, in that history, of the process of biological evolution by natural selection and the emergence of life on Earth. During all but the final minutes, as it were, of this historical narrative, first nature was all that existed.

But then, beginning with the emergence of life and – eventually – *Homo sapiens*, second nature took over, and gradually transformed, an increasingly large area of the planet's surface. Biologists have taught us that every organism modifies its habitat in some degree, but the extent of humanity's modification of Earth exceeds that of other species by orders of magnitude. Second nature is in large measure a human artifact, and in recent centuries the rapidly accelerating expansion of humanity's power – and its territorial reach – has had a devastating impact on global ecosystems. The result is a grave crisis in the relations, or putative 'balance,' between first and second nature. One of the singular merits of the first nature/second nature distinction is the clarity it affords us in characterizing the uniqueness – for good and ill – of humanity and its role in the overall history of nature. By dividing the concept of nature along an historical, or evolutionary, fault line, the first nature/second nature concept enables us to do full justice to humanity's unmatched power to create a unique material and cultural environment. At the same time, however, it has the inestimable merit of validating the idea of a single, subdivided yet fundamentally unified realm of nature.

Harriet Ritvo

Beasts in the jungle (or wherever)

When Byron wrote that “the Assyrian came down like the wolf on the fold” (“The Destruction of Sennacherib,” 1815), his audience had no trouble understanding the simile or feeling its force, even though wolves had not threatened most British flocks since the Wars of the Roses. Almost two centuries later, expressions such as “the wolf is at the door” remain evocative, although the Anglophone experience of wolves has diminished still further. For most of us, they are only to be encountered (if at all)

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in zoos or in establishments like Wolf Hollow.

Located in Ipswich, just north of Boston, Wolf Hollow is the home of a pack of gray wolves who live a sheltered suburban existence behind a high chain-link fence. Their captivity has modified their nomadic habits and their fierce independent dispositions. (The pack was established twenty years ago with pups, so that only inherent inclinations, and not confirmed behaviors, needed to be modified.) Their relationship with their caretakers seems affectionate and playful, sometimes even engagingly dog-like – so much so that visitors need to be warned that it would be very dangerous for strangers to presume on this superficial affability. The animals themselves give occasional indications that they retain the capacities of their free-roaming relatives – that though apparently reconciled to confinement, they are far from tame. When large, loud vehicles rumble past on nearby Route 133, the wolves tend to howl. And despite their secure enclosure within the built-up landscape of North American sprawl, their calls evoke the eerie menace that has immemorially echoed through the wild woods of fairy tale and fable.

The symbolic resonance of large ferocious wild animals – the traditional rep-

representatives of what seems most threatening about the natural world – has proved much more durable than their physical presence. Indeed, their absence has often had equal and opposite figurative force. The extermination of wolves in Great Britain, along with such other unruly creatures as bears and wild boars, was routinely adduced as evidence of the triumph of insular (as opposed to continental) civilization in the early modern period. As they dispersed around the globe, British settlers and colonizers set themselves parallel physical and metaphorical challenges, conflating the elimination of dangerous animals with the imposition of political and military order. In North America, hunters could claim bounties for killing wolves from the seventeenth century into the twentieth, although by the latter period wolves had abandoned most of their historic range, persisting only in remote mountains, forests, and tundras. In Africa and (especially) Asia, imperial officials celebrated the “extermination of wild beasts” as one of “the undoubted advantages . . . derived from British rule.”¹

Very occasionally, large aggressive predators could symbolize help rather than hindrance. They served as totems for people whose own inclinations were conventionally wolfish or leonine. And alongside the legendary and historical accounts of big bad wolves existed a minority tradition that emphasized cooperation rather than competition. From this perspective, the similarities of wolf society to that of humans implicitly opened the possibility of individual exchange and adoption. A slender line of imagined lupine nurturers ran from the foster mother of Romulus and Remus, to Akela, who protects and mentors

Mowgli in *The Jungle Book* (1894). But in this way, as in others, Kipling’s animal polity looked toward the past rather than the future. By the late nineteenth century, human opinions of wolves and their ilk had indeed become noticeably mixed. The cause of this amelioration, however, was not an altered understanding of lupine character or an increased appreciation of the possibilities of anthropolupine cooperation, but rather a revised estimation of the very qualities that had made wolves traditional objects of fear and loathing.

The shift in European aesthetic sensibility that transformed rugged mountains into objects of admiration rather than disgust is a commonplace of the history of aesthetics. For example, in the early eighteenth century, even the relatively modest heights of what was to become known as the English Lake District impressed Daniel Defoe as “eminent only for being the wildest, most barren and frightful of any that I have passed over in England, or even in Wales itself.”² The increasingly Romantic tourists who followed him gradually learned to appreciate this harsh, dramatic landscape, so that a century later the noted literary opium-eater Thomas De Quincey could characterize the vistas that had horrified Defoe as a “paradise of virgin beauty.”³ Of course, this altered perception had complex roots, but it is suggestive that it coincided with improvements in transportation and other aspects of the infrastructure of tourism.

1 Edward Lockwood, *Natural History, Sport, and Travel* (London: W. H. Allen, 1878), 237.

2 Daniel Defoe, *A Tour Through the Whole Island of Great Britain*, ed. P. N. Furband and W. R. Owens (New Haven: Yale University Press, 1991), 291.

3 Thomas De Quincey, *Literary Reminiscences from the Autobiography of an English Opium Eater*, vol. 3, *The Works of Thomas De Quincey* (Boston: Houghton Mifflin, 1851), 310–311.

As economic and technological developments made the world seem safer and more comfortable, it became possible to experience some of its extremes as thrilling rather than terrifying. Or, to put it another way, as nature began to seem a less overwhelming opponent, the valence of its traditional symbols began to change. Ultimately (much later, after their population numbers and geographic ranges had been radically reduced), even wild predators began to benefit from this reevaluation. The ferocity and danger associated with wolves and their figurative ilk became a source of glamour, evoking admiration and sympathy from a wide range of people who were unlikely ever to encounter them. As representatives of the unsettled landscapes in which they had managed to survive, they inspired nostalgia rather than antagonism.

Supplementing these symbolic shifts were shifts in scientific understanding, which redefined high-end predators as a necessary element of many natural ecosystems. Late-nineteenth-century attempts at wild animal protection were modeled on the hunting preserves of European and Asian elites. Thus the immediate antecedents of modern wildlife sanctuaries and national parks were designed to protect individual species that were identified as both desirable (whether intrinsically or as game) and in danger of extinction, whether the bison in North America or the giraffe in Africa. They were much less concerned with preserving the surrounding web of life. In fact, most early wildlife-management policies had the opposite effect. Although not all of the species targeted for protection provided conventional hunting trophies – for example, by the end of the nineteenth century, many great ape populations received some form of protection – all were herbivores.

Further, none offered significant resistance to human domination of their territory. (If they did, policies could be reversed. For example, hippopotami, which enjoyed protection in some parts of southern Africa, were slaughtered with official encouragement in Uganda, where their belligerent attitude toward river traffic interfered with trade.⁴) Predators inclined to kill the species designated for protection received no protection themselves, either physical or legal. On the contrary, in many settings people simply replaced large predators at the top of the food chain and showed no mercy to their supplanted rivals.

Deep ancient roots can be unearthed for holistic or ecological thinking. Although most of the British pioneers of game preservation had enjoyed the classical education prescribed for privileged Victorian boys, the works of Charles Darwin may have offered more readily accessible arguments for understanding biological assemblages as interconnected wholes. Darwin provided many illustrations of the subtle and complex relationships among the organisms that shared a given territory. For example, in *On the Origin of Species*, he explained the frequency of several species of wildflowers in southern England as a function of the number of domestic cats kept in nearby villages. The cats had no direct interest in the flowers, but more cats meant fewer field mice, which preyed on beehives – therefore fewer mice meant more bees to fertilize the flowers.⁵ Nev-

4 Harriet Ritvo, *The Animal Estate: The English and Other Creatures in the Victorian Age* (Cambridge, Mass.: Harvard University Press, 1987), 284 – 289.

5 Charles Darwin, *On the Origin of Species* [1859] (Cambridge, Mass.: Harvard University Press, 1964), 73 – 74.

ertheless, it was not until the last half of the twentieth century that wildlife managers routinely considered individual species as components of larger systems, and that the standard unit of management became the ecosystem rather than the species.

In consequence, large predators were redefined as essential components (even indicators) of a healthy environment rather than blots on the landscape. They often began to receive legal protection, however belated and ineffective. And there has been a movement to reintroduce them to areas that have been ostensibly preserved in their wild form or that are in process of restoration. Thus in recent decades wolves have reoccupied several of their former habitats in the western United States, both as a result of carefully coordinated reintroduction by humans, as in Yellowstone National Park, and as a result of independent (but unimpeded) migration from Canada. It is interesting that the reemergence, or even the prospective reemergence, of the wolf has inspired a parallel reemergence of traditional fear and hostility among neighboring human populations.

I have been using several terms as if their meanings were clear and definite, when in fact they are contested and ambiguous. The cultural critic Raymond Williams characterized 'nature' as "perhaps the most complex word in the English language."⁶ The term 'wilderness' is similarly problematic. In the context of preservation or restoration, it often collocates with words like 'pristine' and 'untouched,' and therefore connotes a condition at once primeval and static. This connotation suggests that the first task of landscape stewards is to identify

this ur-condition, but even a moderately long chronological perspective suggests that any such effort is bound to be quixotic. The environment in which modern animals have evolved has never been stable. Less than twenty thousand years ago, glaciers covered much of North America and Eurasia. After their gradual release from the burden of ice and water, most northern lands continued to experience significant shifts in topography and climate – and, therefore, in flora and fauna. These natural changes have been supplemented for thousands of years by the impact of human activities. The theoretical and political problems presented by 'wilderness' are knottier still. In a groundbreaking essay published more than a decade ago, William Cronon argued that wilderness and civilization (or 'garden') were not mutually exclusive opposites, but that they rather formed part of a single continuum. Far from being absolute, "the one place on earth that stands apart from humanity," wilderness was itself "a quite profoundly human creation."⁷ Cronon's formulation sparked (and continues to spark) agonized resistance on the part of environmentalists who base their commitment on the notion of untouched nature.

If wildness in landscape has been effectively (if controversially) problematized, the same cannot be said for wildness in animals. The *Oxford English Dictionary* defines the adjective 'wild' unambiguously and emphasizes its zoological application. The first sense refers to animals: "Living in a state of nature; not tame, not domesticated: opp. to TAME." In a standard lexicographical ploy,

7 William Cronon, "The Trouble with Wilderness; or, Getting Back to the Wrong Nature," in *Uncommon Ground: Rethinking the Human Place in Nature* (New York: Oxford University Press, 1996), 69.

6 Raymond Williams, *Keywords* (New York: Oxford University Press, 1976), 184.

‘tame’ is defined with equal confidence and complete circularity as (also the first sense) “reclaimed from the wild state; brought under the control and care of man; domestic; domesticated. (Opp. to wild.)”

But outside the dictionary these terms are harder to pin down and their interrelationships are more complex. Like Cronon’s wilderness and garden, the wild and the tamed or domesticated exist along a continuum. In a world where human environmental influence extends to the highest latitudes and the deepest seas, few animal lives remain untouched by it. At least in this sense, therefore, few can be said to be completely wild: for example, it would be difficult so to characterize the wolves that were captured, sedated, airlifted to Yellowstone, and then kept in ‘acclimatization pens’ to help them adapt to their new companions and surroundings. And as the valence of the wild has increased, and its definition has become more obviously a matter of assertion rather than description, the boundaries of domestication have also blurred.

Not that they were ever especially clear. As twenty-first-century wolves belong to a long line of animals whose wildness has been compromised, tamedness has conversely also existed on a sliding scale. According to the OED, both ‘wild’ and ‘tame’ have persisted for a millennium, remaining constant in form as well as core meaning, while the language around them has mutated beyond easy comprehension, if not beyond recognition by modern Anglophones. But this robustness on the level of abstraction has cloaked imprecision and ambiguity on the level of application or reference. Although medieval farmers and hunters may have had no trouble distinguishing livestock animals from game or vermin, it would have been difficult

to extract any general definition from their practices. The impact of domestication varied from kind to kind, as well as from creature to creature. The innate aggression of the falcons and ferrets who assisted human hunters was merely channeled, not transformed; when they were not working, they were confined like wild animals in menageries. Then as now, people exerted much greater sway over their dogs than over their cats, who were mostly allowed to follow their own instincts with regard to rodents and reproduction. Medieval cattle, the providers of labor as well as meat, milk, and hides, led more constrained lives than did contemporary sheep; and pigs were often left to forage in the woods like the wild boars they closely resembled.

With hindsight, even these relatively tame cattle could appear undomesticated, especially as wildness gained in glamour. Thus changes in the animals’ physical circumstances were complicated by changes in the way they were perceived. In the late eighteenth century, for example, a few small herds of unruly white cattle, who roamed like deer through the parks of their wealthy owners, were celebrated as aboriginal and wild. As the Earl of Tankerville, whose Chillingham herd was the most famous, put it, his “wild cattle” were “the ancient breed of the island, inclosed long since within the boundary of the park.”⁸ The “ancient breed” was sometimes alleged to be the mighty aurochs (the extinct wild ancestor of all domestic cattle, which had been eliminated in Britain by Bronze Age hunters; the last one died in Poland in the seventeenth century), which gave these herds an ancestry distinct from that of ordinary domestic cat-

8 C. A. B. Tankerville and L. Hindmarsh, “On the Wild Cattle of Chillingham Park,” *Athenaeum* 565 (August 25, 1838): 611.

tle. To increase or underscore their distinctiveness, the white cattle were never milked, and if their meat was required for such ceremonial occasions as the coming-of-age of a human heir, they were hunted and shot, not ignominiously slaughtered. Through the nineteenth century, their autochthonic nobility continued to inspire the effusions of such distinguished poets and painters as Sir Walter Scott and Sir Edward Landseer, as well as the expenditure of newly wealthy landowners eager to bask by association in the prestige of wild nobility and ancient descent. But even at the height of their renown, it was clear that their claims to wildness included a large measure of wishful thinking. Skeptics persuasively wondered whether, even assuming that the nineteenth-century emparked herds lived in a state of nature, that state represented a historical constant or a relatively modern restoration.⁹ Many who investigated the background of the herds concluded that they were feral at best (at wildest, in other words) – that they were the descendants of domesticated animals, whether originally owned by Roman settlers or by later farmers. Modern anatomical and genetic research has confirmed these doubts, connecting the emparked herds with the ordinary domestic cattle of the medieval period.¹⁰ But so great is the

continuing appeal of wildness, and so limited the persuasive force of scientific evidence, that a recent president of the Chillingham Wild Cattle Association has nevertheless asserted that “although there is still much that is not known about the origins of the Chillingham Wild Cattle, one fact that is certain is that they were never domesticated.”¹¹

Only a few people possessed the resources necessary to express their admiration for the wild, and their somewhat paradoxical desire to encompass it within the domestic sphere, on such a grand scale. But numerous alternative options emerged for those with more restricted acres and purses. An increasing variety of exotic animals stocked private menageries. The largest of these were on a sufficiently grand scale to have also included a cattle herd, if their owners had been so inclined – for example, those of George III or the thirteenth Earl of Derby, which accommodated large animals like kangaroos, cheetahs, zebras, and antelopes. Smaller animals required more modest quarters, and parrots, monkeys, canaries, and even the celebrated but ill-fated wombats owned by the poet Dante Gabriel Rossetti could be treated as pets. Breeders attempted to enhance or invigorate their livestock with infusions of exotic blood. If they were disinclined or unable to maintain their own wild sire, they could, in the 1820s and 1830s, pay a stud fee to the newly established Zoological Society of London for the services of a zebu or a zebra. In Australia, Russia, Algeria, and the United States, as well as in Britain and France, the acclimatization societies of the late nineteenth cen-

9 For an extended discussion of the history of this debate, see Harriet Ritvo, “Race, Breed, and Myths of Origin: Chillingham Cattle as Ancient Britons,” *Representations* 39 (Summer 1992): 1–22.

10 For summaries of recent research see Stephen J. G. Hall and Juliet Clutton-Brock, *Two Hundred Years of British Farm Livestock* (London: British Museum (Natural History), 1989); Stephen J. G. Hall, “The White Herd of Chillingham,” *Journal of the Royal Agricultural Society of England* 150 (1989): 112–119; and Stephen J. G.

Hall, “Running Wild,” *Ark* 16 (1989): 12–15 and 46–49.

11 Ian Bennet, “Chillingham Cattle,” *Ark* 18 (1991): 22.

tury targeted an impressive range of species for transportation and domestication, from the predictable (exotic deer and wild sheep) to the more imaginative (yaks, camels, and tapirs).¹² So difficult (or undesirable) had it become to distinguish between wild animals and tame ones that exotic breeds of domestic dogs were exhibited in Victorian zoos, and small wild felines were exhibited in some early cat shows.

The popular appeal of wild animals has continued to increase as they have become more accessible, either in the flesh or in the media. So entangled are wildness and domesticity that it is now necessary to warn visitors to North American parks that roadside bears may bite the hands that feed them, and it is now possible for domesticated animals to represent nature. This extended symbolic reach was demonstrated in 2001, when foot-and-mouth disease struck British livestock. Because the disease spreads rapidly and easily, the government prescribed a cull not only of all infected herds and flocks, but of all apparently healthy livestock living in their vicinity. Although outbreaks were widespread, the greatest number of cases occurred in the Lake District, the starkly dramatic landscape that had been disparaged by Daniel Defoe and praised by Thomas De Quincey; it is now the site of England's largest national park. Video and print coverage of the cull, which took the spectacular form of soldiers shooting flocks of sheep and then immolating them in enormous pyres, thus featured some of the nation's most cherished countryside as background.

The ovine victims also had iconic status. Many of them belonged to the local Herdwick breed, and at first the intensive cull seemed to threaten its very sur-

vival. What was at stake was not merely adaptation to a demanding environment, since several other British hill breeds look very much like the Herdwicks and share their physical and emotional toughness. The Herdwicks' special claim to consideration was their connection to their native ground, itself a kind of national sacred space. Not only were the sheep acknowledged to possess detailed topographical information about the hills they inhabited, but their owners claimed that they transmitted it mystically down the generations, from ewe to lamb. So well recognized was their attachment to their home territories that when a farm was sold, the resident Herdwicks were conventionally included in the bargain, on the theory that if they were taken away, they would soon manage to return. And despite strong historical indications that the ancestral Herdwicks had arrived in the vicinity of the Lake District by boat, and the further fact that all British sheep descend from wild mouflons originally domesticated in the eastern Mediterranean region, they were celebrated as indigenous, "peculiar to that high, exposed, rocky, mountainous district."¹³ An article in the preeminent Victorian agricultural journal asserted that the Herdwicks possessed "more of the characters of an original race than any other in the county" and that they showed "no marks of kindred with any other race."¹⁴ Twenty-first-century journalists reporting on the threatened toll of foot-and-mouth disease adopted similar rhetoric.

13 John Bailey and George Culley, *General View of the Agriculture of Northumberland, Cumberland, and Westmorland* [1805] (Newcastle: Frank Graham, 1972), 245.

14 William Dickinson, "On the Farming of Cumberland," *Journal of the Royal Agricultural Society of England* 13 (1852): 264.

12 Ritvo, *Animal Estate*, 232–242.

As the sheep were nativized, they were also naturalized. A reporter for the *Independent* newspaper feared that if the Herdwicks disappeared, the whole ecology of the region might be changed “beyond recognition.”¹⁵ And since the dramatic bare uplands of the Lake District have been maintained by nibbling flocks for at least a millennium, his concern was not completely unreasonable. Thus, whether technically indigenous or not, and although they are incontestably domesticated, the Herdwicks have become compelling symbols of the apparently untamed landscape they inhabit – more compelling than the numerous wild birds and small mammals with which they share it. Like the landscape itself, they seem wilder than they are; that is, they appear to be independent and free-ranging, but their lives (and, indeed, their very existence) are ultimately determined by human economic exigencies. They are both accessible (that is, there are a lot of them and they are everywhere, not only in the fields but grazing and napping beside the roads and even on top of them) and also inaccessible (that is, they are skittish and tend to retreat when approached). The armed assault on the Herdwick sheep was therefore perceived as an attack on both the domesticated countryside and the unspoiled natural landscape. In both the sheep and their environment the wild and the tame had inextricably merged.

If vernacular usage illustrates the increasing slippage between wildness and tameness in animals, scientific classification has made a similar point from the opposite direction. The species concept has a long and vexed history. The study

of natural history (or botany and zoology) requires that individual kinds be labeled, but for many plants and animals (those that, unlike giraffes, for example, have very similar relatives) it has often been difficult for naturalists to tell where one kind ends and the next begins. Darwin’s theory of evolution by natural selection provided a theoretical reason for this difficulty, while his shrewd observations that “it is in the best-known countries that we find the greatest number of forms of doubtful value” and that “if any animal or plant . . . be highly useful to man . . . varieties of it will almost universally be found recorded” offered a more pragmatic explanation.¹⁶ The classification of domesticated animals has epitomized this problem. That is, none of them has become sufficiently different from its wild ancestor to preclude the production of fertile offspring (the conventional if perennially problematic definition of the line between species), and some mate happily with more distant relatives. Nineteenth-century zookeepers enjoyed experimenting along these lines, and zoogoers admired the resulting hybrids between horses and zebras, domestic cattle and bison, and dogs and wolves.¹⁷

Despite these persuasive demonstrations of kinship, however, ever since the eighteenth-century emergence of modern taxonomy, classifiers have ordinarily allotted each type of domestic animal its own species name. While recognizing the theoretical difficulties thus produced, most modern taxonomists have continued to follow conventional practice. Domestic sheep are still classified

16 Darwin, *Origin of Species*, 50.

17 Harriet Ritvo, *The Platypus and the Mermaid, and Other Figments of the Classifying Imagination* (Cambridge, Mass.: Harvard University Press, 1997), 92 – 95.

15 Ian Herbert, “Foot and Mouth Crisis: Cumbria,” *Independent*, March 27, 2001, 5.

as *Ovis aries* while the mouflon is *Ovis orientalis*, and dogs are *Canis familiaris* while the wolf is *Canis lupus*. The archaeozoologist Juliet Clutton-Brock explains this practice as efficient (it would be unnecessarily confusing to alter widely accepted nomenclature) as well as scientifically grounded, at least to some extent (most domestic animal populations are reproductively isolated from wild ones by human strictures, if not by biological ones).¹⁸ But it also constitutes a simultaneous acknowledgment of the artificiality of the distinction between wild animals and domesticated ones, and of its importance and power. Vernacular understandings can trump those based on anatomy and physiology.

The implications of making or not making such distinctions extend beyond the intellectual realm. They construct the physical world as well as describing it. Although the howls of the wolf may retain their primordial menace, the wolves who make them have long vanished from most of their vast original range, and are threatened in much of their remaining territory. To persist or to return, they need human protection, not only physical but legal and taxonomic. With the advent of DNA analysis in recent decades, the taxonomic stakes have risen, so that even animals that look and act wild may be found genetically unworthy. For example, efforts to preserve the red wolf, which originally ranged across the southeastern states, have been complicated by suggestions that it is not a separate species, but a hybrid of the gray wolf and the coyote. No such aspersions have been cast upon the pedigree of the gray wolf, but nevertheless every attempted gray wolf restoration has trig-

gered human resistance, and local challenges to their endangered status inevitably follow even moderate success. If domestic dogs were returned to their ancestral taxon, wolves would become one of the most common animals in the lower forty-eight states, rather than one of the rarest. Their survival as wild animals depends on the dog's continuing definition as domesticated – an indication of the extent to which unsettled landscapes and their inhabitants are the product of human ideas about what is natural and what to do about it.

18 Juliet Clutton-Brock, *A Natural History of Domesticated Mammals* (London: British Museum (Natural History), 1987), 194 – 197.

Camille Parmesan

Where the wild things were

Georges Fabre was a forester in late-nineteenth-century France. In the region known as the Cévennes, villages were doing well: the silk and chestnut industries were booming, and shepherds banded together to make the yearly ‘transhumance,’ bringing thousands of sheep up to the rich pastures of Mont Aigoual in springtime. Life was good – too good.

Clearing of the land for pasture and crops had been going on for at least five thousand years, but population booms in the late 1700s greatly overtaxed the land. Clearing and cutting trees for pastureland and firewood had denuded the old forested lands. Whole mountainsides were barren. By 1856, the normal heavy rains of this region caused abnormal floodwaters. When rains came, the

now loose soil became mudslides pouring down into the valleys and towns below. Once bountiful fresh springs and clear streams became silted and undrinkable.

“On the 4th of October, 1861,” wrote Fabre in his diary, “clouds from the southeast, which had amassed for three days on the high summits of the Aigoual, burst suddenly and poured into the valley such quantities of water and stones that all the roads were cut off and the lands silted up On [the] 28th of October 1868, the disaster reoccurred . . . local people were astonished. Flood water from the Herault [river] had never before been so sudden nor so strong; it reached second stories.”

In 1875, the French National Forestry Commission gave Fabre a monumental task: to repair the environmental problems in the Cévennes. Over the next thirty years, Fabre, with the help of botanist Charles Flahaut, restored some 3,500 hectares, reaching 11,800 hectares by the time the Parc de Cévennes was created. To recover a working watershed, these two unintentional environmentalists argued the need to restore the land as it was before the clear-cutting. This was not an easy task: they had to win over angry locals, who feared the loss of pastureland for their sheep. They

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poured over diaries and interviewed the elderly – the ones who had been there Before. They figured out which hillsides had been beech woods; which live oak, cherry, and chestnut; which swathed in pines and firs. Flahaut started an arboretum – to experiment with trees from around the world – finding which species would do well in this harsh environment, with its poor soils.

Fabre and Flahaut were ahead of their time. They designed a new forest that included exotic Scots and Black Austrian pines, but they also made an effort to nurture the few remaining stands of native beech forest, as well as the native sweet chestnut and cherry groves. This was not conservation in its strictest sense, but these actions were also far from the response of many modern foresters to similar circumstances: planting acres of a single species of nonnative but fast-growing pine, which culminates in a ‘forest’ that is devoid of flowers, insects, and birds. Such a sea of green is in reality a biologically sterile wasteland.

It wasn’t until one hundred years later that the Cévennes area became a park, officially guiding and limiting activities. When one walks through the Parc de Cévennes now, it appears as wild and untouched as can be. On the hike to the Cascade D’Orgon, one can see Cirque eagles lazily gliding on a spring thermal, seeming to be just enjoying the sheer fun of it after a long cold winter. Peacock and tortoiseshell butterflies bask on the rocks. The beech woods are a fantasy land – all silver gnarled trunks rising from deep copper floors. Later, toward summer, one can spot Cleopatra and speckled wood butterflies flitting from heather to basket-flower to mint to thyme. Only the wild roses are ignored, full of scent but no sweet nectar. Local black honeybees and bumblebees and

giant dragonflies join the dance in the air. It appears to be as it always has been.

The Society for Ecological Restoration was founded in 1988 – recognition that many areas had been degraded to the extent that preservation alone would not be enough, that time and energy needed to be put into recreating the landscape and the native biodiversity to restore the system back to health. Fabre and Flahaut’s restoration of Cévennes biodiversity might be the first large-scale, successful ecological restoration project. Even now, most restoration projects are miniature compared to the scale of the ‘Aigoual Epic’ some 130 years ago. Scale, however, is not what is most notable about his project. The mark of these two men was in realizing that man and nature are not separate. Fabre was a visionary for recognizing the dependence of humans on what we now call a ‘stable, functioning ecosystem.’

In practice, much of modern society, even now, clings to the misconception that human culture is separate from nature. This fallacy is an overriding theme in many cultures, but it is perhaps most obvious in the urban cultures of industrial nations, where water is well known to come from a tap. Even within the conservation community, this view often unconsciously pervades conservation planning. The catholic nature of this attitude makes for strange bedfellows. Consider a staunch capitalist viewing nature as something to harness and tame to serve Man, alongside an environmentalist viewing nature as a treasure to be preserved for its own sake. Underlying both views is the tacit assumption of nature as something separate from humans – interacting in either positive or negative ways, but acting as separate entities.

How does the human as an animal fit into this paradigm? *Homo sapiens* first

appeared about 1.5 to 1.8 million years ago. Many groups hold dear to the idea that our emergence was somehow special – that we are fundamentally different from every other species on Earth. Perhaps it is easy to believe this now, given that no other species appears to inhabit our niche. We are able to mold our local environments to fit our needs on a scale that dwarfs what any other species currently around us is able to do. However, at our inception, perhaps we did not appear so special. There were several other primate species that walked on two legs; made and used tools for hunting; gathered fruits, nuts, and vegetables from the land; and lived in social, family clusters. From the perspective of our use of resources and interactions with our environment, we weren't special by any means. We were simply the ones that survived. There is even some evidence that we hastened the extinction of our main competitors: the occasional skeleton of Neanderthal Man sporting an injury to the head that appears to have been inflicted by a heavy weapon. We are animals; and as animals, we are just as dependent upon, and connected to, nature as any other wild animal on this planet.

This recognition underlies a new vision that has swept through the conservation community – that there is, in fact, no dichotomy of worlds. This idea was not new in society – the pantheistic movement so beautifully encapsulated by the works of Thoreau, Wordsworth, and others had at its core the oneness of Man, God, and Nature. What conservation science did was to specify and quantify the ways in which the very existence of human culture and society relies on goods and services supplied by nature.

The evidence that man depends on and is affected by the health of natural ecosystems is incontrovertible. Like-

wise, it is clear that human beings have managed and shaped natural ecosystems since the dawn of time. The invention of a hunting tool efficient enough to take down big game appears to have allowed human tribes to hunt to extinction many of Earth's large mammals, at least as far back as twelve thousand years ago. This vision – that humans and nature are not two domains but one – has been more recently joined by environmental economists, driven by Herman Daly, Richard Norgaard, and others.

One planet. One system with finite resources. Sustainability of human society relies on the sustainability of nature. This has formally been accepted in theory, if not in practice, by 189 nations who have signed and ratified the Convention on Biological Diversity (CBD).¹ The goal now clear, the question becomes how to achieve it. In nations that have had high human impact for thousands of years – much of Asia, Africa, and Europe – it is clear that preservation, through creation of parks systems and hunting bans, will not successfully maintain biodiversity. Perhaps paradoxically, active management of natural ecosystems shaped by prolonged human contact must go along with the restoration and preservation of wilderness. An extremely clear example of this can be found in Europe.

From Great Britain to Sweden to Switzerland to France, the highest diversity of flowering herbs, birds, and butterflies is found in traditionally managed meadows. The natural state over much of Europe is forests. Small meadows must have occurred naturally before man, perhaps because conditions were slightly too wet or the soil too thin for trees. But, generally, forests advanced as glaciers retreated some twelve thou-

¹ Convention on Biological Diversity, United Nations Environmental Program, www.cbd.int.

sand years ago. Man soon followed, and immediately began clearing small patches of woodland to create pastureland for their domestic animals and farmland for crops. Over thousands of years, the native flowers, birds, and butterflies colonized and flourished in these man-made meadows. Native species are now so dependent upon these man-made meadows that if the land were not managed, and reverted to its natural, forested state, then these species would go locally extinct.

Stability of these exceptionally diverse systems depends on human management. To preserve these habitats, the historical means of keeping this land from reverting to forest must be maintained. Meadows must be either grazed for a brief period or cut for hay once or twice during the year. Strict 'preservation' – putting up a fence and keeping man out – results in natural reforestation: woody shrubs and trees taking over within a few years.

Similar active management is becoming more commonplace in the 'wild' areas of North America, necessitated by spillover from human activity degrading these areas. Many systems are adapted to a particular regime of fires – they need fires of the right temperature at the right time of year at a particular frequency. Fire suppression can kill off native fire-dependent species and create shrubby undergrowth in place of open forest. Nitrogen pollution from industry and automobile emissions lead to streams clogged with green algae and can completely alter which species dominate the landscape. Exotic plants and animals transported across the world can destroy the land outright or outcompete natives and take over. To keep natural systems intact, various forms of ongoing management usually must intervene to keep these human-caused degradations from

fundamentally altering the natural system being preserved.

Taking management actions to maintain biodiversity were great leaps for the conservation community. These actions signaled acceptance that pure preservation – putting a fence up around a patch of land – was no longer enough. Instead, the community recognized that conservation of biodiversity often meant managing the land through controlled burns, weeding out invasive species, and bringing grazers and browsers in to eat off excess plant material resulting from nitrogen enrichment. Sometimes it has meant restoring the land completely from the bottom up, as Fabre did. The community rallied. New cohorts have been trained in this mindset. Long-term conservation planning has laid out guidelines for dynamic management and restoration of old and upcoming preserves. The community has become invigorated with a 'can-do' proactive attitude.

Then came climate change.

Climate change presents an unprecedented challenge. It cannot just be added to the long list of degrading pressures with which managers must deal. Climate change truly is fundamentally different: different impacts, different actions needed to mitigate future impacts, and different suites of adaptation to help current reserves continue to preserve biodiversity. Few of the conservation community's existing tools, techniques, technologies, and strategies are effective against a globally changing climate.

What is it about climate change that makes it so insurmountable? First is its global nature. We're seeing impacts of current warming on every continent and in every ocean. We're seeing its effects in every type of plant and animal that has been studied – from butterflies in Finland to fish in the North Sea, from foxes

in Canada to trees in Sweden, from birds in Antarctica to starfish in Monterey Bay, California.² Second, climate change is conducting the most massive relocation of species since the last ice age. Forty percent of wild species are showing changes in their distributions – shifting their ranges north and south toward the poles and up mountains. An astonishing 62 percent are showing changes in their seasonal timing: spring is earlier and fall is later. Birds arriving for their spring migration, butterflies emerging from wintering, trees leafing out after winter dormancy, and flowers blooming for the first time are all about two weeks earlier than they were thirty years ago across the northern hemisphere. Globally, we have estimated that recent, human-driven climate change has affected half of all wild plants and animals in some form or another.³

Each species has a range of climates within which it can survive and reproduce. Temperatures and rainfall/snowfall that fall outside the ‘climate envelope’ for that species mark geographic areas in which that species cannot live. As Earth warms, the climate envelopes for many species are shifting their locations. About 40 percent of wild plants and animals are relocating accordingly, attempting to track their climate envelopes across land and sea. Species unable to move are becoming endangered, as the climate around them is no longer suitable for them. The obvious result of this process is that many preserves will no longer contain the climates required

by the very species for which they were founded. In another hundred years, a nation’s carefully planned reserve system won’t work as intended. There is no accepted active management scheme that will keep the integrity of biodiversity within a preserve intact in the face of climate change.

Even worse, it is the ‘wildest’ landscapes that are being hit hardest by climate change. Though Earth is dominated by humans, there are still a few places that even the most cynical ecologist considers relatively untouched. A few PCBs and traces of DDT notwithstanding, the harsh landscapes of the boreal tundra, the bizarre life that thrives on ice-covered polar seas, the craggy peaks of the Grand Tetons, Mt. Whitney, and Mt. McKinley: these are places that still evoke a sense of time before man – places we still think of as ‘wild.’ These areas – the few remaining nearly pristine areas – are being strongly affected by anthropogenic climate change. Warming has been strongest at the poles – up to 4°C increase in annual mean temperature (compared to a 0.7°C global increase). As sea ice gets thinner and shrinks in area, so too shrink animal populations for which ice is their home: from the polar bear and the ringed seal in the Arctic, to the Adelié and Emperor penguins in the Antarctic. These animals are retreating toward the poles, and are rapidly reaching the end of the Earth as they know it.

The other havens for cold-adapted species – on mountaintops around the world – are also showing signs of warming stress. The Cévennes is again among the first in the world – this time the first to show clear signs of mountain species being pushed up and off the mountains. The elegant glide of the Apollo butterfly – its alabaster wings only occasionally revealing bright dots of red – can no

2 C. Parmesan, “Observed Ecological and Evolutionary Impacts of Contemporary Climate Change,” *Annual Reviews of Ecology and Systematics* 37 (2006): 637 – 669.

3 C. Parmesan and G. Yohe, “A Globally Coherent Fingerprint of Climate Change Impacts in Natural Systems,” *Nature* 421 (2003): 37 – 42.

longer be seen on plateaus that reach only to 850 meters; these populations have all perished with warming winters. To catch a glimpse of this French treasure one must be on a mountain of more than 900 meters – where proper winters still exist.

Deep in the cloud forests of Central America, it has become harder to find their local treasures – brightly speckled amphibians that truly are jewels of the clouds. Many of these frog species have served as poster children for the preservation of tropical cloud forests. Ironically, now that many sites have successfully been protected, global warming has crept in from behind and staked its claim. The golden toad of Monteverde Preserve in Costa Rica has the dubious honor of being the first species believed to have been driven extinct by global warming.⁴ Among a group of species called ‘harlequin’ frogs for their clown-like colors, seventy-four species have gone extinct in the past thirty years – all in areas that still appear to be excellent cloud forest habitat. Their loss is still a mystery, but the fact that most extinctions were within one narrow elevational band suggests the influence of a changing climate.⁵

At the other end of spectrum, systems that we associate with hot beaches, bath-warm waters, and cold drinks – species that we might think would be hot-adapted – are also suffering. Sixteen percent of tropical coral reefs worldwide were killed off by heat during the single extreme El Niño of 1997 and 1998. A com-

4 J. A. Pounds, M. P. L. Fogden, and J. H. Campbell, “Biological Response to Climate Change on a Tropical Mountain,” *Nature* 398 (1999): 611 – 615.

5 J. A. Pounds et al., “Widespread Amphibian Extinctions from Epidemic Disease Driven by Global Warming,” *Nature* 439 (2006): 161 – 167.

ing threat is the increasing acidity of the oceans, caused directly by increased atmospheric carbon dioxide. The pH of tropical waters has already dropped from 8.2 to 8.1, as carbon dioxide is absorbed and converted to carbonic acid. As pH continues to drop, the ability of animals to construct hard shells will decline dramatically. Some coral biologists fear that ‘business as usual’ projections could lead to tropical corals being unable to build and maintain reefs as early as 2050.⁶

We’re entering an age of vanishing wilderness, when the wild places were. To have any hope of preserving our biodiversity in the face of climate change, we need, like Fabre and Flahaut, to be futurists, pragmatic but farsighted. It is time for radical notions.

One such notion is to transplant species that otherwise have no hope. While several conservation scientists have broached this idea in publications and meetings, it clearly is anathema to many applied conservation biologists – for whom the thought of intentionally introducing an exotic species into an area in which it never lived goes against their most fundamental ethics. Huge amounts of time and money are being spent on keeping exotics *out* of preserves, for invasive exotics are one of the prime causes of endangerment of many native species.

Should we, then, consider moving the polar bear to Antarctica, which currently is losing sea-ice habitat at a slower rate than is the Arctic? With little thought, the clear answer is no. Antarctica already has its own fauna – with loads of tasty bear treats all dressed up in their best tuxedos. Penguins have never evolved

6 O. Hoegh-Guldberg et al., “Coral Reefs Under Rapid Climate Change and Ocean Acidification,” *Science* 318 (5857) (2007): 1737 – 1742.

defenses against large terrestrial predators, for none have existed. Introducing polar bears would mean a high risk of extinction for several penguin species. The known cost is far greater than the unknown good.

But consider as well the case of the American pika, which is less clear-cut. Paleological records show that it lived in the lowlands during the last ice age. As the ice retreated, the once continuously distributed pika gradually shifted upward – an easy move. Now, it survives in isolated mountaintop ‘islands’ on various mountain ranges throughout the western United States. Populations below about seven thousand feet are rapidly going extinct, with past physiological studies suggesting thermal stress is the cause.⁷ Do we watch this species gradually go extinct on all but the highest mountains? Or do we move the American pika to more northerly mountains, where it doesn’t now exist? Is this an acceptable suggestion if the new habitat doesn’t have any other pika species, but unacceptable if such obvious competitors exist? What about the case of no other pika species, but other small mammals that could potentially use similar niches? Where do we draw the line?

Just as climate shapes vegetation, so can vegetation shape climate. A clear-cut can be up to 2°F hotter and 30 percent dryer than the adjacent forest interior. Thus forestation or reforestation will tend to make the local climate cooler and wetter – that is, if it’s in the temperate or tropical zones. In the boreal

zone, shrubs and trees create a dark surface above the snow in winter. Whereas tundra creates a landscape of unbroken snow, reflecting the sun’s energy, and hence cooling the climate, dark trees absorb the sun’s energy, locally warming the climate. Do we use this knowledge to modify climate locally? Do we create novel vegetation structure – the ultimate in species’ invasion – for the sake of small, local climate modification?

These are not scientific questions; they are ethical ones. Science can project which species will be most at risk of extinction, but it cannot help with how that information should be used. Once we accept the premise that there are no more wild places, it becomes easier to emulate Fabre and Flahaut.

Every system is disturbed or managed by mankind: it is only the degree that varies. Many species will go extinct because of climate change. It is up to mankind to decide whether to let that process play out, or to intervene. If action is the chosen course, then when and how, and for whom?

The most obvious action available would actually alleviate many of the impending ethical dilemmas – to reduce greenhouse-gas emissions drastically and prevent the worst-case scenario from becoming reality. The global climate system has a long memory. Global temperature will continue to rise, for the carbon dioxide now in the atmosphere will continue to affect earth’s climate and continue to cause rising seas for a few hundred years. The choice is not whether to stop climate change, but whether to cut emissions drastically now so that we warm ‘only’ another 2°C by 2100, or whether to continue with business as usual and allow Earth to reach a climate it hasn’t seen in a few million years – some four to six degrees warmer than it is now.

7 A. T. Smith, “The Distribution and Dispersal of Pikas: Influences of Behavior and Climate,” *Ecology* 55 (1974): 1368–1376; E. A. Beaver, P. F. Brussard, and J. Berger, “Patterns of Apparent Extirpation among Isolated Populations of Pikas (*Ochotona princeps*) in the Great Basin,” *J. Mammal* 84 (2003): 37–54.

Mitigation (preventing damaging climate change from happening in the first place) is easier, cheaper, and ultimately more successful than adaptation (coping with change after it comes). But this philosophy seems neither to have pervaded the minds of individuals nor the hearts of most governments. Having participated in ten years of meetings, reports, and policy sessions (all with similar recommendations), followed by pathetically slow changes in governmental policy and even less real reduction in emissions, I'm pessimistic that drastic emission reductions will come in time.

Thus we return to the ethical dilemmas that continued climate change will impose. If we act decisively and globally and make major reductions in greenhouse-gas emissions, then our ethical choices may be relatively painless. Inaction will create choices on a grander scale, involving more areas and more species. We are coming up against such choices now – conservation groups are hesitating to buy habitats on barrier islands that are currently in good shape, but that are likely to be undersea in a hundred years. Such decisions have to be made now, not in the future. As global warming increases, the choices will become harder. Which species will we be willing to sacrifice because of overriding costs, potential loss of other species, unknown ecosystem consequences, or simply because the money in hand could be spent on projects with more certain conservation returns? Do we save the charismatic polar bear while ignoring the unglamorous Houston toad?

How do we think about the future? Do we preserve and restore habitat for a particular bird species that all projections say cannot live there one hundred years from now? This is the reality with which the conservation community is

grappling. Even if one accepts the extinction of one bird, the answer isn't obvious. One may argue to preserve the habitat because it will allow one more generation to experience this particular bird, which may have a particularly melodious song. There is also the hope that a given preserve will continue to be good habitat for other native species – perhaps those less beautiful but also less vulnerable to climate change, and perhaps for new species that will enter as they themselves are forced from their former homes. Preservation and restoration cannot be a bad thing, even if we may not be able to divine how the return on investment will play out over the centuries.

Perhaps that is the message – to continue to aid nature in ways we know how, in hopes that Nature will eventually recover. Species *will* disappear from our parks. Species will go extinct. The unknowns are the extent, the when, and the where – not the fundamental process. The greatest challenge facing conservationists will be in letting go of conservation in the narrow sense, and setting conservation goals that more fundamentally preserve the essence of what we mean by 'biodiversity.' This will mean that difficult decisions will have to be made, such as who to save and who to let go, when to fight and when to give up. There may be no true wilderness left – but let us hope that a new generation of conservation futurists will preserve a world where wild things still live.

Gordon H. Orians

Nature & human nature

People working in quite different fields with different methodologies and research agendas nevertheless often shared a veiled antipathy, trying to keep their distance from the implications of two ideas: Our minds are just what our brains non-miraculously do, and the talents of our brains had to evolve like every other marvel of nature. Their effort to keep this vision at bay was bogging down their thinking, lending spurious allure to dubious brands of absolutism and encouraging them to see small, bridgeable gaps as yawning chasms.

– Daniel Dennett, preface to *Freedom Evolves*¹

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Throughout human history, people have pondered their relationship to the living and nonliving components of the environments in which they have lived: Where did we and all the other living organisms around us come from? How long have we been here? In what ways are we different from other species? How should we relate to them? Do we have any responsibilities to them? If so, what are they?

Human cultures have generated a rich variety of answers to these and similar questions. Most of these answers reflect the intimate contacts people had with nature because nature, both benign and terrifying, influenced the consequences of most of their activities. Moreover, our ancestors could not have failed to notice the many striking similarities between themselves and some of the other species that shared habitats with them. For people lacking knowledge of both the age of the Earth and the processes by which life evolved, such similarities must have seemed puzzling.

The dominant view throughout Western intellectual history has been to posit an unbridgeable gap between humans

¹ Daniel Dennett, *Freedom Evolves* (London: Penguin Books, 2003). I thank Leda Cosmides and Judith Heerwagen for helpful comments on an earlier version of the manuscript.

and other animals. This belief has often been combined with the position that other species were created specially with human needs in mind:

It was with human needs in mind that the animals had been carefully designed and distributed. Camels, observed a preacher in 1696, had been sensibly allotted to Arabia, where there was no water, and savage beasts “sent to deserts, where they may do less harm.” It was a sign of God’s providence that fierce animals were less prolific than domestic ones and that they lived in dens by day, usually coming out only at night, when men were in bed. Moreover, whereas other members of wild species all looked alike, cows, horses, and other domestic animals had been conveniently variegated in color and shape, in order “that mankind may the more readily distinguish and claim their respective property.” The physician George Cheyne in 1705 explained that the Creator made the horse’s excrement smell sweet, because he knew that men would often be in its vicinity.²

In striking contrast, the sharp division between humans and other animals that has dominated Western thought is alien to Eastern philosophy. In some of those traditions a reincarnated human soul can take many shapes and forms. A human can become a fish; a fish can become a God. Thus, all living things are spiritually connected. Lacking a religion that grants souls only to one species, Eastern philosophers readily accepted the notion that our species is historically linked to others.

Even in the West, most children do not share the view that a great gap exists between humans and other animals. “Chil-

dren show no trace of the arrogance which urges adult civilized men to draw a hard-and-fast line between their own nature and that of all other animals. Children have no scruples over allowing animals to rank as their full equals. Uninhibited as they are in the avowal of their bodily needs, they no doubt feel themselves more akin to animals than to their elders, who may well be a puzzle to them.”³

The fact that human bodily functions are shared with animals is, not surprisingly, one of the many challenges to the belief in an unbridgeable gap between humans and other animals. One response has been to propose that other fundamental differences trump the obvious metabolic similarities. One interesting ‘solution’ was to suggest that physical modesty about bodily functions distinguished humans from beasts. A passage in the diary of New England clergyman Cotton Mather, written in 1700, illustrates this perspective:

I was once emptying the cistern of nature, and making water at the wall. At the same time there came a dog, who did so too, before me. Thought I; “What mean and vile things are the children of men . . . How much do our natural necessities debase us, and place us . . . on the same level with the very dogs.”

My thought proceeded. “Yet I will be a more noble creature; and at the very time when my natural necessities debase me into the condition of the beast, my spirit shall (I say at that very time!) rise and soar”

Accordingly, I resolved that it should be my ordinary practice, whenever I step to answer one or the other necessity of nature to make it an opportunity of shap-

2 K. Thomas, *Man and the Natural World: A History of the Modern Sensibility* (New York: Pantheon Books, 1983), 19.

3 Sigmund Freud, *Totem and Taboo* (London: Hogarth Press).

ing in my mind some holy, noble, divine thought....

In the nineteenth century, one of the great arguments against vaccination was that inoculation with fluid from cows would result in the ‘animalization’ of human beings. Why eating other species, a nearly universal practice among those who opposed vaccination, did not have the same effect was never explained! Bestiality became a capital offense in Britain in 1534 and, with one brief interval, remained so until 1861. Incest, by contrast, was not a secular crime at all until the twentieth century. Though these and other beliefs about the gap between humans and other species may seem quaint to us now, some of today’s defenses of the gap will probably seem equally quaint to our descendants.

Scientific advances have repeatedly challenged the notion of a gap. New information about the functioning of the physical world, most notably that the Earth was not the center of the universe, raised some concerns, but they were relatively quickly accommodated by religious leaders and their followers. In 1859, Charles Darwin presented by far the most serious challenge. He offered a hypothesis that explained the processes by which life evolved over long time spans, demonstrating that the appearance of design did not require the operation of a designer. Even more importantly, he also suggested that humans had evolved together with other forms of life via those same processes, thereby effectively removing us from the pedestal most people thought we occupied. The repercussions of this dangerous idea still reverberate powerfully today.⁴

4 Daniel Dennett, *Darwin’s Dangerous Idea* (New York: Simon and Schuster, 1995).

Among the ‘casualties’ caused by more recent scientific advances are the claims that possessing a culture, language, music, self-awareness, and an ethical sense are uniquely human traits. Despite the discovery that these traits are shared with at least some other species, new ways continued to be found to defend the gap. Among nonscientists, belief in the gap is now based primarily on the presumed existence of a component, such as a soul, that is implanted in humans, but in no other species, at some point after conception by some supernatural process. Differences among religions concerning when a soul is believed to be implanted in a human body figure prominently in current debates over the ethics of abortion.

Natural and social scientists who still believe in an unbridgeable gap between people and other animals, but who are reluctant to invoke some supernatural process, generally base their belief on a claim that the evolution of human consciousness, combined with our remarkable ability to learn, has emancipated us from the control of our genome. If so, it follows that there is no such thing as ‘human nature.’ Instead, a human being is born with a mind that is a blank slate. As expressed by José Ortega y Gasset, “Man has no nature; what he has is history.” This view dominated Western psychology, sociology, and anthropology during much of the twentieth century.

Today, however, given the amazing recent advances in cognitive neurology, few scientists ascribe to such an extreme view. What has replaced it in the minds of most (but not all) scientists,⁵ if not

5 For alternative views, see R. C. Lewontin, S. Rose, and L. J. Kamin, *Not in Our Genes: Biology, Ideology, and Human Nature* (New York: Pantheon Books, 1984); S. J. Gould, “Biological Potential vs. Biological Determinism,” in S. J.

among the general public, is the belief that, although behavior may be the product of complex interactions between heredity and environment during an individual's maturation, for humans developmental influences overwhelmingly overpower residual genetic influences. Humans are, accordingly, free to devise remarkably diverse kinds of cultures and to establish rich arrays of behavioral norms. Thus, humans differ fundamentally from other animals in that environmental influences so soundly trump genetic influences on the development of human behavior that genes can safely be ignored. Some scientists have even argued that the human genome is too small to encode much more than a blank slate.

Most scientists have discarded blank-slate models. A major reason is that such models are unable to account for most of the diverse array of problems that humans and other animals routinely solve. All efforts to account for the rates at which children accomplish the extraordinarily complex task of language learning, for example, employing only a blank slate, have failed.

Another reason for abandoning blank-slate models is that geneticists have shown that genes in all organisms are organized into two functional elements – transcription factors and promoters. Promoters are the sequences of DNA that determine whether the adjacent coding regions will be expressed. Promoters, and the various transcription factors that act on them, are largely responsible for the cascade of events during early development that determine

the structure and functioning of organisms. Genes that govern development were not discovered until 1985 because geneticists had concentrated their attention on the transmission of inherited characteristics from adult organisms to their offspring. Studying almost exclusively the part of DNA (only about 1.5 percent of human DNA) that codes for proteins, they ignored the regulatory component (about 3 percent of human DNA) that governs development.

Differences in the adult forms of different animal species result from differences in where and when regulatory genes are turned on and off. The factors that govern the formation and patterning of the bodies and body parts of multicellular organisms are referred to as the molecular tool kit, in the sense that a few tools in a carpenter's tool kit can be used to build many things. The number of developmental genes in the tool kit of the human genome turns out to be sufficient to generate a complex neural network capable of yielding such surprising phenomena as the deep structure shared by all human languages.⁶

Although belief that a child is born with a 'blank-slate brain' is no longer scientifically justified, a rich research agenda remains to explore the nature and extent of genetic and environmental influences on components of human behavior. Great variability exists. In considering differences among people, some traits, such as the ability to learn a language early in life, are entirely genetically determined – almost everyone without brain damage has this ability, and when they do not, it is usually because of a rare mutation. Other traits that differ among people, such as which language a

Gould, ed., *Ever Since Darwin: Reflections in Natural History* (New York: Norton, 1977); P. R. Ehrlich, *Human Natures: Genes, Cultures and the Human Prospect* (Washington, D.C.: Island Press, 2000).

6 S. B. Carroll, *Endless Forms Most Beautiful: The New Science of EvoDevo* (New York: W. W. Norton, 2005).

person speaks, are completely environmentally determined.

The distinction is not only of intellectual interest. Social policy is often based on assumptions about the degree of genetic versus environmental influence on human behavior. For example, until recently, psychiatrists blamed mothers for the behavioral difficulties of their autistic or schizophrenic children by accusing them of failing to engage emotionally with them. Today we know that autism and schizophrenia are highly heritable. The likely environmental influences on the expression of those traits include toxins, pathogens, and developmental accidents. Mothering contributes almost nothing to the probability that a child develops either disorder. Many mothers suffered unnecessarily, believing that they had caused their children's disorders.

Fortunately, the persistence of the belief in the West that an unbridgeable gap exists between humans and other animals has not suppressed people's desire to understand the workings of nature. Indeed, understanding the functioning of nature has been regarded as a high calling, an endeavor by which the mind and methods of the creator might be better appreciated.

Nevertheless, some people have resisted efforts to understand natural processes better, fearing that knowledge would rob nature of its wonder.

Do not all charms fly
At the mere touch of cold philosophy?
There was an awful rainbow once in
heaven:
We know her woof, her texture, she is
given
In the dull catalogue of common things.
Philosophy will clip an Angel's wings,
Conquer all mysteries by rule and line,

Empty the haunted air, and gnomes
mine –
Unweave a rainbow.

As he expressed in this poem, "Lamina," part of which I just quoted, John Keats thought that Isaac Newton had destroyed the beauty and mystery of the rainbow by explaining how it was formed. Keats was not alone, then or now. Even today, many people for the same reason resist having nature, and especially human nature, explained.

The physicist Richard Feynman responded in this way to a friend who asserted that scientists miss the beauty of a flower by studying it:

The beauty that is there for you is also there for me, too. But I see a deeper beauty that isn't so readily available to others. I can see the complicated structure of the flower. The color of the flower is red. Does the fact that the plant has color mean that it evolved to attract insects? This adds a further question. Can insects see color? Do they have an aesthetic sense? And so on. I don't see how studying a flower ever detracts from its beauty. It only adds.

Feynman postulated the wrong pollinator for red flowers (he should have invoked birds), but his point is correct. As any adult who enjoys the pleasure of food or sex should know, understanding the biological function of an activity in no way diminishes the emotions that typically accompany it. Indeed, steps to subvert the intended biological consequences of the behavior may even enhance those emotions.

Nevertheless, resistance to having our emotions explained, and the belief that explaining them will destroy their beauty and our sense of wonder, is still so strong that Richard Dawkins was motivated to write a book, *Unweaving the*

Rainbow, which deals extensively with this issue.

Why human nature has evolved, in part, as a result of the interactions of our ancestors with nature is obvious. Our ancestors lived in environments devoid of modern conveniences. Their survival, health, and reproductive success depended on their ability to seek and use environmental information wisely. They had to know how to interpret signals from animate and inanimate environments and how to adjust their behavioral responses to them. They needed to understand and evaluate relationships between habitats and resources.

These responses may well develop ontogenetically via learning, but not via inefficient, unstructured blank-slate learning mechanisms. Efficiencies are achieved if an organism selectively retains certain information while ignoring or paying less attention to other types of environmental information. It should therefore be no surprise that human learning about the natural environment is caused by content-rich, domain-specialized mechanisms that evolved for specific functions, just as they do in other animals.

Evolutionary biologists expect emotional responses to evolve in response to conditions that strongly influence survival and reproductive success, that is, fitness. Those of our ancestors who did not enjoy food and sex, for example, were more poorly represented genetically in future generations than those who did enjoy – and hence sought out – food and sexual partners. Similarly, individuals who selected inferior environments in which to live should have been less represented genetically in future generations than individuals who made better habitat choices.

The survival value of emotions should not surprise us. Emotions are the major motivators of human behavior. Our actions are strongly influenced by what we like or dislike, what we find pleasurable or unpleasant. Until recently, it was commonly assumed that ‘irrational’ emotional responses prevented us from making appropriate responses to problems we were trying to solve. However, emotions are fundamental to ‘rational’ action. As Aristotle said, “Thought by itself moves nothing.” Modern cognitive psychologists and neuroscientists confirm that emotions, rather than being the antithesis of rationality, greatly aid thinking and decision making. People can reason and deliberate as much as they want, but if no emotions are attached to the various options in front of them, they never reach a decision or conviction. Moral choices do not, indeed cannot, come about through cool Kantian rationality.

Thus, evolutionary processes have designed the human mind (and the minds of all other species that have them) to assist in making decisions that enhance survival and reproductive success. Antonio Damasio put it succinctly: “The brain is for making decisions about how to enhance reproductive success.”⁷ The psychological mechanisms that support decision making are adaptations that natural selection has molded over evolutionary time.

An adaptation is an evolved response to a past environmental problem that persistently confronted individuals for long enough periods of evolutionary time to have caused significant cumulative directional selection. To study an adaptation, scientists do not need to

7 Antonio Damasio, *The Feeling of What Happens: Body and Emotion in the Making of Consciousness* (New York: Harcourt Brace, 1999), 35.

identify those precursors. They need to identify only the design of the adaptation and the forces of selection responsible for that design. It is useful to understand the origin of an adaptation, but questions about origins and subsequent history often deal with different historical causes. We can study the function of an adaptation without knowing about or understanding the details of its origin.

Adaptations tend to be possessed by all or nearly all members of a species, although some of them are restricted to one sex or are expressed only at certain ages. Moreover, environments that fail to support normal development can suppress their expression. Adaptations are special purpose, not general purpose, in functional design because the environmental problems to which adaptations are responses are specific problems, not general problems. A general-purpose mechanism is unlikely to be an efficient way to solve specific problems.

The preferences that motivate responses to environments are evolutionary outcomes of complex processes that include perceiving things and spaces, selectively extracting information from them, and reacting to them in terms of their potential value. Discerning 'value' involves asking what an environment offers. J. J. Gibson, in 1979, introduced the concept of affordance.⁸ Affordance refers to what an object or environment offers to an individual viewer at a particular time. The perceiver assesses what could be done with that object or in that environment, and evaluates the consequences of doing those things. The observer asks of an object not only, 'What is it?' but also, 'What's in it for me?'

8 J. J. Gibson, *The Ecological Approach to Visual Perception* (Boston: Houghton Mifflin, 1979).

For example, an observer may ask of an environment: How easy would it be to enter it, explore it, and find my way back if necessary? How valuable would the acquired knowledge be? In other words, when we look at trees in a landscape, we think of them not just as objects with recognizable characteristics by which they can be named and classified, but rather as objects suggesting opportunities for doing things, such as picking fruit, seeing further, hiding better, or climbing to safety.⁹ We see rivers not simply as morphological components of the landscape, but rather in terms of their ability to provide water, "a basic necessity for the maintenance of life, or . . . as channels along which we can move if we have the means to do so, or as obstacles to impede our passage if we have not."¹⁰

"Our senses are not transparent windows onto the world. Instead, our senses are adaptations that select, distill, augment, and (sometimes) deceive. We tend to accept our sensations as truthful reflections of reality. But in fact, our senses evolved not to decipher the truth, but to enhance our chances of survival. We perceive 'ugliness' even though there

9 For investigations of human responses to tree shapes and other components of the environment, see R. G. Coss, "The Role of Evolved Perceptual Biases in Art and Design," in *Evolutionary Aesthetics*, ed. E. Voland and K. Gammer (New York: Springer, 2003), 69–130; G. H. Orians and J. H. Herwagen, "Evolved Responses to Landscapes," in *The Adapted Mind: Evolutionary Psychology and the Generation of Culture*, ed. J. H. Barkow, L. Cosmides, and J. Tooby (New York: Oxford University Press, 1992), 555–579.

10 J. Appleton, *The Symbolism of Habitat: An Interpretation of Landscape in the Arts* (Seattle: University of Washington Press, 1990), 25; R. G. Coss and M. Moore, "All That Glistens: Water Connotations in Surface Finishes," *Ecological Psychology* 2 (1990): 367–380.

is nothing in the world that is objectively ugly.”¹¹

What an environment affords is not static. Affordances vary with season and weather, and the age and current needs of individuals. A farmer whose crops are suffering from lack of rain values an approaching storm differently than a family preparing to enjoy a picnic in the woods does. We cannot simply measure the features of an environment and compute its affordance.

An evolutionary result of making and acting upon such evaluations is that individuals should be able to recognize the kinds of environments in which they function well and to prefer them. That is, high-quality environments should evoke positive emotions, whereas low-quality environments should fail to do so. People should prefer to be in the environments in which they thrive because they would benefit from not wasting time in unsatisfactory environments. Individuals unable to distinguish between good and poor environments would have spent much time in poor environments. They should have left fewer surviving offspring than individuals who were better able to assess environmental quality.

Decisions are based on a combination of information currently impinging on an individual, the accumulated memory related to the significance of information that impinged on the individual in the past (ontogenetic memory), and information stored in the organism's genome (genetic memory). The brain selectively stores information that has proven to be relevant to the welfare of the individual in which it resides. Much relevant ontogenetically stored environ-

mental information concerns the location of things in space. Where were prey animals yesterday? Where did I cache the food I could not carry back to camp? Where are the trees that bear nutritious fruit? Where are the safe hiding places that I may need to use in an emergency?

However, an environment consists of more than its physical and biological components that provide resources and the conditions under which we seek them. Friends, enemies, potential reproductive partners, and dependent offspring are all important components of the environment, too. Indeed, the great importance of other members of our own species is reflected in the composition of modern universities: humans are the subject matter of the majority of departments, including the largest ones.

The processes by which life has evolved have no foresight. Therefore, all adaptations are to past environments. They tell us about the past, not the present or the future. A corollary is that adaptations need not be appropriate under current conditions. Indeed, some of them may be maladaptive if conditions have rapidly changed, as they recently have for humans. Thus we should expect to find some ‘ghosts of environments past’ in the human psyche. The biological world, like the mental world of Ebenezer Scrooge, is replete with ghosts. There are ghosts of habitats, predators, parasites, competitors, mutualists, and conspecifics past, as well as ghosts of meteors, volcanic eruptions, hurricanes, and droughts past.¹² Some ghosts are the products of ancient events; others derive from recent events. But how long are

11 David Huron, *Sweet Anticipation: Music and the Psychology of Expectation* (Cambridge, Mass.: MIT Press, 2006).

12 A. Öhman and S. Mineka, “Fear, Phobias and Preparedness: Toward an Evolved Module of Fear and Fear Learning,” *Psychological Review* 108 (2001): 483–522.

adaptations to past environments likely to persist? Why do they persist? Which of our response patterns were formerly, but no longer are, adaptive? A major challenge in the study of the evolution of human behavior is identifying, characterizing, and interpreting ghosts – and determining their longevity.

One reason we should expect behavioral ‘ghosts’ in the human psyche is the relatively small number of generations that lie between us and our ancestral hunters and gatherers. Only about ten thousand years have elapsed since the first appearance of agriculture in the fossil record. Only during the past five thousand years have more than half of the human population engaged in agriculture. In the absence of strong selection against a trait, its persistence under today’s radically altered conditions is at least plausible.

As Ebenezer Scrooge discovered, ghosts, no matter how inconvenient they may seem to be, can yield positive benefits. If emotional responses evolved because they enabled people to solve life’s problems better, exposure to high-quality environments should be restorative; that is, it should reduce feelings of tension and stress. Stress reduction consistently emerges as one of the key benefits reported by users of wilderness areas. Patients recovering from surgery, in hospitals with either views of natural vegetation or simulated views that depict natural scenes with water, recover more rapidly and have less postoperative anxiety than do patients with no access to natural views or who are presented with simulations of abstract designs. Many studies have shown that even a brief exposure to nature – real or via photographs – leads to positive emotional feelings, reductions in stress, and better performance on demanding tasks. The positive responses people have to

nature have important implications for the design of work places, living spaces, and health-care facilities.

People have clearly intuitively understood the restorative value of interactions with nature for a long time. The gardens of ancient Egypt, the walled gardens of Mesopotamia, and the gardens of merchants in medieval Chinese cities indicate that, for centuries, people have gone to considerable lengths to maintain and enhance their contacts with nature. More recently, the belief that exposure to nature fosters psychological and physical health has formed part of the justification for providing parks and other nature in cities and for preserving wilderness.

In addition to visual stimulation, the sounds of nature and the sounds we produce ourselves have the power to affect us strongly.¹³ Beethoven is reported to have said, “I leave my music to heal the world.” Philip V of Spain was cured, so it is claimed, of his melancholia by the singing of a brilliant castrato, Farinelli, who sang the same four arias to him every night for ten years. The “Chalice of Repose” project in Missoula, Montana, offers live music, usually including harpists and singers, to persons in the last stages of terminal illness. Skeptical doctors have been convinced of the value of the music by observing that patients on very high levels of painkillers requested either lower levels of or no pain killers after a visit by the Chalice team. In the 1920s, MUZAK introduced music into elevators in skyscrapers to help calm passengers. Many clinics employ music therapy to calm patients and reduce the need for general anesthetics. Music therapy has been widely used in many societies since antiquity. In fact,

13 Huron, *Sweet Anticipation*.

Americans spend more money on music than on sex or prescription drugs!

Human responses to nature are biased in certain directions by our evolutionary history, by the ways that people lived and the problems they had to solve. Who we are today has been molded by our intimate interactions with the physical and biological components of the natural world, including that component formed by our fellow humans. Therefore, the increasing isolation of people from nature poses serious problems for our attempts to live sustainably on Earth.

It is easy for people not to miss what they never had and never saw. Consider the passenger pigeon. Two hundred years ago there were billions of them. It is estimated that one out of every two land birds in North America was a passenger pigeon. John James Audubon witnessed a flock that took three days to fly past him near Cincinnati in 1813. He described it as follows: "The light of the noonday was obscured as by an eclipse." Today there are none. But how many Americans are aware of what we lost, and how many of us feel that our lives have been diminished by the loss?

Similarly, a few hundred years ago sea turtles were so abundant that ships sometimes sank when they struck vast shoals of them. The turtles may have consumed more plants in the Caribbean than the herds of bison did on the plains. Today all marine turtle species are rare, but few of us miss them or are even aware of the remarkable phenomenon that has been lost.

We are unlikely to care about our environments and other species and be motivated to preserve them unless we live and interact with them and directly experience how they enrich our lives. Conservation success in the United

States will depend to a large degree on our willingness to exploit options that fall under 'reconciliation ecology.' Reconciliation ecology is the science of inventing, establishing, and maintaining new habitats to conserve species diversity in places where people live, work, and play.¹⁴ Reconciliation ecology is an applied science that assists us in designing habitats so that we can share them with other species. As the ancient Chinese sage said: "The careful foot can walk anywhere." Nature needs us to walk carefully. So does human nature.

14 M. L. Rosenzweig, *Win-Win Ecology: How the Earth's Species Can Survive in the Midst of Human Enterprise* (New York: Oxford University Press, 2003).

Cass R. Sunstein

Precautions & nature

All over the world, there is increasing interest in a simple idea for regulation of risk: In cases of doubt, follow the Precautionary Principle.¹ Avoid steps that will create a risk of harm. Until safety is established, be cautious; do not require unambiguous evidence. In a catchphrase: better safe than sorry.

In ordinary life, pleas of this kind seem quite sensible, indeed a part of ordinary human rationality. It can be hazardous to interfere with natural processes, and we often refuse to alter the status quo because of a salutary fear of adverse side effects. Shouldn't the same approach be followed by rational regulators as well?

My central claim here is conceptual. The real problem with the Precautionary Principle in its strongest forms is

that it is incoherent; it purports to give guidance, but it fails to do so, because it condemns the very steps that it requires. The regulation that the principle requires always gives rise to risks of its own – and hence the principle bans what it simultaneously mandates. I therefore aim to challenge the Precautionary Principle not because it leads in bad directions, but because read for all that it is worth, it leads in no direction at all. The principle threatens to be paralyzing, forbidding regulation, inaction, and every step in between. It provides help only if we blind ourselves to many aspects of risk-related situations and focus on a narrow subset of what is at stake. Protection of nature often makes sense, but the

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1 The literature is vast. See, for general discussion, Poul Harremoës et al., eds., *The Precautionary Principle in the 20th Century: Late Lessons from Early Warnings* (London: Earthscan, 2002); Arie Trouwborst, *Evolution and Status of the Precautionary Principle in International Law* (London: Kluwer Law International, 2002); Tim O’Riordan and James Cameron, eds., *Interpreting the Precautionary Principle* (London: Cameron May, 2002); Joel Tickner, ed., *Precaution, Environmental Science and Preventive Public Policy* (Washington, D.C.: Island Press, 2002); Carolyn Raffensberger and Joel Tickner, eds., *Protecting Public Health and the Environment: Implementing the Precautionary Principle* (Washington, D.C.: Island Press, 1999).

Precautionary Principle is not a helpful way of identifying when, and how much, protection of nature makes sense.

For those interested in precautions, the initial question is this: what exactly does the principle mean or require? There are at least twenty definitions, and they are not compatible with one another. We can imagine a continuum of understandings. At one extreme are weak versions to which no reasonable person could object. At the other extreme are strong versions that would require a fundamental rethinking of regulatory policy.

The most cautious and weak versions suggest, quite sensibly, that a lack of decisive evidence of harm should not be a ground for refusing to protect natural processes. Controls might be justified even if we cannot establish a definite connection between, for example, low-level exposures to humanly introduced carcinogens and adverse effects on human health. Thus the 1992 Rio Declaration states, “Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.”

The Ministerial Declaration of the Second International Conference on the Protection of the North Sea, held in London in 1987, is in the same vein: “Accepting that in order to protect the North Sea from possibly damaging effects of the most dangerous substances, a Precautionary Principle is necessary which may require action to control inputs of such substances even before a causal link has been established by absolutely clear scientific evidence.” Similarly, the United Nations Framework Convention on Climate Change offers cautious language: “Where there are threats of serious or irreversible damage, lack of full scien-

tific certainty should not be used as a reason for postponing [regulatory] measures, taking into account that policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost.”

The widely publicized Wingspread Declaration, from a meeting of environmentalists in 1998, goes further: “When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not established scientifically. In this context the proponent of the activity, rather than the public, should bear the burden of proof.” The first sentence just quoted is a mildly more aggressive version of the statement from the Rio Declaration. It is more aggressive because it is not limited to threats of serious or irreversible damage. But in reversing the burden of proof, the second sentence goes further still. Of course everything depends on what those with the burden of proof must show in particular.

In Europe, the Precautionary Principle is sometimes understood in a still stronger way, as asking for a significant margin of safety for all decisions. According to one definition, the Precautionary Principle means “that action should be taken to correct a problem as soon as there is evidence that harm may occur, not after the harm has already occurred.”² The word “may” is the crucial one; almost all of the time, there will be “evidence that harm may occur,” if “may” is not understood to require some threshold of probability. In a comparably strong version, the Final Declaration of the First European “Seas At Risk” conference says that if “the ‘worst case

2 <http://www.logophilia.com/WordSpy/precautionaryprinciple.asp>.

scenario' for a certain activity is serious enough, then even a small amount of doubt as to the safety of that activity is sufficient to stop it taking place."³

The weak versions of the Precautionary Principle state a truism – uncontroversial in principle and necessary in practice only to combat public confusion or the self-interested claims of private groups demanding unambiguous evidence of harm (which no rational society requires). Because the weakest versions are unobjectionable, even banal, I will not discuss them here. To make analytic progress, let us understand the principle in the strong way to suggest that regulation is required whenever there is a potential risk to health, safety, or nature, even if the supporting evidence remains speculative and even if the economic costs of regulation are high. To avoid palpable absurdity, the idea of 'potential risk' will be understood to require a certain threshold of scientific plausibility. To support regulation, no one thinks that it is enough if someone, somewhere, urges that a risk is worth taking seriously. But under the Precautionary Principle as I shall understand it, the threshold burden is minimal, and once it is met, there is something like a presumption in favor of regulatory controls.

I believe that this understanding of the Precautionary Principle fits with the understandings of some of its most enthusiastic proponents, and that with relatively modest variations, this understanding fits with many of the legal formulations as well.

It is tempting to object that the Precautionary Principle, thus understood, is

hopelessly vague. How much precaution is the right amount of precaution? By itself, the principle does not tell us. It is also tempting to object that the principle is, but should not be, cost-blind. Some precautions simply aren't worthwhile, because they cost so much and help so little. But the most serious problem lies elsewhere. The real problem is that the principle offers no guidance – not that it is wrong, but that it forbids all courses of action, including regulation. It bans the very steps that it requires.

To understand the objection, it will be useful to anchor the discussion in some concrete problems:

- Genetic modification of food has become a widespread practice.⁴ The risks of that practice are not known with precision. Some people fear that genetic modification will result in serious ecological harm and large risks to human health; others believe that genetic modification will result in more nutritious food and significant improvements in human health.
- Many people fear nuclear power, on the ground that nuclear power plants create various health and safety risks, including some possibility of catastrophe. But if a nation does not rely on nuclear power, it might well rely instead on fossil fuels, and in particular on coal-fired power plants. Such plants create risks of their own, including risks associated with global warming. China, for example, has relied on nuclear energy, in a way that reduces greenhouse gases and a range of air-pollution problems.⁵

4 Alan McHughen, *Pandora's Picnic Basket* (New York: Oxford University Press, 2000).

5 See Ling Zhong, "Note: Nuclear Energy: China's Approach Towards Addressing Global Warming," *Georgetown International Environ-*

3 Final Declaration of the First European "Seas At Risk" Conference, Annex 1, Copenhagen, 1994.

- There is a possible conflict between the protection of marine mammals and military exercises. The United States Navy, for example, engages in many such exercises, and it is possible that marine mammals will be threatened as a result. Military activities in the oceans might well cause significant harm; but a decision to suspend those activities, in cases involving potential harm, might also endanger military preparedness, or so the government contends.⁶

In these cases, what kind of guidance does the Precautionary Principle provide? It is tempting to say, as is in fact standard, that the principle calls for strong controls. In all of these cases, there is a possibility of serious harms, and no authoritative scientific evidence demonstrates that the possibility is close to zero. Put to one side the question of whether the Precautionary Principle, understood to compel stringent regulation in these cases, is sensible. Let us ask a more fundamental question: is more

mental Law Review 12 (2000): 493. Of course, it is possible to urge that nations should reduce reliance on either coal-fired power plants or nuclear power, and move instead toward solar power. For general discussion, see Godfrey Boyle, ed., *Renewable Energy: Power for a Sustainable Future* (Oxford: Oxford University Press in association with the Open University, 1996); Allan Collinson, *Renewable Energy* (Austin, Tex.: Steck-Vaughn Library, 1991); Dan E. Arvizu, "Advanced Energy Technology and Climate Change Policy Implications," *Florida Coastal Law Journal* 2 (2001): 435. But these alternatives pose problems of their own, involving feasibility and expense.

6 See Testimony of Vice Admiral Charles W. Moore, Deputy Chief of Naval Operations for Readiness and Logistics, before the House Resources Committee, Subcommittee on Fisheries Conservation, Wildlife and Oceans, June 13, 2002.

stringent regulation really compelled by the Precautionary Principle?

The answer is that it is not. In some of these cases, it should be easy to see that in its own way, stringent regulation would actually run afoul of the Precautionary Principle. The simplest reason is that such regulation might well deprive society of significant benefits, and hence produce a large number of deaths that would otherwise not occur. In some cases, regulation eliminates the 'opportunity benefits' of a process or activity, and thus causes preventable deaths. If this is so, regulation is hardly precautionary. Consider the case of genetic modification of food. Many people object to genetic modification, with the thought that 'tampering with nature' can produce a range of adverse consequences for the environment and for human health. But many other people believe that a failure to allow genetic modification might well result in numerous deaths, and a small probability of many more. The reason is that genetic modification holds out the promise of producing food that is both cheaper and healthier – resulting, for example, in 'golden rice,' which might have large benefits in developing countries. The point is not that genetic modification will definitely have those benefits, or that the benefits of genetic modification outweigh the risks. The claim is only that if the Precautionary Principle is taken literally, it is offended by regulation as well as by nonregulation.

Regulation sometimes violates the Precautionary Principle because it would give rise to *substitute risks*, in the form of hazards that materialize, or are increased, as a result of regulation.⁷ Con-

7 See the discussion of risk-related trade-offs in John Graham and Jonathan Wiener, *Risk vs. Risk* (Cambridge, Mass.: Harvard University

sider the case of DDT, often banned or regulated in the interest of reducing risks to birds and human beings. The problem with such bans is that in poor nations, they eliminate what appears to be the most effective way of combating malaria – and thus significantly undermine public health.

Or consider the ‘drug lag,’ produced whenever the government takes a highly precautionary approach to the introduction of new medicines and drugs into the market. If a government insists on such an approach, it will protect people against harms from inadequately tested drugs; but it will also prevent people from receiving potential benefits from those very drugs. Is it ‘precautionary’ to require extensive premarketing testing, or to do the opposite? In the context of medicines to prevent AIDS, those who favor ‘precautions’ have asked governments to reduce premarketing testing, precisely in the interest of health. The United States, by the way, is more precautionary about new medicines than are most European nations – but by failing to allow such medicines on the market, the United States fails to take precautions against the illnesses that could be reduced by speedier procedures. More generally, a sensible government might want to ignore the small risks associated with low levels of radiation, on the ground that precautionary responses are likely to cause fear that outweighs any health benefits from those responses.⁸

Press, 1995); Cass R. Sunstein, “Health-Health Tradeoffs,” in Cass R. Sunstein, *Risk and Reason* (Cambridge: Cambridge University Press, 2002), 133–152.

8 Ibid. For some counterevidence in an important context, see Lennart Hardell et al., “Further Aspects on Cellular and Cordless

We should now be able to see the sense in which the Precautionary Principle, taken for all that it is worth, is paralyzing: it stands as an obstacle to regulation and nonregulation, and to everything in between.

In practice, the Precautionary Principle is widely thought to provide concrete guidance. How can this be? I suggest that the principle becomes operational if and only if those who apply it wear blinders – only, that is, if they focus on some aspects of the regulatory situation but downplay or disregard others. What accounts for the particular blinders that underlie applications of the Precautionary Principle? When people’s attention is selective, why is it selective in the way that it is? Much of the answer lies in a series of identifiable mechanisms. Let us begin with a popular idea about the sanctity of nature.

Sometimes the Precautionary Principle operates by incorporating the belief that nature is essentially benign and that human intervention is likely to carry risks – as in the suggestion that the Precautionary Principle calls for stringent regulation of pesticides or genetically modified organisms. Many people fear that any human intervention will create losses from the status quo and add that these losses should carry great weight, whereas the gains should be regarded with some suspicion or at least be taken as less weighty. For example, “[h]uman intervention seems to be an amplifier in judgments on food riskiness and contamination,” even though “more lives are lost to natural than to man-made dis-

Telephones and Brain Tumours,” *International Journal of Oncology* 22 (2003): 399 (discussing evidence of an association between cellular telephones and cancer).

asters in the world.”⁹ Studies show that people overestimate the carcinogenic risk from pesticides and underestimate the risks of natural carcinogens. People also believe that nature implies safety, so much that they will prefer natural water to processed water even if the two are chemically identical.¹⁰

A belief in the benevolence of nature plays a major role in the operation of the Precautionary Principle, especially among those who see nature as harmonious or in balance. In fact, many of those who endorse the principle seem to be especially concerned about new technologies. Most people believe that natural chemicals are safer than man-made chemicals.¹¹ (Most toxicologists disagree.) On this view, the principle calls for caution when people are intervening in the natural world. Here of course we can find some sense: nature often consists of systems, and interventions into systems can cause serious problems. But there is a large problem with this understanding of the Precautionary Principle. What is natural may not be safe at all.¹²

Consider in this light the familiar idea that there is a ‘balance of nature.’ According to one account, this idea is

9 Paul Rozin and Carol Nemeroff, “Sympathetic Magical Thinking: The Contagion and Similarity ‘Heuristics,’” in *Heuristics and Biases: The Psychology of Intuitive Judgment*, ed. Thomas Gilovich, Dale Griffin, and Daniel Kahneman (Cambridge: Cambridge University Press, 2002).

10 Ibid.

11 See Paul Slovic, *The Perception of Risk* (London: Earthscan Publications, 2000), 291.

12 See James P. Collman, *Naturally Dangerous* (Sausalito, Calif.: University Science Books, 2001).

“not true.”¹³ A scientific revolution has shown that nature “is characterized by change, not constancy,” and that “natural ecological systems are dynamic,” with desirable changes including many “induced through human action.”¹⁴ In any case, nature is often a realm of destruction, illness, killing, and death. Hence the claim cannot be that human activity is necessarily or systematically more destructive than what nature does. Nor is it clear that natural products are comparatively safe.¹⁵ Organic foods, favored by many people on grounds of safety and health and creating annual revenues of \$4.5 billion in the United States alone, are, according to one account, “actually riskier to consume than food grown with synthetic chemicals.”¹⁶ If the Precautionary Principle is seen to raise doubts about pesticides, but not about organic foods, it is probably because the health risks that come with departures from ‘nature’ register as especially troublesome.

Some of the most serious risks we face are a product of nature. Nothing is more natural than exposure to sunlight, which people rarely fear. But such exposure is associated with skin cancer and other harms, producing serious health problems that (unfortunately) have not been the occasion for invoking the Precautionary Principle. Tobacco smoking kills 400,000 Americans each year, even though tobacco is a product of nature. To say all this is not to resolve specific issues, which depend on complex ques-

13 See Daniel B. Botkin, “Adjusting Law to Nature’s Discordant Harmonies,” *Duke Environmental Law & Policy Forum* 7 (1996): 25, 27.

14 Ibid., 33.

15 See Collman, *Naturally Dangerous*.

16 Ibid., 31.

tions of value and fact. But the false belief in the benevolence of nature helps to explain why the Precautionary Principle is thought, quite incorrectly, to provide a great deal of analytical help.

People tend to be loss-averse, which means that a loss from the status quo is seen as more undesirable than a gain is seen as desirable.¹⁷ When we anticipate a loss of what we now have, we can become genuinely afraid, in a way that greatly exceeds our feelings of pleasure when we anticipate some supplement to what we now have. So far, perhaps, so good. The problem comes when individual and social decisions downplay potential gains from the status quo, and fixate on potential losses, in such a way as to produce overall increases in risks and overall decreases in well-being.

In the context of risk regulation, there is a clear implication: people will be closely attuned to the losses produced by any newly introduced risk, or by any aggravation of existing risks, but far less concerned with the benefits that are foregone as a result of regulation. Loss aversion often helps to explain what makes the Precautionary Principle operational. The opportunity costs of regulation often register little or not at all, whereas the out-of-pocket costs of the activity or substance in question are en-

tirely visible. In fact this is a form of status-quo bias. The status quo marks the baseline against which gains and losses are measured, and a loss from the status quo seems much worse than a gain from the status quo seems good.

If loss aversion is at work, we would predict that the Precautionary Principle would place a spotlight on the losses introduced by some risk and downplay the benefits foregone as a result of controls on that risk. Recall the emphasis, in the United States, on the risks of insufficient testing of medicines as compared with the risks of delaying the availability of those medicines. If the 'opportunity benefits' are offscreen, the Precautionary Principle will appear to give guidance notwithstanding the objections I have made. At the same time, the neglected opportunity benefits sometimes present a devastating problem with the use of the Precautionary Principle. In the context of genetic engineering of food, this is very much the situation. We can find the same problem when the Precautionary Principle is invoked to support bans on nonreproductive cloning. For many people, the possible harms of cloning register more strongly than the potential therapeutic benefits that would be rendered unattainable by a ban on the practice.

Loss aversion is closely associated with another cognitive finding: people are far more willing to tolerate familiar risks than unfamiliar ones, even if they are statistically equivalent.¹⁸ For example, the risks associated with driving do not occasion a great deal of concern, even though in the United States alone, tens of thousands of people die from motor vehicle accidents each year. The relevant risks are simply seen as part of life. By contrast, many people are quite

17 See Richard H. Thaler, "The Psychology of Choice and The Assumptions of Economics," in *Quasi-rational Economics* (New York: Russell Sage Foundation, 1991), 137, 143 (arguing that "losses loom larger than gains"); Daniel Kahneman, Jack L. Knetsch, and Richard H. Thaler, "Experimental Tests of the Endowment Effect and the Coase Theorem," *Journal of Political Economy* 98 (6) (1990): 1325, 1328; Colin Camerer, "Individual Decision Making," in *The Handbook of Experimental Economics*, ed. John H. Kagel and Alvin E. Roth (Princeton, N.J.: Princeton University Press, 1995), 587, 665–670.

18 See Slovic, *The Perception of Risk*, 140–143.

concerned about risks that appear newer, such as the risks associated with genetically modified foods, recently introduced chemicals, and terrorism. Part of the reason for the difference may be a belief that with new risks, we are in the domain of uncertainty (meaning that we cannot assign probabilities to bad outcomes) rather than risk (where probabilities can be assigned), and perhaps it makes sense to be cautious when we are not able to measure probabilities. But the individual and social propensity to focus on new risks outruns that sensible propensity. It makes the Precautionary Principle operational by emphasizing, for no good reason, a mere subset of the hazards actually involved.

It is well-established that in thinking about risks, people rely on certain heuristics, or rules of thumb, which serve to simplify their inquiry.¹⁹ Should we be fearful of nuclear power, terrorism, abduction of young children, or pesticides? The availability heuristic is particularly important for purposes of understanding people's fear and their interest in precautions.²⁰ When people use the availability heuristic, they assess the magnitude of risks by asking whether examples can readily come to mind. If people can easily think of such examples, they are far more likely to be frightened than if they cannot. In fact, the belief in the benevolence of nature often stems from the availability heuristic, as people recall cases in which 'tampering' resulted in serious social harm.

19 See Daniel Kahneman, Paul Slovic, and Amos Tversky, *Judgment Under Uncertainty: Heuristics and Biases* (Cambridge: Cambridge University Press, 1982).

20 See Amos Tversky and Daniel Kahneman, "Judgment Under Uncertainty: Heuristics and Biases," in *ibid.*, 3, 11 – 14.

Furthermore, "a class whose instances are easily retrieved will appear more numerous than a class of equal frequency whose instances are less retrievable."²¹ Consider a simple study showing people a list of well-known people of both sexes, and asking them whether the list contains more names of women or more names of men. In lists in which the men were especially famous, people thought that there were more names of men, whereas in lists in which the women were more famous, people thought that there were more names of women.²²

This is a point about how *familiarity* can affect the availability of instances. A risk that is familiar, like that associated with smoking, will be seen as more serious than a risk that is less familiar, like that associated with sunbathing. But *salience* is important as well. "For example, the impact of seeing a house burning on the subjective probability of such accidents is probably greater than the impact of reading about a fire in the local paper."²³ So too, recent events will have a greater impact than earlier ones. The point helps explain much risk-related behavior, including decisions to take precautions. Whether people will buy insurance for natural disasters is greatly affected by recent experiences.²⁴ If floods have not occurred in the immediate past, people who live on flood plains are far less likely to purchase insurance. In the aftermath of an earthquake, insurance for earthquakes rises sharply – but it declines steadily from that point, as vivid memories recede. Note that the use of the availability heuristic, in these con-

21 *Ibid.*, 11.

22 *Ibid.*

23 *Ibid.*

24 Slovic, *The Perception of Risk*, 40.

texts, is hardly irrational. Both insurance and precautionary measures can be expensive, and what has happened before seems, much of the time, to be the best available guide to what will happen again. The problem is that the availability heuristic can lead to serious errors, in terms of both excessive fear and neglect.

The availability heuristic helps to explain the operation of the Precautionary Principle for a simple reason: sometimes a certain risk, said to call for precautions, is cognitively available, whereas other risks, including the risks associated with regulation itself, are not. For example, it is easy to see that arsenic is potentially dangerous; arsenic is well known as a poison, forming the first word of a well-known movie about poisoning, *Arsenic and Old Lace*. By contrast, there is a relatively complex mental operation in the judgment that arsenic regulation might lead people to use less safe alternatives. In many cases where the Precautionary Principle seems to offer guidance, the reason is that some of the relevant risks are available while others are barely visible. And when people seek to protect nature against human intervention, it is often because the dangers of intervention are visible and familiar while the dangers of nonintervention are not.

I have not suggested any particular substitute for the Precautionary Principle. But none of the arguments here supports the views of Aaron Wildavsky, an acute and influential political scientist with a special interest in risk regulation, who also rejects the Precautionary Principle.²⁵ In Wildavsky's view, the notion of 'precaution' should be abandoned and

replaced with a principle of 'resilience,' based on an understanding that nature, and society, are quite able to incorporate even strong shocks, and that the ultimate dangers are therefore smaller than we are likely to fear. It would follow from Wildavsky's 'resilience' principle that people should be less concerned than they now are with the risks associated with (for example) arsenic, global warming, and the destruction of the ozone layer.

Unfortunately, the principle of 'resilience' is no better than that of 'precaution.' Some systems, natural and social, are resilient, but many are not. Whether an ecosystem, or a society, is 'resilient' cannot be decided in the abstract. In any case resilience is a matter of degree. Everything depends on the facts. The resilience principle should be understood as a heuristic, one that favors inaction in the face of possibly damaging technological change. Like most heuristics, the resilience principle will work well in many circumstances, but it can also lead to systematic and even deadly errors.

A better approach would be to acknowledge that a wide variety of adverse effects may come from inaction, regulation, and everything between. Such an approach would attempt to consider all of those adverse effects, not simply a subset. When existing knowledge does not allow clear assessments of the full range of adverse effects, such an approach would develop simplifying devices, helping to show the appropriate course of action in the face of uncertainty. When societies face risks of catastrophe, even risks whose likelihood cannot be calculated, it is appropriate to act, not to stand by and merely to hope. A sensible approach would attempt to counteract, rather than to embody, the various cognitive

25 See Aaron Wildavsky, *But Is It True?* (Cambridge, Mass.: Harvard University Press, 1995), 433.

limitations that people face in thinking about risks. An effort to produce a fair accounting of the universe of dangers should also help to diminish the danger of interest-group manipulation.

To be sure, public alarm, even if ill-informed, is itself a harm, and it is likely to lead to additional harms, perhaps in the form of large-scale 'ripple effects.'²⁶ A sensible approach to risk will attempt to reduce public fear even if it is baseless. My goal here has been not to deny that point, but to explain the otherwise puzzling appeal of the Precautionary Principle and to isolate the strategies that help make it operational. At the individual level, these strategies are hardly senseless, especially for people who lack much information or who do the best they can by focusing on only one aspect of the situation at hand. But for governments, the Precautionary Principle is not sensible, for the simple reason that once the viewscreen is widened, it becomes clear that the principle provides no guidance at all. Rational nations should certainly take precautions. But they should not adopt the Precautionary Principle.

26 See the discussion of the social amplification of risk in Slovic, *The Perception of Risk*.

Philip E. Tetlock & Michael Oppenheimer

The boundaries of the thinkable

Be it conservatism or liberalism, Marxism or libertarianism, or our topic at hand – environmentalism – all ‘isms’ come with conceptual boundaries – and litmus tests for which opinions fall inside or outside the bounds of reasonableness for that ‘ismatic’ worldview. Can a good conservative back abortion rights or higher marginal tax rates? Or a good liberal condone racial profiling? Or a good communist support China’s

transformation into a capitalist state? Or a good pacifist endorse military intervention in Darfur? Or a good environmentalist support pollution trading permits, French-style nuclear-energy programs, or the Copenhagen Consensus’s low-priority ranking of the threat posed by global warming?

These questions resist precise answers because ‘isms’ don’t obey the norms of classical logic (notwithstanding the occasional efforts of thought police to lay out well-defined necessary and sufficient conditions for category inclusion and exclusion). ‘Isms’ are best viewed as fuzzy sets with porous, shifting boundaries – and as organized around prototypes. This means that although it is easy at any given juncture in history to design a prototypic ‘ismatic’ belief system (informed observers can rattle off with high interjudge agreement the positions, pro and con, that the prototypical ‘true believer’ should take), it is hard to say at what point one has added or subtracted enough features to or from the prototype that it no longer falls in its original category – and the liberal has become a conservative or vice versa (hence the frequent need for transition categories like ‘neoconservatives’ and ‘neoliberals’).

Political psychologists have a long-standing interest in how communities

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of cobelievers define the boundaries of the thinkable and where they set their thresholds for issuing fatwas, excommunicating deviants, excluding former participants from coalitions, or just shunning someone at a cocktail party. Our starting point is Tetlock's sacred value protection model (SVPM),¹ which takes as its starting point an undeniable fact of political life: the tendency of like-minded souls to coalesce into communities of cobelievers dedicated to defending and advancing shared values. The SVPM posits that cobelievers seek reassurance from each other that their beliefs are not mere social conventions but rather are anchored in backstop or sacred values beyond challenge. These values can be as diverse as the causes around which human beings cluster: in pro-life communities, it would be bizarre to challenge the sacred mission of saving the unborn; in libertarian communities, it would be bizarre to challenge the sacred status of property rights; and in scientific communities or groups relying on scientific expertise, it would be bizarre to challenge the notion that assertions about nature can be tested objectively (within a range of uncertainty) and deep truths revealed. Those foolish enough to ask why sacred values are so special – what is wrong with stem cell research or faking data or redistributive taxation? – reveal themselves to be dim-witted or ill-intentioned outsiders who just don't get it.

Here it is worth pausing to note that our topic at hand – elite environmentalist organizations – already poses a special challenge to our analytic framework. Insofar as these organizations attach a

sacred status to both moral values, such as a commitment to be good custodians of the planet for the sake of future generations, and scientific values, such as a commitment to abandoning preconceptions about what constitutes good custodianship in response to dissonant evidence, these organizations inevitably straddle the boundaries of politics, science, and increasingly religion. Straddlers, so defined, are especially vulnerable to the most psychologically painful type of value conflict – that between competing sacred values. The canonical dilemmas are those in which either fidelity to scientific norms requires acknowledging evidence that undercuts a policy stance one prefers on moral grounds, or fidelity to moral-political objectives requires ignoring or discounting evidence that one knows has probative scientific value. Hypothetical examples of the former dilemma might be: 'I detest the nuclear power industry but increasingly see it as a key part of the solution to global warming,' or 'I find emissions trading ethically distasteful but must admit that it seems to work quite well.' Examples of the latter might be: 'If I acknowledge this flaw in these computer models of global climate, critics will seize on it to stall even more,' or 'If I concede that this geoengineering proposal has merit, it opens the door to a wave of far more dangerous schemes.'

These sources of ambivalence complicate applying the SVPM, for it is much easier to predict the behavior of individuals and organizations not torn by clashing sacred values – those with no complications about suppressing inconvenient facts or about inventing convenient ones.

With these caveats, we push forward. Drawing on a long list of social scientists over the past century, especially Emile Durkheim, the SVPM identifies two typ-

1 P. E. Tetlock, "Social-Functionalist Frameworks for Judgment and Choice: The Intuitive Politician, Theologian, and Prosecutor," *Psychological Review* 109 (2002): 451 – 472.

ical methods that moral communities use to defend sacred values: moral outrage and moral cleansing. The model also identifies a powerful class of variables capable of modulating moralistic responses: real-world constraints.

The model defines moral outrage as an aversive arousal state, with cognitive, affective, and behavioral components: harsh trait attributions to norm violators, anger and contempt aimed at them, and enthusiastic support for thought police charged with enforcing both norms and the meta-norm of punishing those who fail to punish norm violators. It is worth stressing that the model predicts sharp reactions against even those caught contemplating taboo trade-offs or contaminated compromises. The psycho-logic here is that of ‘constitutive incommensurability’: our commitments to other people require us to deny that certain things are comparable (e.g., valuing lives in dollars). Constitutive incommensurability arises whenever treating a value as commensurable subverts one of the values in the trade-off calculus. In this sense, taboo trade-offs are morally corrosive. The longer observers believe that a decision maker has contemplated an indecent proposal, the harsher their assessments of that person’s character, even if that person ultimately comes around and makes the right choice and affirms the sacred value.

Moral cleansing is identity repair, efforts by those who feel contaminated by psychological proximity to norm violations to persuade in-group members not to direct moral outrage at them. For instance, the closer one’s working relationship with a norm violator, the greater one’s need will be to engage in symbolic acts of moral cleansing that reaffirm one’s solidarity with the moral community. In the antique language of psychoanalysis, one overcompensates

by becoming a superpatriot or a super-environmentalist. As with moral outrage, moral cleansing can be triggered by merely seriously entertaining taboo trade-offs, even if one ultimately returns to the ideological fold and ‘does the right thing.’

The SVPM accepts that people are often sincere when they express moral outrage and engage in moral cleansing. But the model also portrays a delicate mental balancing act. People regularly run into decision problems in which the costs of upholding sacred values become very steep – arguably prohibitive. If parents dedicated their net worth to reducing to a probability of zero all threats to their children’s safety, for example, they would rapidly impoverish themselves. Likewise, a society committed to guaranteeing state-of-the-art health care for all citizens would soon devote an unacceptable proportion of its GDP to the project. The model predicts that when there is no pressure to confront secular-sacred trade-offs, people and political movements will adopt the low-mental-effort solution of accepting their own side’s no-trade-off rhetoric at face value. Such low-effort options are easiest to deploy in the political sphere when one’s movement is in an oppositional role (as environmentalists mostly feel they have been during the Bush administration) and has no responsibility for making policy.² However, trade-off denial is not an option when one is compelled to develop and advance politically viable solutions, not just denounce the solutions proposed by others.

2 P. E. Tetlock, K. Hannum, and P. Micheletti, “Stability and Change in Senatorial Debate: Testing the Cognitive Versus Rhetorical Style Hypotheses,” *Journal of Personality and Social Psychology: Attitudes and Social Cognition* 46 (1984): 979 – 990.

Having laid our framework, we now explore the potential utility and limitations of this model for understanding the evolution of policy stands of environmentalist organizations in the United States over the last twenty-five years. Our approach is of necessity largely anecdotal, and based mostly on the experiences of one of us (Oppenheimer) as a professional environmentalist between 1981 and 2001 – as well as an observer of environmental policy and occasional advocate up to the present. The subjective and impressionistic nature of our approach underscores the relative scarcity of academic literature analyzing the structure, *modus operandi*, funding, and motivations of U.S. environmental organizations and individual environmental activists, a shortcoming that cries out to be rectified, given the current centrality of ‘green’ politics. We hope this essay will encourage others to dig into the extensive archival material available and to interview key participants in the debates.

Our overview of how several controversies have played out in the environmental community and larger political arena underscores how hard it is to fit any one-size-fits-all theoretical model. Terms that theorists casually bandy about have sharply contested meanings in the real world. For instance, ‘taboo’ proves to be a *Rashomon* concept, connoting principle and resolve to those determined to defend the boundaries of the thinkable, and rigidity and dogmatism to those determined to cross the boundary. Whose definition prevails in the battle for public opinion and political-regulatory favor determines whose policy agenda prevails.

Here we consider four examples of how this political-psychological tug-of-war has unfolded in environmental policy debates: the disposition of the Arc-

tic National Wildlife Refuge (ANWR), nuclear power, emissions trading, and geoengineering of the climate. In each case, we identify how the most ardent environmental organizations have defined the issue as a matter of principle (What are the sacred values at stake? What options should be considered taboo?) and examine how successful these organizations have been in mobilizing uniformly solid opposition to policy options that threaten to breach the principle/taboo boundary: Were there ever – or are there now – significant dissenters within the environmentalist community? Were these dissenters the targets of moral outrage? Did those linked to the dissenters feel the need to engage in moral cleansing? In each case, we also pose questions viewed as taboo by morally resolute boundary defenders but as mandatory by those who see environmentalism as the application of the analytical tools of science to public policy. The recurring identity-defining questions will be: What would change your mind? How far would the generalized cost-benefit calculus need to tip for you to modify or even abandon your policy positions?

Legally protected since 1960, the Arctic National Wildlife Refuge (ANWR) occupies the far northeast corner of Alaska, running from the Arctic Ocean south across the Brooks Range into the Yukon Valley. It has been referred to (not uniquely) as America’s Serengeti because of the annual caribou migration that passes through, in addition to the grizzly bears, wolves, and other resident fauna, an appellation that neatly sums up its iconic status.

With the convergence of two oil supply crises in the 1970s and the consideration of the Alaska Lands Act to determine disposition of hundreds of millions

of acres of land among federal, state, and Native American governance as a delayed consequence of Alaska statehood, the issue of whether to allow drilling for oil in the area became pointed. Distrust of the environmental reliability and fiscal probity of oil companies, who were already developing a pipeline and drilling complex to the west at Prudhoe Bay, ran high. Views on native rights sometimes conflicted, with some based on sacred views of the land and others on financial interest in drilling. The U.S. environmental movement became committed to opposing drilling entirely (Oppenheimer visited the area in 1975 and testified in Congress in favor of leaving it pristine, a position he maintains today), and the final legislation forbade drilling without further permission from Congress. Such permission, fought over sporadically for thirty years, has never been granted, as environmental opposition has remained steadfast.

Among the cases we examine, ANWR is the only one in which a taboo seems to have functioned as a nearly absolute bar to repositioning. How have environmentalists managed to be so successful in holding the taboo line on ANWR? We see a number of possibilities. First, the attack has not been nearly as ferocious as it could have been if the oil industry itself had been more committed to prevailing. The industry is worried about drilling costs, and the bad publicity and legal liabilities that would attach to accidents – and may well perceive other drilling opportunities as more profitable investments. To some degree, the political fight over ANWR may be a diversionary maneuver while these firms attempt to gain access to other, less noticed reserves. Second, the remoteness of ANWR may paradoxically add to ANWR's allure and iconic status as untouched natural land. From

one point of view, its remoteness means that the vast majority of Americans will never visit it, and many may never have heard of it. But the success in protecting the ANWR region over thirty years has reinforced its uniqueness, made it more renowned as a special place, and strengthened the utility of taboo as a political gambit.

Although trade-offs have been discussed, such as bartering permission to drill in ANWR for agreement to increase the stringency of Corporate Average Fuel Economy Standards for motor vehicles, it is unclear whether these discussions ever came close to being a serious 'deal.' For one thing, the deal would not have been a simple trade-off: those who might benefit directly from drilling (oil companies) are not the same group as those who might suffer from an increase in fuel-economy stringency (auto companies and their workers). Yet a third group, environmentalists and those they represent, would lose from drilling but gain from increased stringency on fuel economy, but different constituencies within the movement might see the gains and losses differently. Such compromises are not easily arranged. Furthermore, the total reserves in the Refuge correspond to only about six months of U.S. consumption, which, even if economically recoverable, is equivalent to an amount of consumption that could be avoided by a small increment in vehicle fuel economy without any trade-off (making the trade-off look superficial).

To gauge how robust this – or any other taboo – has become, one needs to subject it to counterfactual stress testing and explore the willingness of respondents to change their minds in response to increasingly tough hypothetical arguments: for example, if oil companies could reduce the likelihood

of significant spills to zero; if the value of reserves exceeded five or more years' worth of consumption; or if excess profits could be used in part to compensate local communities or to protect endangered species elsewhere.

A more directly relevant hypothetical would be trading complete protection of a large, imminently threatened area of Arctic wilderness (the Kamchatka Peninsula, for example) for permission to drill in ANWR. It is unclear what transnational entity would have such power, but assuming it existed, the willingness of the environmental community to entertain such a trade would still be highly doubtful.

The most resolute antiutilitarian defender of the taboo would be a respondent who refuses to participate on the ground that the questioning process is morally corrosive (to compare is to destroy): a process akin to asking how much money it would take to sell your children to slave traders. The next level down would be those who insist that there is no remotely plausible cost-benefit calculus that would change their minds. The next levels down now put us on a potentially slippery-slope continuum of affixing increasingly plausible numerical values to questions that open the door – to varying degrees under varying contingencies – to compromise. These latter respondents may pride themselves for their pragmatism but risk the moral wrath of the taboo defenders should the bar on ANWR development ever come under serious political threat.

The pros and cons of nuclear power have been discussed at great length elsewhere, and we shall not repeat them in detail. On the 'pro' side are electricity production free of direct emission of air pollution and greenhouse gases, and rel-

atively low operating costs. On the 'con' side are the threat of radiation releases (and resulting cancer incidence) during mining and transport of fuel and plant operation (including core meltdown); no implemented plan for long-term waste disposal; possible diversion of wastes for weapons production; targeting of plants by terrorists; and in the United States, high cost of construction despite various subsidies. Accidents at Three Mile Island and Chernobyl – and since then, the continual stories of leaks at aging plants – have kept public concern at the level where a majority in the United States do not want one built in their neighborhood. Yet nuclear power delivers 20 percent of U.S. electricity, recently renovated plants have been operating smoothly and efficiently, and some countries have had a fairly good record of safety and efficiency, if not a solution to the waste-storage issue.

Perhaps more than any other example, nuclear power is an issue that carries iconic status on both sides. In contrast to the skepticism expressed by many environmentalists, the 'other side' poses support for nuclear power as a litmus test of environmentalists' seriousness about clean energy, and attempts to position opponents as Luddites: 'You want to reduce carbon dioxide emissions? If you are serious, rather than just an enemy of electric power companies, economic growth, and progress for humanity, surely you must support nuclear power, or at least be willing to contemplate it as a serious part of solving the problem.' Substitute acid rain or air pollution for carbon dioxide (or the desire to avoid building hydropower dams on iconic rivers like the Colorado), and you have the raw outlines of a conversation going back many decades. In fact, many of these conversations seem to have less to do with specific electric-power options

as they do with symbolism, as in: 'Are you man enough to accept nuclear power?' Such rhetorical gambits have probably only intensified the polarization.

Meanwhile, many environmentalists see nuclear power as a symptom of mega-project-itis: a bloated, highly subsidized (through public-research funding and limits on liability for accidents), unnecessarily centralized way to generate power, attention to which deflects political and financial resources from lower-impact, distributed technologies that increase efficiency and employ renewable options, like solar power.

Are environmentalists in fact willing to countenance relaxation of the apparent taboo without exiling those guilty of doing so? Here the record is less clear. Recently, some environmental leaders have indicated a willingness to reconsider the movement's near-total aversion to nuclear power;³ and while this arguably new stance has elicited criticism for 'going soft,' in fact the same groups still work together at about the same level of cooperation (and sometimes lack thereof) on the same issues as they did previously. Although there have been skepticism and annoyance over the perceived taboo violations, there is little evidence of either ostracism or a perceived need for moral cleansing. Of course, the 'reconsideration' may be little more than a repositioning to divert, deflect, or transcend the 'manliness' argument, and opponents of altering the view may read it as such, reducing their need to ostracize.

In any event, the repositioning was part of the first steps in wheeling-and-dealing over climate-change legislation, providing a real-life test of just how taboo nuclear power is: despite the apparent shift in attitude on the part of some

environmentalists, several senators reversed their support for global-warming legislation proposed by Senators McCain and Lieberman and voted against it due to the insertion of a provision encouraging nuclear power. But since the legislation had no chance of passage anyway, this outcome was more a visible way to take a shot across the bow, rather than a firm, final position. However, it is expected that the issue will be revived again over the next two years because the chances of successful federal legislation have increased. Then the trade-offs involved in supporting the building of new nuclear plants (using existing technology) to reduce carbon-dioxide emissions may become quite pointed because the problems with nuclear power that provide the rational basis for taboo remain.

Theoretical solutions to all the technical problems of nuclear power abound; whether they can be implemented at a cost competitive with other carbon-free options is an unanswered question. Until it is answered, the question of whether the taboo is absolutely applicable to all nuclear technology, or just the current versions, will remain hypothetical. Rather, the skirmish in the political arena may be over whether an arguably faulty and expensive technology with little immediate prospect for expansion is worth further subsidy and other inducements to get controls on greenhouse-gas emissions.

The question of whether an 'irrational' taboo is at work may be buried under layers of plausible argument and counterargument. The only way we know to answer the question is via systematic counterfactual stress testing. The nuclear industry argues that it can build reactors that produce very low levels of waste that can be safely disposed of, and that entail no significant poten-

3 See "Old Foes Soften to New Reactors," *The New York Times*, May 15, 2005.

tial for attack or diversion for production of weapons. If all this could be accomplished at a cost competitive with other sources, would – and should – a majority of opponents relent? The sign of a taboo – in something resembling the original anthropological sense of the term (unconditional disgust unmediated by reason) – is a categorical ‘no,’ coupled with deep annoyance that you would even ask the question.

After remaining buried in the economic literature for decades with scant attention paid to it in the policy arena, the idea of controlling pollution by distributing free or through auction a limited number of rights-to-pollute (called emissions allowances), which could be traded as commodities, was implemented on a large scale in the 1990 Clean Air Act Amendments. The triggering event was the emergence of bipartisan consensus on the need to reduce acid rain. And the outstanding success of the program in reducing pollution at much lower cost than command-and-control approaches that mandate particular technologies has led to its being labeled the favored means to limit emissions of the greenhouse gases, both in the United States (assuming such a program will be implemented at the federal level) and in Europe (where it is currently in use to implement the Kyoto Protocol).

But the early history of emissions trading was marked by controversy, and many critics remain. Its initial rejection in some quarters as a proposed solution to the acid-rain problem reflected numerous concerns, including: that the creation of a property right and a market in pollution amounted to letting polluters buy their way out of an obligation, posing an ethical issue involving potential inequities; that trading would result in a geographic distribution of pollution

reductions dependent on an economic calculus rather than environmental targets; that the ability of electric utilities to switch to low-sulfur-content coal under a trading system would shift the distribution of employment in the coal-mining industry; and that the entire system of accounting for emissions reductions and trading was too complex and would allow gaming, lessening the actual emissions reduction obtained.

One environmental group, the Environmental Defense Fund (now named Environmental Defense), took an aggressive pro-trading stance, to the displeasure of most of its colleagues in the movement. Many of the latter never fully embraced the system and stood aside from taking a position on the draft legislation, of which they otherwise approved, because of the presence of this feature (and its potential side effects, noted above). Years later, when the effectiveness of the trading system was beyond dispute, some environmentalists made a point of emphasizing (correctly) that the concomitant costs savings were partly attributable to reductions in rail rates for shipping coal, not the inherent efficiency of trading.

But despite considerable opprobrium (low to moderate moral outrage), it would go too far to assert that Environmental Defense was ostracized. Support for trading began a long series of disputes between those in the advocacy community that supported flexible, incentive-based approaches to regulation and those who preferred command-and-control regulation. These disputes are still evolving, and today center on the global-warming problem. Some individuals and organizations attacked pro-trading groups directly, while others wriggled uncomfortably on the sidelines, occasionally indulging in acts that may fit the description of moral cleans-

ing. The attacks were often not for supporting trading per se but for other perceived wrongdoing involving issues of procedure within the environmental coalition. But the substantive differences over trading aggravated these controversies. Despite such stresses and strains, cooperation in the community has remained the dominant mode and no group has been banished for support of emissions trading.

On the other hand, many of those opposed to trading have softened their positions in response to, first, the reality of the effectiveness of the acid-rain program as a regulatory scheme and, second, the political and economic reality of the efficacy of trading. In the first category fall certain environmental organizations that either opposed or remained neutral with respect to the trading elements of Title IV of the 1990 Clean Air Act Amendments. Some of these soon gave the highest compliment to the originators of Title IV, including Environmental Defense, by claiming partial credit for its design once its success was clear. An example of the second case is the European Union (and some environmentalists therein), which originally opposed designing implementation of the Kyoto Protocol around an emissions-trading system. Nevertheless, the agreement reached in 1997 embodied the trading framework with a structure generally following the lines of the U.S. proposal. The EU, having grudgingly ceded to the United States on this point, and then, along with other Kyoto parties, suffered the rebuff of U.S. withdrawal from the Kyoto process in 2001, nonetheless maintained emissions trading as a key means for implementing the Protocol. The intervening four years had seen too much negotiation on the details of the system to countenance ripping it up and starting over, and some non-EU parties

were already positively disposed toward trading. The period also provided governments with the opportunity to learn more about the efficacy of trading. Furthermore, many in the EU retained a belief in the possibility of reengaging the United States even before the end of the Bush administration. Consequently, the EU proceeded to become the world's leading experimenter in trading greenhouse-gas allowances and, ironically, is now a strong proponent of this approach while the United States stands aside (for the moment). Thus, the taboo has become the accepted practice.

Emissions trading still engenders argument but less over its ethical basis and more over its consequences in specific applications. Mercury emissions from coal-burning electric power plants provide a case in point. Mercury is a neurotoxin with no known dose threshold for causing damage, particularly in fetuses. The Bush administration proposed to control mercury emissions with a trading system that would inevitably create disparities in emissions reduced at one location versus another, and therefore in human exposure (in contrast to carbon dioxide, which becomes globally uniform after emission, or to acid-causing emissions, for which a separate set of regulations limits local exposure and from which no significant geographic 'hot spots' of acid rain have been produced by the trading program). The reaction was immediate and uniformly negative in the environmental community. If there were supporters of this approach among trading proponents, they kept their counsel.

This episode underscores at least one strong, and arguably rational, basis for the taboo in specific instances: trading can result in dramatic inequities in local impacts. So the idea of trading aggravated a long-standing dispute between lo-

cal environmental groups (sometimes unfairly and derisively called ‘NIMBY’ groups, i.e., Not in My Back Yard), who focus on local pollution, and the national, professionalized groups, who often see issues through the prism of national or global environmental consequences. For the latter groups, obtaining larger overall cuts in pollution appeared at times to take precedence over these local concerns. It is fair to say that the sensitivity of the national groups has substantially increased after a considerable drubbing by the locals, who brought pressure to bear on the nationals through the media and also via funders such as foundations. Risking the death of a small number of identifiable people, usually poor, for the greater statistical good was just not a viable position for a movement that draws a substantial part of its membership and support from egalitarian progressives – and is often accused of reflecting the tastes and preferences of affluent professionals. In effect, ignoring equity concerns became a new and effectively enforced taboo – as we can now see by the uniform response in the case of mercury.

It is worth reconnoitering the ever-shifting boundaries of the thinkable. Assuming no local inequities, would opponents of trading accept it if all permits were auctioned, eliminating the onus created by a seemingly free ‘right to pollute’ that is established when they are distributed to polluters (e.g., power companies), as they largely were under the acid-rain program? And, assuming local inequities cannot be brought down to zero, would sufficient compensation to local communities alleviate the disparate impacts that would occur in the case of a pollutant, like mercury, with local impacts? Although it seems plausible that the former proposal would gain some adherents (especially considering

the expected returns to the government from the auctions), the latter proposal raises issues related to monetizing life – one of the most taboo subjects of all.

A very current example is provided by proposals to geoengineer the climate in response to the threat of global warming. The idea here is to take action to oppose the effect of the buildup of greenhouse gases by implementing measures that would either remove the warming gases, e.g., carbon dioxide, from the atmosphere after emission, or alter the Earth system so as to reduce sunlight sufficiently to negate the warming. An example is a proposal to loft particles that reflect sunlight high in the atmosphere in sufficient quantity to cancel the increasing greenhouse effect.

There are many good reasons to oppose such approaches without resort to stigmatizing them altogether as taboo. Many are arguably more costly than measures to reduce emissions and avoid much of the warming in the first place. They raise complex political issues because any country could effectively decide to geoengineer everyone’s climate unilaterally. Finally, and most salient, many or all such proposals entail potential side effects that could in the end rival the consequences of warming. For example, reflecting particles could add to the damage of the ozone layer, and would do nothing to reverse acidification of the oceans by dissolved carbon dioxide. Furthermore, such geoengineering only masks warming, and should the approach become unsustainable, a large greenhouse-gas buildup, and accompanying warming, would be revealed.

It is not just the ability to cite such consequences but the expectation of *unintended* consequences that troubles opponents. After all, such proposals are effectively experiments on the whole

Earth system, and uncertainties in predicting how the system would respond are vast.

But beyond this point, and drawing strength from it, lies a principle that many environmentalists and scientists adhere to: it is simply wrong to fix one environmental problem by increasing the risk of another. It is better to relieve the prime causes (e.g., fossil-fuel combustion and deforestation) than to apply massive engineering techniques with uncertain outcomes. Some also fear that the very existence of a last-resort option would reduce pressure to remediate emissions. It is this principle that has placed geoengineering into the nearly taboo category, relegated to slender consideration over at least twenty-five years in voluminous analyses of how to solve the climate problem. The recent publication of a special issue of the journal *Climatic Change* dedicated to papers on geoengineering was accompanied by an unusual advance campaign to deflect the inevitable criticism and shield the scientists publishing the papers from collegial abuse.

Yet the uneasy feeling that countries could postpone action on greenhouse gases long enough to make emergency engineering measures necessary to avoid draconian consequences (like complete meltdown of the Greenland ice sheet) provides a strong rationale for at least allowing theoretical research to proceed. The issue of whether to allow or encourage small-scale demonstration experiments is much more controversial.

One could argue that the perception of a rapidly changing climate has already allowed reality to lessen the taboo. Nevertheless, geoengineering is likely to remain a more or less taboo subject, at least in the sense of marginalization compared to other remedies, unless a consequence-free approach is compel-

lingly presented or the climate does indeed get out of control.

To tease apart the relative importance of the various reasons for opposing geoengineering, consider two tests of the limits of this taboo: First, if our knowledge changed suddenly and it became apparent that Earth were headed into an ice age, would we entertain ways, such as speeding up greenhouse-gas emissions, to maintain the stable global climate of the last several millennia? Second, would geoengineering be an appropriate response to natural warming, were the latter shown to be large, life-threatening, and imminent?

The environmental movement represents a complex amalgam of ideas, interests, and styles of thinking. Some environmentalists (and environmental organizations) have a clear commitment to the scientific method – and they feel that the scientific norm of falsification requires them to view a broad range of their beliefs as testable hypotheses. The inability to answer the question, ‘What would it take to convince you that you are mistaken?’ would be a source of professional discomfort. The thought experiments with which we end each section are the types of questions that such advocates would likely be willing to entertain. At the other end of the epistemic continuum, some organizations may be caricatured as displaying a quasi-religious devotion to protecting natural systems. Some of the thought experiments with which we close each section are, quite literally, unthinkable – and those who ‘play the game’ do not understand the moral stakes. Yet within such organizations are cleavages on how to approach particular issues. Many ‘expert’ groups have several dyed-in-the-wool values-based staff members, and some staffers at values-driven organizations

are devoted to a science-based approach. Even the views and approaches of individual environmentalists shift from issue to issue, with greater or less focus on science versus other values.

From a scientific point of view, the rigorous articulation of a belief system – with airtight partitioning of facts and values, crystal-clear specification of trade-off functions, and candid acknowledgement of what would count as falsifying evidence – is an unalloyed (if often unattainable) good. But it would unfairly handicap environmentalists to hold them to burdensome standards of introspective rigor that no other political movement accepts. What are the limits that attach to willingness to acknowledge trade-offs between one's epistemic commitments to objectivity and one's moral-political commitments to like-minded souls struggling for causes one deems just? We suspect that the short-term challenges of policy campaigning require sweeping such nettlesome trade-offs under the rhetorical rug, but the long-term challenges of governance ultimately require thinking more deeply about how we think.

We again stress the exploratory nature of our survey of the boundaries separating the 'thinkable' from the 'unthinkable.' But our modest effort has brought to light serious complications that we hope future, more systematic efforts will address. On one hand, we discover what seem to be strong pockets of taboo cognition – policy domains in which even speculative forms of cost-benefit analysis (would you change your mind if ...?) are likely to provoke sharp resistance. On the other, we discover numerous exceptions and qualifications. It requires more presumptuousness than we can muster to label strong policy positions as examples of taboo cognition when the defenders of these positions can gener-

ate reasonable scientific and economic objections that cannot be reduced to an emotive 'ugh' reaction. (Distinguishing reasons from rationalizations is a deep problem with which social psychologists have wrestled for many decades.) And, even if we had a surefire method of identifying true cases of taboo cognition, it strikes us as unfair to characterize an entire school of thought as upholding a taboo when there is as much diversity within and between organizations and individuals as we find among environmental organizations.

The core complication may well be that taboos are hard to maintain in any community of cobelievers in which the funding sources are as diverse as those for environmental organizations. Each has its own culture, preferred issues, and specialized approaches to solving them. Donors, be they foundations or individuals, can shift support from one to another, making enforcement of a monolithic party line difficult, if not impossible. Such diversity can be viewed as both political weakness and strength. It is a weakness inasmuch as concerted cooperation is necessary to pull together minimum winning coalitions in competitions for power in democratic politics. And it is a strength inasmuch as diversity signals a degree of openness to debate and compromise within at least portions of the environmental community. This very American combination of characteristics leads us to suspect that the 'boundaries of the thinkable' among environmentalists will be subject to frequent challenges in the twenty-first century – challenges driven by technological innovations, economic pressures, shifting political alignments, and new data on the fragility or robustness of the complex natural systems that make life possible on this odd planet on the outskirts of the Milky Way.

Margaret Schabas

Nature does nothing in vain

Man alone among living things knows that he has evolved. Man alone is able to decide what direction or directions he desires his own future evolution to follow, and can set about acquiring the knowledge he needs to achieve the desired results.

– Thomas Goudge, *Ascent of Life*

According to recent scientific findings, we are responsible for the elimination of three species every hour, a rate approaching that holocaust of species associated with the age of dinosaurs.¹ Secretary General of the United Nations Ban Ki Moon recently declared that “the global response to these challenges [of biodiversity] needs to move much more rapidly.”² But even if we could significantly reduce gas emissions and put a halt to global warming, biodiversity is

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likely to continue declining. It takes on average a million years for a species to branch off and distinguish itself; no new phyla have surfaced for over one hundred million years. Our phenomenological experience of biodiversity is thus almost exclusively one of decreasing numbers. Where Darwin once saw an entangled riverbank teeming with life, our vision of the earth’s future landscape is as desolate as the moon.

But perhaps such worries are unwarranted? Insofar as evolutionary theory commits us to some degree of interspecific competition, it seems counterproductive to preserve and prolong the life of each and every species. Who is to say that two million species is not preferable to twenty? Moreover, why not strive to preserve variation within a specific species, especially given that the taxonomic units themselves are so contested? Since subspecies are potential species, perhaps our attention is better placed there.

Numbers aside, there are many arguments in favor of preserving, if not enhancing, biodiversity. Some are consequentialist, appealing to values instru-

1 I wish to thank the following for comments and criticisms (with the usual disclaimer): Emma Spary, Loïc Charles, Staffan Müller-Wille, Lorraine Daston, and John Beatty.

2 *International Herald Tribune*, May 23, 2007.

mental to the welfare of *Homo sapiens*, such as the medical potential of tropical plants. Other arguments are deontic, appealing to intrinsic values, such as the beauty of the wilderness or the sanctity of life. None are entirely persuasive, however, for the simple reason that they assume we can, in some meaningful sense, alter the pace of the evolutionary process and thus ensure greater longevity either for humans or for other species. Implicit in these arguments is the belief that we can step outside of a realm called 'Nature': that human agency can be partitioned and treated as a separate sphere that does not follow the same deterministic chains found in the biological realm.

My objective here is to make sense of that assumption, and to take an approach quite different from those who subscribe to the movement known as deep ecology. While deep ecologists wish to level man with nature and to steer us away from anthropocentric values, they overlook the fact that their concept of nature is itself replete with social concepts that are in turn steeped in natural discourse. To put it another way, what remains underexamined is the sense in which ecology itself embodies a complicated amalgam of the social and the natural.

'Nature' has long held the promise of a realm separate from human influence. To commune with 'nature' mandates just such a distinction. A sharp contrast could be drawn between the lush vegetation of the Jamaican forest and the cement buildings of the South Bronx. But just as the cement harks from bauxite mines found in the Jamaican interior, the nearby forest receives rain laced with acid from distant cement factories. There is, arguably, no place in the sub-lunar region immune from human agency. As Bruno Latour provocatively re-

marked, the ozone layer is a political object.

Any effort to single out what is meant by 'nature,' let alone demarcate its part in 'the environment' is most likely futile. 'Nature,' as David Hume warned us in 1740, is one of the most ambiguous and equivocal words in the English language. It is the repository of anything and everything. But one possible means to acquire at least a feeble hold on its set of meanings is to look at distinctions drawn by specific sciences and to examine them as they have evolved over time. We have perhaps no other means of access, since we lack the view from nowhere and must thus be content with our own contingent historical reach. So let me propose here, for the sake of argument, that the 'natural realm' be understood as the sum of physical phenomena studied by natural scientists at a given point in time. Let me contrast this with the 'social realm,' taken to be the sum of social phenomena as studied by social scientists.

What I will argue, from my standpoint as a historian and philosopher of science, is that the natural and social realms were much more closely conjoined in scientific discourse a couple of centuries back; hence, the separate domains that currently exist are of relatively recent origin. Furthermore, insofar as these two realms – the natural and the social – have become increasingly distinct and disentangled, at least at the conceptual level, I will propose that if we can 'step out of nature' and alter the rate of extinction, the motivation for this will come from our understanding of the social realm.

The case for distinct sciences goes back at least to Aristotle, who argued that the observable features of our world could be partitioned into distinct clusters,

plants, stars, etc. Approaching environmental studies with Aristotelian eyes already creates confusion, since the phenomena are part natural, part social. Even if one were to take a very simplistic definition of nature – that nature is what is left over after one subtracts human agency – the latter itself is part natural and part social. One central challenge for environmental studies, then, is to sort out what it means to view us partly as biological creatures, one species among many, and partly as social creatures bent on enhancing our welfare. Since the boundary between the natural and the social has a history that possesses a range of meanings – some contradictory – we must negotiate the distinction between us as objects and as agents. It is not self-evident.

The study of biodiversity, or ecology more generally, tends to fall under the purview of natural scientists. Yet the very term *ecology* bears witness to the conflation of the natural and the social. In 1866 Ernst Haeckel coined *oecologie* to replace the *oeconomy of nature*, a term that gained currency in the latter half of the seventeenth century and received considerable enrichment in the hands of Carl Linnaeus, Charles Lyell, and Charles Darwin. The term *oeconomia*, as expounded upon by Xenophon and Aristotle, pertained to the wise management of a household and, at its broadest reach, the doctrine of virtue ethics. And while commerce and trade were extensive in antiquity, and their analysis subsumed under discussions of household management, there was no concept of an economy per se. In the early modern period, economic discourse shifted focus to the crown as steward of a national or provincial household. Frugality, foresight, and prudence were the traits to cultivate in place of the prodigality and impetuosity of medieval princes. Still, it did not

correspond to what we commonly call ‘the economy’ at present: a separate human arena for the production, distribution, and consumption of goods and services. Instead, *oeconomia* also came to denote order more generally. The term was used in a variety of contexts in the eighteenth century: the animal oeconomy, the oeconomy of the body, even the oeconomy of the stars.

The oeconomy of nature treated God as the supreme director, planner, and provider of nature’s larder. In his popular tract *Oeconomia naturae* (1749), Linnaeus attended to the proportions of predator to prey, taking into account rates of propagation, distribution, and longevity. God had established perfect ratios across the entire organic realm, thus ensuring the provision of food for each of his offspring. Supply met demand and the market cleared, so to speak. Nevertheless, a wide array of hazards, such as an earthquake or a particularly dry season, could disrupt the balance. Linnaeus thus formulated more elaborate mechanisms to restore equilibrium, appealing to insects to expand their numbers and swoop in, like police, to restore law and order.

Until Linnaeus, the term *oeconomia* was mostly employed in the Aristotelian sense of household management. Linnaeus was the first to offer a nascent concept of an economy, of multiple producers and consumers in a state of exchange such that ends and means were aligned. Linnaeus’s oeconomy of nature included not only plants and animals (including humans), but also the earth’s crust and atmosphere, since organisms decay and excrete vapors. His account devised an early version of the hydrological cycle. It had been a given since antiquity that matter (the four elements), while constantly in flux, was conserved within the sublunar region. Linnaeus

brought additional order to this totality by embedding organisms in an intricate system of exchange and equilibrium: “We see Nature resemble a well-regulated state in which every individual has his proper employment and subsistence, and a proper gradation of offices and officers is appointed to correct and restrain every detrimental excess.”

Although Linnaeus subscribed to the Biblical account of creation, he attempted to fill in more of the story whereby long ago the individual pairs of each species had multiplied, migrated, and distributed themselves around the globe. In his view, the oeconomy of nature was completely full of life, with no waste or void. Needless to say, God would not tolerate the extinction of any one of his creations, nor admit of novelty, since this would imply that the original plan was less than perfect. Goethe, while director of the *Finanzverwaltung* for Weimar in the 1770s, echoed such sentiments when he declared that “nature is the perfect oeconomy.” She did not waste her currency nor act in vain.

Charles Lyell, writing in the early 1830s and in full possession of the concept of extinction, was far more inclined to see imperfection in the oeconomy of nature. His equilibrium was a dynamical one, and he identified a much longer list of mechanisms that restored a balance. Geological depositions or volcanic eruptions necessarily meant both the migration of organisms and ongoing extinction, which in turn, he speculated, meant that new species were forged to fill the gaps. Still, Lyell adhered to a belief in a fixed quantity of life and thus believed that the entry and exit of species sustained a balance.

Darwin’s *Origin of Species* (1859) is replete with references to the oeconomy of nature, and his intellectual debts to Linnaeus and Lyell on this are explicit and

well documented. But the term acquired a new and significant set of meanings. Darwin discerned that speciation meant that the aggregate quantity of life could increase, as distinct varieties came to seize upon unoccupied stations in the oeconomy. Darwin supported this insight with an experiment. Taking two equal plots of land – one planted with one grass, the other with distinct genera of grasses – he found that the harvest yielded a much greater biomass in the latter case, suggesting that nature was not a zero-sum game. Frequent extinctions also implied that nature was not full. Diversification meant that human populations could grow in tandem with other organisms, not in spite of them. There were, in short, gains from trade such that the oeconomy of nature could expand indefinitely.

Haeckel’s clever move to cover up the economic roots of this discourse ran its course. With the advent of game theoretical models, ecologists are rediscovering their economic heritage. They now model foraging behavior as a market, complete with an interest rate. Similarly, economists are embracing their biological roots, not just in the form of mainstream environmental economics or the more dissenting eco-economics, but also with game theoretic accounts that employ evolutionary models.

Economics thus comes in the back door as well as the front. It is critical to the understanding of ecology as a mode of inquiry, not only because nature itself is understood in terms of efficiency and scarcity – an economy – but also because the trope of stewardship runs deeply through the discourse. Clearly, to sort out the role of human agency on the question of biodiversity is inherently an economic problem, if understood as the management of scarce resources between alternative ends. We

have become the stewards of nature, now itself understood more as a competitive marketplace than a storehouse. Yet another debate that brings in economics (and will not be expanded upon here) is over the very value or worth of nature taken as whole, an estimation that implicitly underwrites all of ecological theory.³

We have already seen that Linnaeus had a well-developed theory of an economy, arguably more thought-out than anyone else's at the time. He also wrote extensively on political economy and promoted its place in the Swedish universities and academies. In his eyes, economic welfare was inextricably linked to botany since only the proper management and hence knowledge of plants could free us from want, waste, or famine: "The pillar for all economics is to know the great economy of nature."

By the 1750s economic discourse was widely pursued; François Quesnay, David Hume, and Adam Smith were the three most prominent contributors. Each one had sustained interests in the natural sciences, and viewed economic theory as part of a more general search for natural regularities. Quesnay was explicit in his search for a natural order in the study of wealth. A renowned physician at Versailles, he contributed to metaphysics and physiology, notably a treatise entitled *Essai physique sur l'oeconomie animale* (1736). In the late 1750s, he forged a set of economic ideas that came to be known as physiocracy, or 'rule of nature.' His celebrated series of

tableau economique (1758 – 1767) exploited numerous physiological and mechanical analogies between the body politic and the human body, most famously the circulation of wealth that mimicked the circulation of blood. But his analysis went much beyond the level of analogical trade. Inspired by the iatromechanical ideas of Descartes and Borelli, the physiology of Boerhaave and Hales, and the metaphysics of Malebranche, physiocracy was self-consciously and explicitly a branch of natural philosophy.

More fundamentally, for Quesnay, only nature could produce wealth, via the gifts of rain, sunlight, and soil in the agrarian sector. For every seed planted in the spring we reap two in the fall. "We strictly owe the net product of the soil, to Providence, and to the beneficence of the Creator, to his rain that beats down and changes it to gold." Manufacturing, by contrast, was sterile. It merely transformed leather into shoes but produced no genuine wealth or net product.

As preposterous as this sounds to our ears, it contains a kernel of truth. To acquire genuine wealth as a species we must extract something from outside our sphere; and thus, to put it figuratively, it is only through nature's gifts that we can truly augment our physical wealth. The labor used to make shoes must in turn be fed, and that grain can only genuinely enhance our well-being if we, at the end of the day, get something from nothing. Quesnay himself expanded his sphere of nature's gifts to include mining, fishing, and lumbering. His thoughts on these sectors remained incomplete, but a charitable reading might permit his argument to segue toward the industrial era that lurked on the horizon.

The contributions to political economy by Hume and Smith are legendary, but less well known are their respective

*Nature does
nothing in
vain*

3 For an excellent overview of this question, see Matt Price, "Economics, Ecology, and the Value of Nature," in Lorraine Daston and Fernando Vidal, eds., *The Moral Authority of Nature* (Chicago: The University of Chicago Press, 2004), 182 – 206.

and sustained interests in natural history. Hume clearly knew the extant arguments regarding the adaptation of species for his *Dialogues Concerning Natural Religion* (drafted in the late 1740s), but he also injected these ideas into his essays on economic topics, his *Political Discourses* (1752). This is manifest in the broad temporal brushstrokes by which he paints the ebb and flow of wealth, its migration from one region to another, and in the emphasis on self-equilibrating mechanisms. Hume draws numerous analogies between economic phenomena and plants and animals, suggesting too that his mind, like Linnaeus, was prone to seeing these as part of one seamless web. He emphasized the migration of economic opportunity and maintained that the causal path was unidirectional. Once commerce has flourished in one region, it will necessarily decline due to high wages. The capital will flow to another region, and enhance commercial flourishing elsewhere.

Hume's economic essays are the first ones to portray us as one species among others. We are, he claims, more like apes than angels; our efforts to acquire wealth and our faculties of reason are not fundamentally different from that of other animals high up in the chain of being. There is evidence that Hume came under the sway of the protoevolutionary thought of the French savants Maupertuis, Tremblay, and Buffon, precisely as he was working on his economic essays. Certainly, and like so many of his contemporaries, he contemplated the salient fact of a much-expanded history to the earth.

Smith also read natural history for much of his career, and was particularly interested, starting in the 1740s, in the work of Linnaeus. His 1756 *Letter to the Edinburgh Review* ferried the ideas of Réamur and Buffon over to Scotland.

Again, numerous elements of natural-historical modes of thinking are present in his political economy, including the processes of equilibration and adaptation of means and ends. He begins his account by asserting that we are one species among many, and share the same tendency toward geometric rates of reproduction. But one of our distinctive traits is the propensity to truck, barter, and exchange – one not observed, he claims, in other animals. This inclination unleashed a long and expansive process of trade and commerce; and as markets grew, so too did the process of specialization by trade and the division of labor more generally. Smith's natural-historical account of commerce is couched in epigenetic terms. Our wealth expands without any planning or intentionality. An array of mechanisms enables the stock of human characteristics – such as frugality or courage, prudence or trust – to expand and contract, and thus fuel commercial ends. As Smith conjectured, in the commercial era each and every one of us is, in some sense, becoming more and more a merchant. However, one of the underexamined features of the economics of both Hume and Smith is the extent to which they focus on the evolution of commerce as the unfolding of institutions and the enhancement of certain habits and customs.

There were thus many points of contact between economics and biology long before the famous epiphany experienced by Darwin upon reading Malthus. As Karl Marx observed in an 1862 letter to Engels, Darwin had simply read classical political economy into the world of plants and animals. Subsequent historians of science, Robert Young most notably, have expanded on the strong similarities, but what has not been ful-

ly acknowledged is the extent to which pre-Malthusian political economy was itself saturated with biological concepts, a discourse that, in turn, was indebted to notions of *oeconomia*. This is exemplified by the robust adherence to the concept of *laissez faire*, which emerged in the late seventeenth century with the writings of Boisguilbert and was widely endorsed right up to the twentieth century. An appeal to a providential order – letting nature take its course – implies that markets were seen as seamlessly joined to physical nature.

As a concept of an economy came to the fore in the first part of the nineteenth century, it shed some of its ties with physical nature and acquired a fair degree of autonomy. John Stuart Mill was the first major economist to propose that human agency be treated as the proximate cause of economic phenomena, that economics must therefore be a mental and not a material science. This in turn fed readily into the very profound shift from a labor to a utility theory of value, with the advent of the neo-classical theory of economics circa 1870. Wealth acquired a plasticity that freed it from material constraints; it was defined in purely mental terms, as the maximization of utility. It was no longer beholden to the bounty of the annual harvest or Malthusian population pressures.

Appeals to ‘the economy,’ now commonplace, are de facto appeals to a separate social realm or sphere, one in which human agency and hence the mind serves as the proximate cause. As John Searle has argued in his *Construction of Social Reality* (1995), collective intentionality serves as the bridge between natural and social phenomena. The world is made of microscopic particles organized by force fields, and we organisms who have acquired consciousness have created distinct objects that themselves

are organized, such as monetary systems. From a God’s-eye view, Searle argues, there are no social properties in the world. We *Homo sapiens* engage in certain activities, banking for example, but the God’s-eye view sees money simply as organized physical particles (mostly now in the form of electric currents). There is nothing distinctive about them, nothing that connects those particles to, say, the price charts of a marketplace or the interest rate.

Social facts are objective to us humans, as Durkheim once lobbied, in the sense that we are powerless to remove them single-handedly. They – money, language, kinship systems – came into existence at a distant point in time, usually under the cloak of anonymity. And while social facts can evolve over time, and the proximate cause of such evolution is purportedly human agency, the forces at work are always collective. The chairman of the Federal Reserve Bank may appear to adjust the interest rate and hence the money stock, but the result can only come about through the set of market forces and activities that are by their very nature collective. With the advent of fiat money, money became so deeply woven into the fabric of society that, as economist Duncan Foley observes, it has “a reality as unyielding to an individual’s will as any natural phenomenon.” This too helps to capture the sense in which money is the result of *collective* intentionality; a given currency would cease to function as money if everyone thought it was not.

Searle (and Durkheim before him) also helps us to see that social reality is “weightless and invisible.” Social objects or facts subsist indistinguishably from the natural landscape, such that, as Searle cautions, it is harder to see objects as just natural phenomena. What does he mean by this? It is difficult to

strip off any object or set of relations from human intentionality, to reach the basic ontology of a world of physical particles in fields of force. Social facts and objects necessarily intrude. As this brief survey of eighteenth-century political economy has disclosed, wealth, money, and trade were part and parcel of the natural order – indeed the direct issuance of nature, and not humankind. To see economic phenomena as coalescing into ‘the economy’ requires conceptual work.

One might well ask what this tells us about nature. At first glance, it seems that we can easily subtract the social; simply look for cases of collective intentionality and by-products such as money that have patterns of evolution that lie outside the physical. Of course, there is an obvious connection; intentions are mental states that current science maps onto neurological states, which in turn could be reduced to molecular or even quantum mechanical states. The trouble is that we have not gotten very far with the reductionist program, and some philosophers – John Dupré for example – make compelling arguments to abandon the project altogether as not only unattainable but also undesirable. Searle has revived the Durkheimian view that the social has patterns that are quite distinct and detached from the natural. “Collective intentionality is a biologically primitive phenomenon that cannot be reduced or eliminated.”⁴

Searle’s efforts are part of a much longer tradition to identify properties that are purportedly unique to us humans. What is novel about Searle’s approach is that he includes other social animals, hyenas and wolves for example, since there is firm empirical support that they

behave as the result of collective intentionality. What they don’t have is a symbolic representation of the social facts, or a set of rules that codify the social order – what Searle calls institutional facts. It remains an open question if other animals might acquire this subset of social facts, especially since they depend on the existence of language.

Findings over the past fifty or so years have ruled out a number of attributes that were once thought to belong uniquely to us. Many animals use tools, some use language, some mate for life, some use systems of exchange, and some are self-aware. Moreover, whatever scientific knowledge we have might be placed on a continuum with the sorts of knowledge other animals use. Knowledge can be viewed as just another kind of tool that enables a given species to play the evolutionary game.

And yet, as Thomas Goudge discerned in the opening epithet, we are the only species that knows about biological evolution. We are also very likely to remain in this unique position. True, we could convey this fact with sign language to some higher primates, but it is unlikely that we could do so with any sophistication. To comprehend the theory of evolution really takes several years, at least if one is to gain some understanding of the specific mechanisms and weigh in on the debates over the concept of fitness or the rate of speciation.

As a historian and philosopher of science, I would submit that we are most likely to revise the specific mechanisms and analytical units of our evolutionary theory in the coming centuries. There are still significant debates over the basic conceptual foundations, the definition and number of species, or the definition and efficacy of a gene. But the basic narrative is far more robust, and likely to withstand major conceptual shifts of the

⁴ John Searle, *The Construction of Social Reality* (New York: Free Press, 1995), 24.

internal content. Insofar as we come upon and justify the theory of evolution from a number of disparate lines of inquiry – embryology, paleontology, biogeography, to name but a few – it is highly likely that the main thesis is warranted, namely, that we are descended from other organisms and are thus kin to most if not all living forms.

What does the fact of our knowing this entail? Are there special obligations that come with this knowledge, or with any knowledge for that matter? Most readers of this essay have some expertise, but does it follow that one must thereby use that expertise to serve any or every possible cry for help? Does knowing evolutionary biology entail that we must ensure the greatest longevity for the greatest number, and does this include other species as well as our own? There are no clear answers to any of these questions. It seems wiser not to succumb to the naturalistic fallacy, but perhaps the frequency with which the fallacy is committed is itself part and parcel of our evolutionary myopia.

One could look at it this way, in the same spirit captured by Gouge's opening statement: given that we stumbled upon the theory of biological evolution, the product of many contingent lines of inquiry, exploration, excavation, and acquisition, and given that this theory helps us to embrace all the more our own contingency, it is a privilege to use this knowledge – and the privilege is part of what gives our lives some meaning. Just as we value a longer life rather than a shorter one, we ought to do our best for the entire evolutionary schema since no other species can.

But if so, how far is that reach? If Peter Singer's arguments are found compelling, we must resist being speciest, and take into account all sentient beings. And insofar as they are dependent

on an elaborate food chain that includes plants, meteorological processes, soil deposition, etc., it seems we would be hard-pressed to draw any boundaries. Why bald eagles but not cold viruses?

Let me put it another way. If no species knew about the evolutionary process, then no species could intentionally speed it up or slow it down. Indeed, the notion of a pace to evolution would make no sense. The wide variation by which species come into being or are rendered extinct is just what it is, a play of many actors. But it is only when one of those actors knows that it is a play that the acting becomes self-reflexive and we have an 'economy of nature' or an emergent social realm. And it may be partly for this reason that we have sought to distinguish the social realm from the natural at much the same time that we came up with the theory of evolution. To continue the metaphor, one conceptual breakthrough was a dress rehearsal for the other. My bold historical conjecture would suggest we view Smith and Linnaeus, and, later on, Mill and Darwin, as two sides of the same coin. In sum, we have managed to commence an understanding of the evolutionary narrative at roughly the same time we became self-reflexive about our self-reflexivity. Moreover, if the evolutionary narrative is more or less correct, then our ability to be self-reflexive in this manner might be viewed as a salient adaptive trait. It may well be that our belief, warranted or unwarranted, in the operations of a separate social sphere such as the economy, allows us to believe, again with or without warrant, that we might exit nature and turn the tap of biodiversity.

Daniel J. Kevles

The contested Earth: science, equity & the environment

Since World War II, an army of advocates and agitators, some of them scientists, have shaped our attitudes toward nature. Among the best known is Rachel Carson, whose *Silent Spring*, first published in 1962, warned that chemical weed killers and insecticides were despoiling the environment and threatening human health. Carson called such agents “elixirs of death,” explaining, “For the first time in the history of the world, every human being is now subjected to contact with dangerous chemicals, from the moment of conception until death.”¹

Carson’s eloquent alarm derived in part from her unalloyed devotion to

nature, but her environmentalism was also a product of her career in the U.S. Fish and Wildlife Service from 1936 to 1952. Explaining a series of twelve booklets that she produced for the agency under the rubric “Conservation in Action,” she deplored the accelerating destruction of nature in the Western Hemisphere and declared, “Wildlife, water, forests, grasslands – all are parts of man’s essential environment; the conservation and effective use of one is impossible except as the others also are conserved.”² In *Silent Spring* Carson noted that people had long liked to believe “that much of Nature was forever beyond the tampering reach of man . . . that, however the physical environment might mold Life, that Life could never assume the power to change drastically – or even destroy – the physical world.”³ It now seemed manifestly evident to her

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1 I wish to thank the Andrew W. Mellon Foundation for support in writing of this essay and Peter Neushel for research assistance. Rachel Carson, *Silent Spring* (New York: Houghton Mifflin, 1962), 15.

2 Paul Brooks, *The House of Life: Rachel Carson at Work, with Selections from Her Writings* (New York: Houghton Mifflin, 1972), 100–101.

3 Ibid.

that the foundations of this belief were dissolving.

Carson overstated her case by warning against the destruction of the physical world. That world would remain, if in modified form, no matter what human beings might do. But in calling attention to how human beings were altering the natural world to the mutual disadvantage of both, she placed herself in a historical line of good company. Prominent among them was the corps of agitators for nature who emerged in the nineteenth century and that included Henry Thoreau, John Muir, and George Perkins Marsh. Thoreau and Muir advanced a kind of antimodernism, celebrating nature as a haven from the technological metropolis. Marsh embraced scientific knowledge and methods as a means of using nature without irrevocably destroying it. Together, they expressed an ambivalence toward the scientific and technological exploitation of the Earth that has marked attitudes toward nature, including Carson's, since the Industrial Revolution.

Marsh, a diplomat, businessman, and polymathic scholar, advanced his views most comprehensively in 1864, in *Man and Nature; or Physical Geography as Modified by Human Action*. Here he argued with passion and authority that man was fast making the earth "an unfit home for its noblest inhabitant." He attributed the alteration partly to geological causes and partly to war and misrule, but he argued that much of the blame could be credited to man's unwitting, "ignorant disregard of the laws of nature."⁴ The originality of his book resided in its exposi-

tion of nature's intricate interconnectedness and in his argument, which ran contrary to most scientific thinking at the time, that man's small disturbances of nature's equilibria could accumulate to transform the land and its creatures. For example, when human beings killed insect-eating birds, such as robins, the insects increased and in turn attacked trees.

What absorbed Marsh most was the human impact on an essential resource of his era – the forests in modern Europe and the United States, a subject to which he devoted more than a third of his book. Marsh pointed out that forests were not only sources of wood but retainers of soil and moisture, indispensable to the maintenance of watersheds that fed the streams and supplied the cities and towns. Marsh was not a pure preservationist. On the contrary, he expected that people would – and should – continue to exploit nature for material purposes. Impatient with the romantic impulse to flee the mechanical and commercial age, he approached nature with the sensibilities of the practical man of affairs that he was – without sentimentality. What was striking about Marsh's treatise was precisely its establishment of the renewal of nature, no matter the region, as a joint imperative with the material use of it.

The interests of human beings occupied John Muir less than did those of trees and mountains. A native of Scotland, Muir grew up in Wisconsin, in the 1850s, under the hand of a harsh, Calvinist, and acquisitive father. But during two years at the University of Wisconsin, he read the works of Henry Thoreau among similar writers; and on a trip to Canada he experienced a kind of epiphany, finding himself, on a walk one day, weeping for joy upon encountering the exquisite beauty of the flower *calypso*

4 George P. Marsh, *Man and Nature; or Physical Geography as Modified by Human Action* (New York: Charles Scribner, 1864); ed., David Lowenthal (Cambridge, Mass.: Harvard University Press, 1965), 43 – 52.

borealis. By 1868, he had made his way to California, where he reveled in the storms, the fauna, the great trees, and especially the mountains, reading, as he put it, “the glacial manuscripts of God.”⁵ For Muir, nature, especially mountainous nature, had become a religion. In nature he found a religion that was dissociated from his father’s harsh discipline, a Jehovah that was joyful.

His new faith transcended all human measures, including the scale that relegated nature to the service of human needs and desires. From his first days in the Sierras, Muir felt called to “preaching these mountains like an apostle.”⁶ He sang the natural wonders of the West in *The Mountains of California*, a book that distilled all his readings of nature into a kind of extended poem. He turned themes of groundwater into lyrical celebrations of the Sequoia, and he lamented that “*man* is in the woods, and waste and pure destruction are making rapid headway,” continuing, “If the importance of forests were at all understood, even from an economic standpoint, their preservation would call forth the most watchful attention of government.” Yet Muir’s call for forest preservation was energized far less by economics than by devotion to a romantic religion of nature.⁷

5 William Frederic Badé, *The Life and Letters of John Muir*, vol. 1 (New York: Houghton Mifflin, 1924), 178.

6 Stephen R. Fox, *The American Conservation Movement: John Muir and His Legacy* (Madison: University of Wisconsin Press, 1985), 4–7, 12–13, 82–83, 51–52.

7 John Muir, *The Mountains of California* (New York: The Century Co., 1894 [1898 printing]), 192–200. Muir later wrote of the Sierras as “pervaded with divine light,” declaring that all of its creatures and rocks were “throbbing and pulsing with the heartbeats of God.” John

George Perkins Marsh’s book was ultimately recognized as a classic of American environmental literature, and in its own day it did not go unnoticed. Marsh’s arguments helped prompt a number of states – the first was Nebraska, in 1872 – to establish an Arbor Day for the planting of trees, and they helped stimulate the movement for forest protection that led to the creation after 1885 of the Adirondack State Park and Preserve, in New York, a huge upstate reserve of forest and stream that in 1894, in their new constitution, the state’s voters declared should be kept “forever wild.” However, the measure was enacted not only to sustain the spirits of the citizens of New York but also to maintain the great watershed the Adirondacks comprised and that fed the needs of the downstate metropolis.

Meanwhile, the federal government had gotten busy on behalf of nature, too. Between 1891 and 1897, by presidential proclamation, it set aside close to 40 million acres in new forest reserves in most of the Western states. The actions infuriated many Westerners, who took them to mean that the forests were to be forever locked away from all use. In the Senate, Westerners declared that they were victims of Eastern imperialism, emphasizing that their constituents needed timber for homes and mines. The reserves were maintained, but Congress insisted that they be subjected to managed use and development under the control of the Secretary of the Interior.

A hybrid outlook pervaded the politics of trees and forests. In the late nineteenth century, with the frontier closing, millions of Americans loved trees, partly with the worshipful regard of Muir but also partly with the economic estimation

Muir, *Our National Parks* (Boston: Houghton, Mifflin, 1903 [1901]), 76–77.

of Marsh. A preservationist constituency emerged in the Far West at the end of the nineteenth century, its presence signaled by the founding of the Sierra Club in California. Even Western businessmen, as resistant as they were to the withdrawals of timber lands, acknowledged the need for water-oriented conservation. They convinced themselves that the salvation of the region would be irrigation, what Secretary of the Interior John Noble, in 1893, called “the magic wand” that would make the trans-Mississippi region a hundred years hence densely populated and rich. Westerners recognized that if there were to be irrigation, there had to be forests to supply watershed for the rivers that would be dammed and diverted, and they eventually compromised with the movement to maintain them.

The conservationist character of the state and federal enactments of the late nineteenth century would have won applause from George Perkins Marsh, but Henry Thoreau might have deplored much of it. John Muir did deplore the considerable parts that applied to trees. And soon, at the apogee of the conservation movement in the early twentieth century, he fought unsuccessfully to save the Hetch Hetchy Valley, in California, from the conservationist drive to dam and flood it for the sake of ensuring the water supply of San Francisco.

The environmental politics of the era revealed that a sea change had occurred in American attitudes toward the control of nature. The environmentalism that blossomed in the 1890s and flourished up to World War I engaged a broad coalition of different groups, from hard-headed conservationists to romantic preservationists. It drew heavily on science and scientists, bringing issues such as watershed, ground cover, and wildlife habitat as much into the equation as cel-

ebrations of the deity in Nature. Even laissez-faire politicians were rendered supporters of federal regulation of the use of nature by the looming reality of limits, or, in the otherwise recalcitrant West, by what federal conservation might do for their local interests. In these regards, the first environmental movement offers something of a guide for how to cope with the issues of environmentalism in our own day, which pose questions of equity, development, and resistance, increasingly on a global scale.

Rachel Carson’s *Silent Spring* was promptly translated into twelve foreign languages, thus extending the American environmental sensibility abroad and no doubt helping to ignite the environmentalism that swept into most Western nations during the 1960s. Carson’s book – and those by other agitator-biologists such as Paul Ehrlich, who warned about the ticking population bomb, and Barry Commoner, who emphasized the jeopardy that Western capitalism posed to the natural environment – had an effect akin to that of intellectual sparks dropped in tinder: material, cultural, and political circumstances that made not only American society but all the Western nations ripe for an environmental movement with an increasingly planetary sensibility and that have helped sustain it now for more than forty years.⁸

A common ingredient in the tinder was the advent of affluence and more extensive education in the United States, Western Europe, and sectors of the Third World newly emancipated from colonial control. In the closing decades

8 See Barry Commoner, *The Closing Circle* (New York: Alfred A. Knopf, 1971); Paul Ehrlich, *The Population Bomb* (Riverville, Mass.: Riverville Press, 1975).

of the twentieth century, Americans grew increasingly concerned about their quality of life, and many took quality to include the availability of uncorrupted preserves of nature – forests, streams, deserts, and mountains – which the spreading affluence enabled them to repair (and to some degree corrupt by their presence).⁹

The preservationists' West, however, was undergoing rapid transformation, spurred by local ambitions and by the embrace of cold war imperatives, including the conviction that national security required dynamic economic development. Federal defense contracts poured into the region, promoting the expansion of existing industries, notably aircraft and ships; nurturing the development of incipient ones, particularly rockets and electronics; and stimulating the creation of new ones. In Hanford, Washington, a giant nuclear complex grew out of the Manhattan Project's wartime installation along the Columbia River, while in Colorado, a defense-oriented chemical industry began to grow around federal installations for research in chemical warfare.

The growth was enabled to a considerable degree by federal water and power projects that had originated during the New Deal, proceeded through World War II, and in peace became a staple of the regional economy. For example, in Washington, the gargantuan Grand Coulee Dam on the Columbia River, completed in 1941, was joined by more than twenty-five more dams built on the river and its tributaries in the quarter century after the war. The dams were coupled with an extensive network of ditch-

es, reservoirs, and canals constructed to irrigate hitherto arid lands. As a result of federal reclamation projects, in the quarter century after 1945, the amount of irrigated land in the West nearly doubled, reaching almost 37 million acres.

The federal water and power projects stimulated resentment. Irrigation tended to favor agribusiness over small farms and ranches. Dams inundated canyons and valleys, many of them belonging to Native Americans, and they angered people who cared about protecting Western lands from human damage. The resentments burst into full view during the early 1950s in the battle over Dinosaur National Monument in northwestern Colorado, near the Utah border.

The monument covered hundreds of miles of wild, gorgeously colored canyons carved by the Green and Yampu Rivers, part of the Upper Basin of the Colorado River. Since the Truman years, the federal government's plans for the basin included the construction of two dams in Dinosaur, one of them at Echo Park. Western advocates of the dams argued that they were badly needed for the electric power and irrigation that would bolster economic development and national security. Preservationists fought the dams partly to protect the national park system, but mainly to prevent the loss forever of the river canyons of Echo Park itself. In 1956, with the Dinosaur dams becoming the most controversial environmental issue since Hetch Hetchy, Congress passed an omnibus bill authorizing the Upper Colorado Basin project without the two dams, substituting for them a dam at Glen Canyon in Arizona.

The Dinosaur battle united preservationists into a powerful coalition, including enthusiasts of white water, wildlife, and wilderness, and armed them with political, legal, and technical ex-

9 Samuel P. Hays, in collaboration with Barbara D. Hays, *Beauty, Health, and Permanence: Environmental Politics in the United States, 1955–1985* (Cambridge: Cambridge University Press, 1987).

expertise. The victory encouraged them to go on the offensive, lobbying for a law of broad-gauged wilderness preservation to prevent any future Echo Parks, an initiative that resulted in the Wilderness Act of 1964 and in numerous efforts since then to withdraw desert lands, old-growth forests, and ecological treasures from human depredation.

In the 1950s, the cold war helped further to lay the foundation for the second environmental movement by generating controversy over radioactive fallout from nuclear testing in the atmosphere. Claims that testing had no adverse health effects were countered by many scientists, notably Commoner, then at Washington University in St. Louis, who organized the St. Louis Committee for Nuclear Information, which mounted a sustained effort to educate the public about the impact of global fallout on human beings. It was no accident that in *Silent Spring* Rachel Carson repeatedly equated chemical assaults on the environment with radioactive poisoning of the atmosphere and food chain.

Virtually no one felt insulated from the poisons of petrochemical society – of plastics, pesticides, solvents, abrasives, and fuel additives whose development had accelerated since World War II. Smog respected no neighborhood boundaries. Neither did radiation from fallout nor toxics in the food chain or groundwater. Even those who fled to the countryside might encounter there the green algae and dead fish of polluted streams, or the seepage of chemicals and sewage into the soil and lakes, like Lake Erie, which in the summer of 1969 was declared a “dying sinkhole.”¹⁰

Metropolitan people of the 1960s were perhaps more responsive than their forebears to the tangible threats of pollution. Expectations of good health and longer life spans were rising as conventional sanitation combined with antibiotics appeared to be wiping out infectious disease. There was a corresponding increase in the attribution of noninfectious diseases – notably cancer – to environmental sources, and a comparable growth in eagerness to wipe those causes out. Then, too, the same dynamic response to the war in Vietnam that turned many scientists as well as laypeople into dissidents against the high-technology culture of the cold war helped strengthen the constituency of support for measures against the advent of environmental poisons. The military-industrial complex was targeted not only for its responsibility in the war but also for its complicity in the environmental degradation of the planet, not least by the use of defoliants in Vietnam.

Pollution and preservation loomed large in the sights of the new environmental movement. During the 1960s and early 1970s, Congress passed laws to clean up the nation’s waters and air, the latter by giving the federal government power to set emissions standards for automobiles (scientists had learned that cars were responsible for a sizable fraction of smog). It enacted measures to preserve wild and scenic rivers, establish a national system of trails, and maintain endangered species. In January 1970, President Richard Nixon signed the National Environmental Policy Act, which opened the way to his establishment later that year of the Environmental Protection Agency (EPA), a body with sweeping regulatory powers. The act also directed all federal agencies to take into account the environmental impact of their activities, a requirement that

10 Kirkpatrick Sales, *The Green Revolution: The American Environmental Movement, 1962 – 1992* (New York: Hill and Wang, 1993), 19.

gave ordinary citizens the opportunity to take them to court if they did not. Congress cast a cold eye on new irrigation and dam projects in the West. In 1972, the federal government banned the use of DDT, largely as a result of the outcry that Carson's book had raised.

The mainstream environmental activism that produced and sustained this landmark body of legislation tended to be white and middle to upper-middle class in composition, and it provoked social and economic suspicions. The threat to economic growth and jobs in the drive for environmental regulation and preservation often pitted environmentalists against labor and against lower-income people of color. Moreover, the assault against toxics at times placed hazardous waste facilities in or near communities of low-income African Americans and Hispanics. In 1990, a group of non-Anglo activists warned a meeting of environmental-group executives that "the racism and the 'whiteness' of the environmental movement was its 'Achilles heel.'"¹¹

However, since the 1980s at least part of the environmental movement in the United States – notably the local entities known as 'alternative groups' – has recognized that considerations of gender, race, and class should have a place in the policies and the actions of the environmental movement. A number declined to identify themselves as 'environmentalists,' preferring local, functional names such as Concerned Neighbors in Action, Citizens' Clearinghouse for Hazardous Wastes, or The Clamshell Alliance. For many, the historian Robert Gottlieb noted, the term 'environ-

mentalism' had come to refer to "upper-class, Anglo-yuppie types" who are "seen as consumers of Nature or policy technicians." The alternative groups were "about protecting people, not birds and bees," one of their activists declared.¹² They organized against nuclear power plants, corporate pollution, and a variety of other hazards in workplaces and neighborhoods. And they goaded some of the mainstream groups, such as the Sierra Club, into concerning themselves to some degree with environmental justice – that is, with an environmentalism that takes the needs and vulnerabilities of the urban ghettos as seriously as it regards those of spotted owls and sequoias.

Some of the alternative groups were established and supported by labor or minority-group activists. Their leaders included a disproportionately large number of women – for example, Penny Newman, who campaigned against McDonald's use of polystyrene foam packaging and who arrived at an environmental conference wearing a pink t-shirt, on one side of which was stenciled a woman flexing her muscles and captioned, "Tough Women Against Toxics." Cora Tucker, an African American, reported to the same conference that she was tired of going to local governmental bodies to complain about pollutants in the community and being told, "OK, Sugar, we're going to look into it."¹³ The activism of women in local environmental issues derived from their being close to the community ground, sensitive to risks that threatened themselves and their families, and ferociously determined to contest them. The Newmans and Tuckers regularly challenged

¹¹ Robert Gottlieb, *Forcing the Spring: The Transformation of the American Environmental Movement* (Washington, D.C.: Island Press, 1993), 260.

¹² *Ibid.*, 317–318.

¹³ *Ibid.*, 162–163, 207–208.

expert knowledge about environmental issues and took personal and local experience as primary. “You don’t have to be an elected official or an industry executive to have an impact on waste policy,” Newman remarked.¹⁴

The conflicts between material interests and environmental goals made their way onto the table of federal policy. For example, the Clinton administration worked out a compromise that would significantly reduce logging on federal lands while providing aid to retrain loggers and to assist communities that would suffer damage as a result of a new law protecting old-growth forests. The administration also issued an executive order requiring all federal agencies to take account of environmental justice in whatever they do.

Rachel Carson was a biologist as well as a gifted writer, and in working on *Silent Spring* she digested a vast range of technical publications and consulted numerous technical experts to build, step by step, through a synthesis of widely scattered facts, “a really damning case against the use of these chemicals as they are now inflicted upon us,” as she confided to a friend during her work on the volume.¹⁵ She lucidly explained the intricate interconnectedness of nature and how chemical herbicides or insecticides applied by earth or aerial spraying could diffuse through the local soil, be carried through ground and surface water to distant areas, and accumulate in the wild food chain. She detailed the destructive impact of these chemicals on ecological niches and their wild inhabitants, particularly birds. Despite Carson’s credentials, *Silent Spring* was initial-

ly greeted with a barrage of ridicule and denunciation from the chemical industry, parts of the food industry, academic scientists allied with both, and powerful sectors of the media. However, in a report published in May 1963, a special panel of Kennedy’s Science Advisory Committee endorsed Carson’s main conclusions, especially her view that pesticides, rather than being used until they were proved to be dangerous, should be demonstrated as safe before they were deployed.

If science assisted the first environmental movement, it has occupied an increasingly central role in the second one, providing keys to the diagnosis of pollution as well as its remedies and regulation. It has also enabled the detection and analysis of the global threats to the environment that have captured public attention since the 1980s. Indeed, without science, the world would be unaware of ozone depletion and global warming – ignorant of both, that is, until it was too late.

Ozone depletion was first recognized by the chemists Frank S. Rowland and Mario Molina in 1973, when they undertook to track the fate of fluorocarbon molecules that were being generated by the growing commercial and industrial uses of chlorofluorocarbons (CFCs) in, for example, spray cans and air conditioners. At first they could hardly believe their findings that chlorine atoms broken off from the CFCs would seriously reduce the ozone layer in the upper atmosphere, which normally blocks ultraviolet light from reaching the earth’s surface. Such loss of ozone could wreak havoc on human, plant, and animal life because ultraviolet radiation can induce skin cancers and cataracts, lower the yields of basic crops, and kill tiny organisms in the ocean food chain. Rowland and Molina’s analysis, though much dis-

14 Ibid., 162 – 163.

15 Brooks, *The House of Life*, 243 – 245.

puted for years, was gradually confirmed by scientists conducting computer simulations of the atmosphere and, more dramatically, by a British team who in 1985 detected an enormous depletion of the ozone layer over a huge region of Antarctica.¹⁶

The principal source of global warming is the greenhouse effect. An ordinary greenhouse becomes warmer than the air outside it by trapping radiation from the sun. The sun's rays, having entered through the roof glass, are partly reflected back up to the glass, which in turn reflects some of them back into the greenhouse space. In 1896, Svante Arrhenius, the eminent Swedish physical chemist, pointed out in a brilliant article, "On the Influence of Carbonic Acid in the Air upon the Temperature on the Ground," that the earth and its atmosphere form a natural greenhouse.¹⁷ Carbonic acid consists of – and in the atmosphere dissociates into – water and carbon dioxide (CO₂). The carbon dioxide comes from the joining of carbon and oxygen, one of the most common chemical processes on the earth. It occurs in the burning of carbon-abundant organic matter, including forests ignited by lightning or coal and oil fired by man.

Carbon dioxide is a trace chemical in the air, only a few hundred parts in every million air molecules, yet even that small amount acts like the glass in a

greenhouse, trapping some of the solar radiation that constantly bathes the earth. Without the greenhouse trapping, the reflected radiation would escape into outer space, and the earth would be some sixty degrees cooler on average than it is. But we can have too much of a good thing. Arrhenius, who wrote his article primarily to account for the type of climatic swings that had produced the ebb and flow of glaciers, calculated that a tripling of the amount of CO₂ from then-current levels would raise Arctic temperatures as much as sixteen degrees Fahrenheit.

Because industrial growth has stimulated a steady increase in the burning of fossil fuels – and, as a result, a steady increase in the amount of carbon dioxide released into the atmosphere – CO₂ concentrations have increased around 25 percent since Arrhenius's day. The oceans soak up carbon dioxide, as do plants and trees. However, the ocean does not have an infinite capacity for absorbing CO₂, and even though trees and shrubby forests still cover some 40 percent of the earth, deforestation has been taking place at an accelerating rate. Almost half the rise in atmospheric CO₂ since the beginning of the industrial era has occurred in roughly the last forty years. Moreover, other trace atmospheric gases that have also been pouring into the atmosphere – notably the CFCs and methane – intensify the CO₂-induced greenhouse effect by between 50 and 150 percent.

Human beings have produced the CFCs, and human beings are at least partly, if indirectly, responsible for the methane increase, even though the gas is generated by a variety of natural processes – for example, the breakdown of organic matter by bacteria in such locales as rice paddies and the guts of cows and termites. It can be argued that peo-

16 The discussion here and below of ozone depletion and the world measures taken to combat it is based on Richard Elliot Benedick, *Ozone Diplomacy: New Directions in Safeguarding the Planet* (Cambridge, Mass.: Harvard University Press, 1991).

17 The paper, an extract from a more extensive version that had been presented to the Royal Swedish Academy of Sciences, December 11, 1895, appeared in *Philosophical Magazine* 41 (April 1896): 237 – 276.

ple, by killing trees, have made more dead wood for termites to feed on. Certainly they have raised more and more cows and rice to nourish the rapidly growing human population.

The climatic impact of CO₂ was brought dramatically to the public's attention by the brutally hot spring and summer of 1988, which blistered streets in U.S. cities, brought drought and crop disasters to many farms, and fed a seemingly endless fire in Yellowstone National Park. Suddenly, the greenhouse effect commanded alarmed consideration on the front pages of newspapers, on the broadcast networks, at celebrity benefits, and in Congress, where, at a hearing on the subject in June 1988, Senator J. Bennett Johnston of Louisiana publicly worried about the 101-degree temperatures in the capital and the ruin of soybean, corn, and cotton crops. In testimony at the hearing, the respected climatologist James Hansen declared that the warming of recent years was 99 percent likely to have been the result of the greenhouse effect. He said, "It's time to stop waffling so much. It's time to say the earth is getting warmer."¹⁸

Bill McKibben responded to the prospect of human-caused – or anthropogenic – climate change by writing *The End of Nature*, an eloquent and early warning, published in 1989, that "the idea of nature will not survive the new global pollution – the carbon dioxide and the CFCs and the like." A writer who then lived in the Adirondack Mountains, McKibben is something of a latter-day union of Rachel Carson and John Muir. He possesses detailed knowledge of the science underlying the process of global warming and of the social and economic consequences that the warming is likely to

produce. Like many people in the modern era, he has been troubled by a crisis of religious belief and says that he has "overcome it to a greater or a lesser degree by locating God in nature," declaring, "Most of the glimpses of immortality, design, and benevolence that I see come from the natural world."¹⁹

To McKibben's mind, we need a nature that is raw, wild, untainted by man "so that we can worry about our human affairs secure in our knowledge of the eternal inhuman." His vision is global, but his sensibility is especially American, drawing from the powerful Edenic theme in American culture, the perception of the continent's unspoiled natural environment as a garden of innocence. Like Nathaniel Hawthorne, who bridled when, at ease in a forest clearing, he heard the blast of a distant train whistle, McKibben resents the intrusions into nature of human technologies and their ravages. He writes, echoing Rachel Carson, "We never thought that we had wrecked nature. Deep down, we never really thought we could: it was too big and too old; its forces – the wind, the rain, the sun – were too strong, too elemental." But he came to believe that we have wrecked it, writing, "We have changed the atmosphere, and thus we are changing the weather. By changing the weather, we make every spot on earth man-made and artificial. There will be nothing natural about the spring rain, the winter snows, or the July heat wave; nothing natural about the seasons – nothing inhuman about nature."²⁰

McKibben contended that nature deserves to be preserved for its own sake, not for ours. The idea, advanced by animal rights activists and 'deep ecologists,'

18 Bill McKibben, *The End of Nature* (New York: Random House, 1989), 26.

19 Ibid., 58, 71.

20 Ibid., 58.

among others, rests on the premise that nature itself has rights, and on the corollary that we, being only one species among many, have no intrinsic authority over any others, or even over rocks.²¹ Dave Foreman, of the deep ecology group Earth First!, admonished that you protect a river because “it has a right to exist by itself,” adding, “The grizzly bear in Yellowstone Park has as much right to her life as any one of us has to our life.” Before learning about the greenhouse effect, McKibben thought such ideas were extreme; then he came to sympathize with them, holding them to be “at least plausible.” He willingly entertained the admittedly “disturbing” and “radical” idea that “individual suffering – animal or human – might be less important than the suffering of species, ecosystems, the planet.”²²

However, to establish an ecosystem’s suffering as more important than human suffering is to embrace a biocentric radicalism that finds greater intrinsic value in, for example, a free-flowing river than in a billion human beings.²³ The eagerness to preserve the inhuman in nature can lead to claims that are inhumane. It bears remembering that for many people today – and for most people throughout most of history – nature has been not benign but harsh, not safe but dangerous. If today the Adirondack woods provide spiritual sustenance, it is because man – civilization – has tamed the wild enough to make it comforting.

21 See Roderick Frazier Nash, *The Rights of Nature: A History of Environmental Ethics* (Madison: University of Wisconsin Press, 1989).

22 McKibben, *The End of Nature*, 180, 182, 185 – 186.

23 David Graber, in a review of McKibben’s book, *Los Angeles Times Book Review*, October 22, 1989, 9.

More important, the declaration of deep ecologists that nature possesses rights equal to those of man poses perplexing problems for political democracy. Are the rights of a free-flowing river absolute? Can it flow freely over, say, a farmer’s crops and house? If not, we are placed at a loss, since rivers and grizzly bears are unable to negotiate with us the boundaries of their rights and ours. Political democracy knows how to adjudicate conflicts between human groups about their respective interests in nature, but it has no calculus for weighing the rights of nature as such against the rights of man. Indeed, since nature cannot speak for itself, its ‘rights,’ if they exist, must necessarily be interpreted by human beings, refracted through human sensibilities, defined in ways that express human perceptions and interests. All this is perhaps to say that moral and public policy questions concerning the preservation of nature are not biocentric but anthropocentric, and that they are unnecessarily burdened by injecting into them claims that nature possesses intrinsic rights.

McKibben, who acknowledged the legitimacy of several anthropocentric claims, noted that “the greenhouse effect is the first environmental problem we can’t escape by moving to the woods. There are no personal solutions.”²⁴ The long-standing environmental slogan – ‘Think globally, act locally’ – has to be modified in the greenhouse age to include global action.

The nations of the world demonstrated they could take global action when in 1987 they negotiated the Montreal Protocol on Substances that Deplete the Ozone Layer, an agreement that was signed by sixty nations. The Montreal Protocol reflected both scientific knowl-

24 McKibben, *The End of Nature*, 204.

edge and economic interests – that is, it took account of how much various chemicals contributed to ozone loss and how important any of them might be to a nation's manufacturing. The agreement was thus a flexible one, requiring participating nations to limit production of selected groups of ozone-depleting chemicals rather than each and every one. The Protocol took effect on January 1, 1989, having been ratified by twenty-nine nations and the Commission of the European Community, which together accounted for 83 percent of global consumption of CFCs and a related class of chemicals called halons.

The Montreal Protocol was designed to be modified – without extensive formal renegotiation – in response to new scientific, economic, and technological information. In 1988 and 1989, it became clear that CFCs and halons were implicated in the ozone collapse over Antarctica: that ozone had diminished by small but significant amounts over heavily populated areas of the world; and that further significant depletion of the ozone layer would occur even if every nation in the world conformed to the Montreal Protocol. Combined with the rapid appearance of CFC-substitutes, the new scientific results helped lead in 1990 to a toughening of the Protocol's requirements, particularly to an increase in the types of ozone-depleting chemicals it covered and a speed-up in the rate at which they were to be drastically reduced and then phased out. Richard Benedick, a U.S. foreign service officer, headed American preparations for the Montreal deliberations and was the chief U.S. negotiator of the Protocol. In his view, it was “a prototype for an evolving new form of international cooperation” to deal with the other new dangers.

The principal other danger is global warming. Dealing with it requires lim-

iting or, better yet, reducing the emission of CO₂ into the atmosphere, both by curbing the burning of fossil fuels or managing the surface of the Earth so that more CO₂ is absorbed by plant life, especially trees. With regard to the latter measure, the major challenge is eerily reminiscent of what preoccupied George Perkins Marsh – the preservation or restoration of forests.

Some of the world's greatest remaining forests are located in the Third World, and the regions of the planet comprising it harbor active constituencies for forests. Indigenous peoples – natives whose communities have long resided in rural areas and wrested a living directly from the forested habitat – have increasingly resisted the accelerating deprivation of their lands by agricultural development, declaring at a meeting in Paris in 1991 that they were no longer willing “to allow ‘progress and development’ to continue to take possession of our territory to the clear detriment of ourselves.”

In India in December 1972, women in the Uttarkhand region of Uttar Pradesh grew angry at the clear-cutting of ash trees. The depletion of the forest meant that they had to search further and longer for fodder, fuel, and leaves to use for thatching their huts. The women decided to “*Hum chipak jayenge*,” or cling to the trees to prevent the lumber company from cutting them down. Vimla Bahuguna, who emerged as the leader of the ‘Chipko movement,’ as the tree-hugging was termed, likened the women's reaction to that “of a mother when she and her child encounter a wild animal – she instinctively hugs her child close, to protect it.”²⁵ By the 1980s, the movement

25 Sakuntala Narasimhan, “The Roots of a Movement,” *Connexions* 41 (Winter 1993): 22 – 23.

had expanded beyond the protection of existing trees to include teaching land-use techniques, nursery management, and reforestation methods. A government forestry official commented that Chipko “has achieved more in ten years than the forestry department could have done in one hundred years,” but he might have added that its support has broadened far beyond the region’s women because deforestation in the Himalayas is severely impairing the watershed for the Ganges Plain and the roughly 250 to 300 million people who depend on it.²⁶

In Brazil, the activist Chico Mendes led an effective movement for a dozen years to preserve the Amazonian rain forests and the way of life of the Indians inhabiting them, who sustained themselves with an economy based on tapping the rubber trees. (In 1988, Mendes was killed by the son of a cattle rancher who wanted to turn more of the rain forest into pasture.) Even so, as of 1990, the juggernaut of development had already destroyed 408,000 square kilometers of the rain forest, about 10 percent of the total before 1970 and an area about the size of Iraq. Since then, another 300,000 square kilometers has disappeared, bringing the total loss since 1970 to 17 percent.²⁷

However, the interests of Mendes’s followers or the Chipko movement have

tended to be local and traditional. Their efforts have not been targeted at staving off global warming. Trees respire CO₂ whatever the reason they are in place, but the maintenance of forests, not to mention restraint in the burning of fossil fuels, have been persistently challenged by aspirations for development within the Third World and encouragement of it from Northern interests.

Indeed, echoing Westerners in the United States in the late nineteenth century, spokesmen for Third World development contend that the initiatives for the protection of nature coming from the North amount to a kind of environmental imperialism. Questions have been raised about Northern demands that the poorer countries limit new development – by, for example, forgoing the use of fossil fuels – so as to reduce further pollution of the global atmosphere, a public good whose benefits would be shared by the industrial North and paid for disproportionately by the less developed South. Third World leaders want industrial development, automobiles, larger croplands – everything obtainable from the burning of fossil fuels and the clearing of forests. The Chinese have the most abundant coal reserves in the world and no doubt hold that they also possess the right to exploit that resource for their material advancement.²⁸

Prior to the UN-sponsored Earth Summit in Rio, in 1992, Brazil’s representatives insisted that the developing world cannot allow environmental concerns to interfere with the need to find homes and jobs for its citizens. They issued a declaration insisting that “Third World countries have the right to increase their

26 Robert A. Hutchison, “A Tree Hugger Stirs Villagers in India to Save Their Forests,” *Smithsonian* 18 (February 1988): 184–195.

27 The figures are taken from the annual satellite survey done by the National Institute of Space Research in Brazil. They are conveniently summarized in a table in the Wikipedia entry for ‘Amazon Rainforest,’ http://en.wikipedia.org/wiki/Amazon_Rainforest#Measured_rates_of_deforestation_in_the_Amazon, accessed February 23, 2008. See also Michael S. Serrill, “Brazil’s Two Faces,” *Time*, June 8, 1992, 74.

28 Christopher Flavin, *Slowing Global Warming: A Worldwide Strategy*, Worldwatch Paper 91, Worldwatch Institute, October 1989, 8.

consumption of energy to attend to their development needs.”²⁹ Economic development also appeals to imperative ethical claims. In 1991, a United Nations survey reported that in the industrialized North some 200 million people live in poverty, while in the Third World about 1.1 billion people are poor, half of them “extremely poor.”³⁰ McKibben rightly noted, “The thought that people living in poverty, be it desperate poverty or just depressing poverty, will curb their desire for a marginally better life simply because of something like the greenhouse effect is, of course, absurd.”³¹

The inhabitants of modern industrial societies burn the preponderance of the fossil fuels that the world uses, in their cars, homes, and factories. While in the early 1990s, the entire Third World was responsible for only some 35 percent of CO₂ emissions, the United States alone accounted for about 25 percent of them.³² In keeping with their tidal wave of economic growth since, the BRIC countries – Brazil, Russia, India, and China – now emit about the same proportion of the world’s greenhouse gases as does the industrialized West. China’s contribution to the total now roughly equals that of the United States, still about 25 percent. However, the BRIC countries rank among the lowest in per-

capita contributions while the United States leads the highest-producing group.

The London revisions of the Montreal Protocol demonstrated that inequalities between Northern and Southern states could be addressed. A number of Third World countries came to conclude that the 1987 agreement was inequitable because it allowed developing countries a per-capita consumption of the chemicals between twenty and forty times lower than that for industrialized countries. Third World countries, considering CFCs essential to raise their living standards, especially for air conditioning and refrigeration, therefore insisted, as their price for conforming to the Montreal Protocol, that they be given technical and financial assistance for acquiring substitutes.

The Northern countries had good reasons to heed the Third World demand on grounds of both equity and self-interest. Since CFC technology was inexpensive and uncomplicated, the developing countries, if they wanted, could obtain it easily, use it to produce CFCs, and sell huge quantities of the chemicals to their enormous populations. They could thus undermine the North’s efforts to protect the ozone layer. Since the costs of further damage to the ozone layer would be high, assisting developing countries with the development of technology that would cut down the need for CFCs appeared to be a wise investment. In the London revisions of the Protocol, the industrial nations set up a fund to do so.

However, restraining global warming is likely to prove far tougher than managing ozone depletion. The chief culprit in ozone depletion was just one family of chemicals, for which substitutes could be found. In contrast, the imposition of limitations on the emission of CO₂ poses vast difficulties for the world precisely

29 Serrill, “Brazil’s Two Faces,” 74.

30 *Los Angeles Times*, November 23, 1991, 3.

31 McKibben, *The End of Nature*, 201.

32 Flavin, *Slowing Global Warming*, 8; The Free Library.com, “‘BRIC’ countries top many industrialized nations in environmental commitment,” <http://www.thefreelibrary.com/‘BRIC’+countries+top+many+industrialized+nations+in+environmental...-a0173190005>; Power-Technology.com, “Rise of the BRIC Nations,” <http://www.power-technology.com/features/feature1417/> (both accessed February 23, 2007).

because everyone's life and expectations are so entwined with the burning of fossil fuels. What might be substituted for them is not at all obvious. Solar and wind energy will not likely supply a significant fraction of world energy demand, and nuclear energy poses its own deep environmental and safety problems. In short, replacing fossil fuels with other energy sources poses far greater technical challenges than devising substitutes for CFCs – and therefore far greater challenges to equitable distribution of the costs of safeguarding the global environment.

Dealing with the problem of global warming demands some combination of imagination and leadership, yet since the late 1980s the government of the United States, the world's greatest CO₂ polluter, has provided little of either. To be fair, in 1988 prominent scientists cautioned that the heat of that blistering summer could have been a random event, a local statistical variation on a steady climate. The greenhouse effect was held to be a complex topic, riddled with uncertainty. At the Earth Summit, in June 1992, the world's nations nevertheless prudently adopted the UN Framework Convention on Climate Change to seek "stabilization of greenhouse gas concentration in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system."³³

In December 1997, in Kyoto, Japan, the framers of the Convention gave it teeth, mandating that its adherent nations commit to reducing their greenhouse gas emission to 1990 levels or below by the year 2000. The first President George Bush and President Clinton both

supported the original Convention, and Clinton did the same with the Kyoto Protocol, but he never submitted it to the Senate. Congress had made clear that it objected to any agreement on greenhouse gas emissions that might disadvantage the United States in competition with Third World countries. By the time Clinton left office, the United States was emitting 15 percent more CO₂ than in 1990. It is one of the only two industrialized countries that have not ratified the Kyoto Protocol.³⁴

By the beginning of this century, a broad scientific consensus had developed that anthropogenic global warming was in fact occurring. The administration of President George W. Bush, however, refused early in its first term to support the Kyoto Treaty, saying that it would damage the American economy, and it has since retreated into obfuscation, implying that the science of global warming is unsound. In 2006, the case for the soundness of the science was compellingly laid out in Al Gore's *Inconvenient Truth* and the Oscar-winning documentary film of the same title, with its depiction of the impact of the warming on the polar ice caps, showing how they are rapidly melting.³⁵ If there was any doubt about the science, surely it was laid to rest when in 2007 Gore shared the Nobel Peace Prize with the Intergovernmental Panel on Climate Change, which for some two decades, drawing on the work of thousands of scientists around the globe, had issued authoritative reports on the connection between human activities and global climate change.

34 Ibid., 151 – 158.

35 Al Gore, *An Inconvenient Truth: The Planetary Emergency of Global Warming and What We Can Do About It* (Emmaus, Pa.: Rodale Press, 2006).

33 Elizabeth Kolbert, *Field Notes from a Catastrophe: Man, Nature, and Climate Change* (New York: Bloomsbury, 2006), 152 – 153.

Yet even if the next administration embraces the science, which it should, it will have to find ways to resolve the issues of equity across lines of class, region, and hemisphere. Support for indigenous efforts like the Chipko movement would surely help. So would financial assistance from the North to the South for acquiring and producing greener technologies. In all, arrangements will have to be devised that limit the First World's emissions of greenhouse gases while enabling the Third World to continue developing, though in ways that mitigate its contributions to global warming.

Annals by John Hope Mason

Rousseau in England

On January 15, 1766, the *London Chronicle* announced: “On Monday last arrived in town the celebrated Jean-Jacques Rousseau . . . [who] has been brought into much trouble and vexation, both in Switzerland and in France, for having ventured to publish, in many works, his sentiments with a spirit and freedom which cannot be done with impunity in any kingdom or state except this blessed island.”¹

Two days later the *Westminster Journal* recorded his arrival “in this city, to shelter himself from the persecution of the numberless bigots of the Continent.”² Shortly after, another contributor to the *London Chronicle* praised his *Discours sur l’inégalité*, expressed some reservation about *La Nouvelle Héloïse* (which “did more honour to his genius than his phi-

losophy”), and observed that “his native city thought proper . . . to banish him, and, after wandering from state to state, exclaiming at the prejudice and malice of mankind, half a philosopher and half a humorist, dressed in an Armenian habit, and mistaking novelty of opinion for justness of thinking, he has at length thought proper to end his days . . . in this land of boasted liberty.”³ England’s liberty was “boasted,” because unlike France (and elsewhere) its monarchy was not absolute, its press was free, and its degree of religious toleration was comparatively high.

Rousseau had had a reputation in Europe since the publication (in 1760) of *La Nouvelle Héloïse* (soon translated into English), and then (two years later) of *Emile*. The latter, however, contained an account of “natural religion” that praised the teaching of the Gospels,⁴

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1 Jean-Jacques Rousseau, *Correspondance complète*, ed. R. A. Leigh (Geneva: Institut et musée Voltaire, 1965–1998), XXIX, 296.

2 *Ibid.*, XXIX, 295.

3 *Ibid.*, XXVIII, 352.

4 Jean-Jacques Rousseau, *Oeuvres complètes*, ed. B. Gagnebin et al. (Paris: Gallimard, 1959–1995), iv.629.

but attacked the idea of divine revelation⁵ and described the life and death of Jesus as those not of “God” but of “a god.”⁶ This led to its immediate condemnation by both the Sorbonne and the Paris Parlement, and the latter issued a warrant for his arrest. The obvious refuge for him was Geneva, where he had citizenship; but the city-republic was no more amenable to the “*Profession de foi*” in *Emile* than were the authorities in Paris. In addition, the *Contrat social*, his tract on republican government, published almost simultaneously in Amsterdam, contained a chapter on civil religion in which Rousseau attacked Christianity for having become in practice a “violent despotism,”⁷ which only preached “servitude and dependence”;⁸ in other words, it was incompatible with republican freedom and participation. The Genevan authorities announced that he would be arrested if he set foot in the city. (This proclamation had a political dimension, since Rousseau was allied with those citizens who were resisting their exclusion from office by the prevailing oligarchy.)

He took refuge instead in Môtiers, a village in the province of Neuchâtel, then under the protection of Frederick II of Prussia. There he found a new stability – delighted by the countryside, and soon busy in defending first *Emile* (his *Lettre à Christophe de Beaumont* [1763]) and then his Genevan compatriots (in his *Lettres de la montagne* [1764]). His household consisted of his companion Thérèse and his dog Sultan, described (one time he went missing) as “a little

brown dog, with short ears and a short curled tail,”⁹ and dismissed by Hume as “no better than a collie,”¹⁰ but to whom Rousseau himself was very attached. “His affection for that creature,” observed Hume, “is beyond all expression or conception.”¹¹ (And it was indeed one of the few successful relationships of Rousseau’s life.) It was at Môtiers that Rousseau began wearing an Armenian caftan, partly for medical reasons (he had a constriction of the urethra, which meant he had to use catheters), and partly because, in the words of the first page of his *Confessions*, “I am not made like anyone else I have seen. I dare to suppose that I am not made like anyone else who exists. If I am no better, at least I am different (*Si je ne vaut pas mieux, au moins je suis autre*).”¹²

The rural idyll at Môtiers did not last. The religious issue was raised again, this time by the local pastor, and the vehemence of the pastor’s opposition eventually led some of his congregation to throw stones at the house where Rousseau and Thérèse were living, after a particularly hostile sermon one Sunday. It was this incident that then led to Rousseau being invited to England.

This came about through the good offices of an elderly Scotsman, George Keith, a Jacobite refugee who had had to leave the British Isles after the failure of the Jacobite Rebellion of 1715. He was subsequently appointed by Frederick the Great as Governor of Neuchâtel and in that capacity had given Rousseau refuge. It was then in the company of Keith’s fellow Scotsman, David Hume, then

5 Ibid., iv.607–608.

6 Ibid., iv.626.

7 Ibid., iii.462.

8 Ibid., iii.467.

9 *Correspondance complète*, XXIX, 1.

10 Ibid., XXVIII, 114.

11 Ibid., XXVIII, 204.

12 *Oeuvres complètes*, i.5.

Chargé d'affaires at the British Embassy in Paris, that Rousseau came to London. Hume had a high regard for Rousseau's achievements, describing him as greater than Socrates,¹³ and he took an immediate liking to Rousseau in person: "I love him much . . . I think I could live with him all my life in mutual friendship and esteem."¹⁴

Rousseau's arrival in London aroused huge interest, which was not to his taste, nor indeed that of Sultan who (disoriented by the unfamiliar environment) ran away on several occasions, though never lost for long. Hume wrote of Rousseau, at this time,

[He is] endowed with a lively imagination and . . . a singular simplicity of manners. [He] is indeed a perfect child in the ordinary occurrences of life. This quality, joined to his great sensibility of heart, makes him be easily governed by those who live with him, . . . his maid in particular, . . . [and] his dog also has great influence with him . . . He would not stay in London above a fortnight . . . [and] of the great variety of scenes which I propose to him, the most solitary, the most remote, and the most savage place is always that which he prefers.¹⁵

Initially, that place was to be Wales; but then Rousseau was invited to use a house in Derbyshire, on the edge of an area of great natural beauty – the Peak District. In late March he, Thérèse, and Sultan moved there. The conditions seemed ideal and spring would soon arrive.

At this point, however, disaster struck. A letter published in the *St. James Chronicle*, ostensibly from Frederick of Prussia, offered Rousseau asylum in Berlin and

every possible assistance in making him as miserably unhappy as he could want to be. Now it was true that Rousseau was prone to a degree of hypochondria, but (as it was once observed)¹⁶ he was also the worst kind of hypochondriac – namely, the one who is really ill (as Rousseau was, the result of uraemia infecting his kidneys). The depiction of him as an inveterate misanthrope infuriated him. He assumed that Hume was behind it. In fact, it had been written by Horace Walpole, a fluent French speaker and a frequent visitor to Paris. There, he had gotten to know various former friends of Rousseau, who were no longer well disposed toward him, and who delighted in telling Walpole how impossible Rousseau was – *un homme ombrageux*, moody, difficult, and paranoid. This inspired Walpole to write the fake letter.

When Rousseau learned about it he accused Hume of being its author. This led to a bitter quarrel between them, one that was then revealed to the world with the publication of their respective accounts. Less than six months after Hume had brought Rousseau to England – captivated by his personality and originality – Hume was reported as calling the latter "the blackest and most atrocious villain that ever disgraced human nature."¹⁷

Rousseau had first made his name with a prize-winning essay on the subject (set by the Academy of Dijon) of whether "the revival of the arts and science (i.e., the Renaissance) had contributed to the improvement of morality."¹⁸ When he

13 *Correspondance complète*, XXVIII, 114.

14 *Ibid.*, XXVIII, 203, 290.

15 *Ibid.*, XXVIII, 308 – 309.

16 Alasdair C. MacIntyre, *A Short History of Ethics* (London: Routledge and K. Paul, 1967), 185.

17 *Correspondance complète*, XXX, 22.

18 *Oeuvres complètes*, iii.1.

published the essay, he added two words to this question, making it an essay on whether the Renaissance had improved “or corrupted” morality. His point was that this revival had done more harm than good. In so doing, he acknowledged that he was confronting head-on “all that is currently held in esteem.”¹⁹

In adopting this position, he was following a long line of critics of intellectual and cultural achievement, beginning with the Cynics Antisthenes and Diogenes, best known in Seneca’s *Epistle* 88, and present in a number of Renaissance texts by Philip Sidney, Erasmus, Montaigne, and others.²⁰ It also had affinities with the Roman republican distrust of literature and philosophy. Rousseau’s initial inspiration for his essay – his *illumination* on the road to Vincennes – was the republican moralist, Fabricius, who attacked painters, sculptors, poets, and dramatists for their extravagance, self-absorption, and general lack of concern for the *res publica*, and condemned Roman society as a whole for being more concerned with aesthetic activity than moral integrity.²¹

Behind the eloquent attack in the first *Discours*, however, was something more than a historical tradition; there was also a deeply personal crisis. Rousseau had come to Paris to make his name as a writer and composer, but he had found only frustration and disappointment. His play *Narcisse* was accepted for performance at the Comédie-Italienne, but production was endlessly delayed. A worse setback occurred with his opera *Les Muses galantes*, extracts of which had

been performed privately (in 1745). Rameau heard some of the score and attacked it with “brutality” and “rage”; as Rousseau informed a friend, “I have never seen so much conspiracy and animosity.”²² He had supposed, as an honest Swiss, that success came simply with high achievement, “but I have learnt that other talents are necessary which I neither can have nor want to have.”²³

Rameau’s jealousy was not the only thing Rousseau learned from this incident: “The very rage of my enemies made me aware of my strength; without their jealousy I would still not be aware of my ability to combat them.”²⁴ In other words, competition and ill will could be productive. This experience was confirmed a few years later when Diderot asked him to contribute articles on music for the *Encyclopédie*. Rousseau had no great desire to undertake this work, but he saw it as an opportunity to get his revenge on Rameau. That bad feeling was fruitful: hatred could be stimulating; as La Rochefoucauld had observed, “*Il y a de méchantes qualités qui font de grands talents.*”²⁵ The voice of Fabricius condemning Rome was the voice of Rousseau condemning himself. The Dijon academy asked whether the revival of learning and culture since the Renaissance had improved morals. Not only had they not done that, they could not do that.

The central theme of the *Discours* was not that art corrupts but rather that artists are corrupt, not that audiences might be adversely affected but rather that aesthetic achievement is often the

19 *Ibid.*, iii.3.

20 See John Hope Mason, “Reading Rousseau’s First Discourse,” *Studies on Voltaire & the 18th Century* 249 (1987): 251–266.

21 *Oeuvres complètes*, iii.14–15.

22 *Correspondance complète*, II, 87.

23 *Ibid.*, II, 133.

24 *Ibid.*, II, 87.

25 La Rochefoucauld, *Maximes*, no. 468.

product of the least desirable qualities. Writers are animated above all, he stated, by a “*fureur de se distinguer*” – to make themselves noticed – and in the pursuit of that they care nothing for morality or the social good. What they want above all is to be praised: “*Tout artiste veut être applaudi. Les éloges de ses contemporains sont la partie la plus précieuse de sa récompense.*”²⁶ So they oscillate between a contempt for public opinion, which they must despise in order to be distinctive, and a constant attention, if not subordination, to the judgment of others,²⁷ which they must take into account in order to win the applause they crave – a double dose of bad faith.

In the course of writing the *Discours*, Rousseau had sent a letter to Voltaire in which he added after his signature, for the first time, the appellation “*Citoyen de Genève.*”²⁸ The first edition of the *Discours* had on its title page not Rousseau’s name but the words “*Par un citoyen de Genève.*” This was followed by an epigraph from Ovid: “*Barbarus hic ego sum quia non intelligor illis*” (“I am a barbarian here, because they do not understand me”).²⁹

This line was something of a leitmotif for Rousseau; he had first used it seven years earlier,³⁰ and was to use it again two years before he died.³¹ It occurs in an extended sequence of poems to which Ovid gave the title *Tristia* (*Sorrows*), because they were written in exile.

26 *Oeuvres complètes*, iii.21.

27 *Ibid.*, iii.19, 21.

28 *Correspondance complète*, II, 124.

29 *Oeuvres complètes*, iii.1. The citation is from Ovid, *Tristia*, X, 37.

30 *Correspondance complète*, I, 139.

31 *Oeuvres complètes*, i.657.

Ovid’s erotic *Ars amatoria* and some undefined ‘error’³² had caused grave offense to Augustus, and Augustus had banished him from Rome. He was sent to one of the outermost places of the empire, Tomis (now Constanza, in Romania), on the western rim of the Black Sea: a bleak and desolate place, with long cold winters (when even the sea sometimes froze)³³ and inhabited by barely civilized people – Sarmatians – who were in continual conflict with the neighboring tribe of Getae.³⁴ “Even when there is peace,” wrote Ovid, “there is fear of war”; “nothing outside [the city] is secure.”³⁵ Yet in these circumstances it was he who was the barbarian, because he was understood by no one.³⁶

What at the time of Rousseau’s first success (with the first *Discours*) had been a bold claim to individual distinction, became in 1766 an unwelcome fact of life. In England he was indeed almost a complete outsider; while he could read the language he could not speak it, nor understand it when spoken.³⁷ As a result, he was isolated to a degree that he had never experienced before. In these circumstances, almost the only solace – as it had been for Ovid in his *Tristia* – was in writing. “My muse alone comforts me,” wrote Ovid,³⁸ and it was during his seventeen months in England that Rousseau wrote much of the first

32 Ovid, *Tristia*, II, 207, and IV, 10, 90.

33 *Ibid.*, III, 10, 37–38.

34 *Ibid.*, IV, 10, 110.

35 *Ibid.*, III, 10, 65, and V, 10, 17.

36 *Ibid.*, IV, I, 87, and V, 10, 36–37.

37 *Correspondance complète*, XXIX, 162, 266, and XXX, 90.

38 Ovid, *Tristia*, IV, 1, 3, and IV, 19–20.

part of his *Confessions*. But that was not all, for this activity came to be more than consolation. As alienation may illuminate, so exclusion can bring insight; the barbarian may see what the civilized have lost sight of. The very bleakness of Rousseau's situation stimulated his memory, recapturing the time before he had a name in the world with a magically evocative account of his early life. As the rains fell around him in Derbyshire, the happy years of his prolonged adolescence and early manhood came vividly to life once more; and so when he left England the following spring, in May 1767, he did not go empty-handed.

Poem by C.D. Wright

Because We Have Been Here Before

It is imagined that all of the world bears our mark, holds our form, and that the land is reminiscent in detail of all that ever came of its issue, was built on its foundation.

What is not in blinding color becomes progressively obscured in shadow.

A bottle rolled to the foot of the hill glinting against the rock that stopped it.

An eruption of silence in the hottest part of day.

The tree was here then, but we have no pictures, no reports, nor is there any score in the bark to show what it might have endured.

It grew quickly and rose to the dormers of the third floor where shots were directed into a shower stall.

A collection of arrowheads taken to a hock shop.

Clapboards, splendid cattails at the swimming hole, and a motel named Capri.

Maunderers and liars, fry cooks and local historians.

Story of a probable patricide. Taverns of long hours and bad pay.

The king snake that lived under her porch.

A closet of [a suspect's] costumes.

Every place will yield its own tragedies and its own efforts to overcome its past.

An animal running into the woods causing all others to halt.

The yew is perhaps the first of its kind on this continent.

There is an obsolete word, *meuse*, which referred to the form of an animal left by its lying, particularly a hare and other creatures of sport.

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Fiction by Wesley Brown

Body and Soul

There was a small group of musicians waiting for Coleman Hawkins when his ship docked in New York City. Coleman had been away in Europe for five years. But with war simmering to a boil, he knew it was time to get himself on the first ship steaming back to the States. The welcoming committee included two of his oldest friends, Benny Carter and Jimmy Harrison. After the glad-handing was out of the way, they started signifying to make him feel at home.

“Hey Bean, you looking as trim as your mustache,” Jimmy said.

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Leave it to Jimmy to draw first blood. Something Coleman was known for when they were in the Fletcher Henderson Band together. Nobody had called him Bean since he left the country. Early on, Coleman gained a reputation for having a mean ‘bean’ of a brain that allowed him to do just about anything he wanted on the tenor saxophone. He kept tight-lipped about how good he was, but the name stuck and he answered to it.

“I guess if you got a lot of trim over there in England,” Jimmy said, “you more than likely gonna stay that way yourself.”

He enjoyed the laughter that followed but didn’t join in. That was always his way. Stay close to the mix of what was going on, but don’t get too familiar with it. Laughter continued bouncing around in everyone’s shoulders. And Coleman remembered Jimmy was also called ‘bean,’ but only the kind that went with the word ‘string.’ He was still all arms and legs, his skinny limbs like rubber, connecting him to the trombone when he played.

“So who’s who and what’s what?” Coleman asked.

Heads swiveled toward one another to see if everyone got his drift.

“It didn’t take you long to get down to business,” Benny Carter said.

“What business might that be?”

“Bean! You’ve gotten even more slipperiness than you were before you left. But you just gonna have to wait ‘cause we don’t wanna spoil the surprise!”

They all piled into Benny Carter’s Cadillac and headed uptown. Benny always impressed Coleman with how he held his own in any musical setting. He wasn’t intimidated by reputations, whether they preceded his or came after, making him someone who could play with the best and never let anyone play him cheap. This made them do their best when they challenged each other on saxophone or clarinet years before in the Henderson Band. Benny still had that barrel chest, easy laughter, and eyes that soaked up anything worth paying attention to.

“So Bean, tell us about all the ‘fine dinner’ you had while you were gone,” one of the other musicians said.

“You got me all wrong. The reason I came back so trim was because I traveled light and ate the same way.”

“Man! You as much of a tightwad about giving up any info on all your overseas chippies as you’ve always been about holding onto your money!”

“I’m sorry fellas, but I follow the old saying that those who tell don’t know.”

“You don’t need to worry none, Bean. We can’t cut in on your time with ladies who’re way over on the other side of the ocean.”

They had that right, since no one cut in on Coleman’s time with women more than he did himself. He was known to play gigs all night and then find jam sessions that lasted late into the morning. This steady diet of playing fed him creatively but starved his first marriage. Coleman’s wife, Gertie, always greeted him with a ready-made breakfast and a sweetness that only wanted to please. To be honest, he had to accept his share of

the responsibility for that. There was more than a little calculation in how meticulous he was about his appearance – from double-breasted Gibraltar-shouldered suits and long spike-collared shirts to the slim trim of his mustache and cut of his nails. He knew the stylishly dressed figure he cut while playing the Glenn Miller Band’s hit ballad “Wishing (Will Make It So)” would have more than a few women rushing up to him afterward, hoping to convince him how anxious they were to please. And he was more than happy to have them try – which was how he first met Gertie. What he hadn’t figured on was how wanting to please got old when the thrill didn’t cut both ways. It would’ve been better for both of them if Gertie had done what she probably really wanted to do – which was to get up in his face about his late hours and demand that he spend more time with her. That’s what Coleman lived for: the opposition he got from other musicians who took each other’s best shots and came away from the fray with the only kind of companionship that made sense to him.

The day after Gertie finally left, Coleman looked around the nearly empty apartment. Whatever home they shared, she’d made and taken it with her. Coleman felt no loss for what was gone and saw nothing of himself in what remained: a bed, a table, and a few chairs. The only thing that mattered stood upright on a stand in a corner, gleaming like it had been washed in a burst of light from the sun. Coleman often wondered if he could ever be with a woman who needed, as much as he did, the opposition that was the same as friendship. Good question.

Coleman continued to take the ribbing that tightened the squeeze of bodies on either side of him. They could have all the fun they wanted, since there were

more pressing matters on his mind, like the surprise Benny said was waiting for him later that evening. The conventional wisdom was that any advances in the music were a young man's game. He looked at his reflection in the rearview mirror. The streamlined mustache that curved upward just short of his nostrils had no traces of gray and still received compliments from women on how it made his mouth fuller and more expressive whether he was playing or talking. Since he was only a few months shy of thirty-five, his hairline had receded a bit, something he would fix by keeping it cut short. Could it be that he might've stayed away too long, and would be unable to keep pace when challenged by these young upstarts who were eager to expose him as a has-been? But being a little anxious didn't mean he was fearful. He'd spent too many years honing his musical chops to believe there was anyone so good that he wouldn't have answers for whatever they had to offer.

Coleman had come a long way since his youthful days in the early 1920s, when he was given top billing as the 'Saxophone Boy,' with Mamie Smith and her Jazz Hounds. He never mentioned this period of his life because it froze him in a time he wanted no part of. Coleman was even close to the vest about his birth, saying his father was a merchant seaman who met his mother on the Cape Verde Islands, where they married. He was born at sea on a merchant ship heading back to the United States. So there was no record of the actual date or year of his birth. The here and now was all that interested him. On the rare occasions when Coleman dwelled on the past at all, it usually related to music he was thinking about at the moment. He recalled the advice of his mother, Cordelia, whose voice hammered into him the importance of find-

ing something constructive to do that few people, colored or otherwise, could do, and then to do it better than anyone else. She told him, he'd be surprised how many people would flock to be near him once they were aware of how special he was. His father took a second job to pay for a cello and lessons for their only son.

One of the first things Coleman learned about playing the cello was the amount of breath needed to play it. Pressing himself against its wooden body, it surprised him how much he'd taken breathing for granted. As his breath breezed along with the groans plucked and bowed across the strung ribs of the cello's chest, he realized that every breath he took gave his fingers, hands, and arms the strength to bring another sound to life. But nothing prepared Coleman for his first sight of a saxophone in a music store window, glistening like a golden goose whose beak and keys, running down its spine, awaited fingers and a mouth to make it sing. He could only marvel at an instrument in which breathing mouth to mouth was at the heart of making it live. He tried out the various voices of the saxophone and chose the tenor, whose size nestled comfortably in his arms and against his already broad chest, and whose tone was closest to the range of his voice, which had a maturity beyond his twelve years. But the one thing that convinced Coleman that he had to play the saxophone, and made him laugh out loud whenever he thought about it, was the fact that he could blow into the mouth of this long-necked bird of a horn and hear his breath burst out of the other end, which looked like the place where the sun didn't shine!

Coleman tuned in and out of the talk going on in the car and found himself hearing his father's voice, as it sounded when he was a child. William Hawkins

was a man of few words. But when he spoke to Coleman, it usually took the form of a story. One of his favorites was about the legendary outlaw Jesse James, who was shot dead in 1882 by Robert Ford in St. Joseph, Missouri, the city where Coleman was born. According to family lore, Coleman's grandmother had once let James hide out in her home, while he was on the lam from the law. William Hawkins never bought into the stories of James robbing the rich and giving to the poor. Like most of the colored in St. Joe, James came into the world with very little but did more harm than good while he was in it. If he had any saving graces, the one Coleman's father took to heart was James's philosophy of how the world worked. Those who had the best of everything in life made sure that other people paid for it, which is what the rich did. And the only people who paid for everything were those who could least afford to. His father made it clear that this never justified stealing, even from those who were thieves themselves. So Coleman embraced his mother's view that he deserved nothing less than the good life, with all the trimmings worthy of his gift. By 1923, he found, in Fletcher Henderson, a bandleader who was more than willing to pay for his young virtuoso's expensive tastes in clothes, food, liquor, and fancy cars.

In 1936, while performing in Switzerland, Coleman received a letter from his mother that his father had died. A newspaper article, included with her letter, reported that William Hawkins, age sixty, stood on the bank of the Missouri River around noon, lit his pipe, adjusted his glasses, buttoned his coat, and walked calmly into the river. Witnesses who saw him said his body floated on the surface for some minutes before it disappeared. Coleman couldn't

remember feeling much of anything afterward. The fact of his father's death seemed less important than the way he took his life. Aside from walking into the river, he did nothing that was a departure from his daily routine. It wasn't his father's way to draw attention to himself. He went about his business without making a big fuss. And when he decided that the price for living his life was more than he was willing to pay, he calmly got out of a world that didn't allow him to live in it the same way he was leaving it. Coleman learned the lesson of his father's life very well and didn't feel there was any reason to grieve. He'd found his own way of separating himself from the world. But instead of getting out of this life by taking his own, Coleman left his waking life by making another out of his own breath.

Fingers snapped Coleman out of his reverie.

"Damn, Bean," Jimmy said. "You ain't been back an hour and you already off somewhere else."

"String Bean! You got anything better for me to think about until we get to the Savoy?"

"That'd be difficult to do, since you ain't never allowed anyone to get much of a peep inside your head."

"It's all there for anybody to hear when I play."

"Things've changed since you been away. Folks want a lot more from musicians they're paying their hard-earned money to see. You know what cats were saying about you when you left?"

Coleman didn't press Jimmy to answer his own question. Why should he care one way or the other what anyone said about him?

"The word on the street is that you wouldn't give a damn or a dime to see the Statue of Liberty doing the 'Lindy' on the Brooklyn Bridge at high noon!"

He had to give it to Jimmy. That wasn't bad. And by the time they reached the Savoy, everyone's throat, including his, was sore from coughing up a load of laughter. It was several hours before the ballroom opened to the public, but musicians from several bands had already gathered. There were a few double takes and mouths opening in surprise before outbursts of "Hawk!" and "Bean!" echoed everywhere, followed by a round or two of needling to see if the years away had made it any easier to get underneath his skin. As the group around Coleman drifted away, he spotted a chunky, fat-cheeked man with a trumpet under his arm, giving him a grin that stretched out to a whole upper row of teeth. A smile creased Coleman's cheeks but didn't go any further than that. It was Rex Stewart, a trumpet player who'd been in the Henderson Band. The last time he'd seen Stewart, there wasn't even peach fuzz on his face. Coleman remembered him as someone who had difficulty figuring out the keys that many of the band's arrangements were written in. Sight-reading was second nature to Coleman. Thinking back on it, he wondered if he should've been more understanding of what Stewart was going through. But he was only twenty-one at the time, not much older than Stewart, and found ways of messing with band members, especially those who weren't able to keep up with him musically. Stewart was one who fell into that category. Coleman had gone into the dressing room early before a gig and rubbed some itching powder into the collar of the shirt Stewart was going to wear. During a high point of the night, when heat was rising up off of dancers on the floor, Stewart stood up to take his solo. The itching powder mingled with his sweat, and it was all he could do to keep his jerking head from flying off the

handle of his neck. He was too old for that kind of foolishness now. But it was still funny as hell.

"What are you smiling about?" Stewart asked, no longer grinning.

"Just thinking about all the laughs we used to have in Fletch's Band."

"You mean the laughs you had!"

Stewart was no longer that kid who gripped his trumpet so tightly that he strangled the notes in his throat before he could get them out. He lifted his trumpet slowly to his mouth and gently pressed it against his lips. The sound came out in short bursts at the tempo of a high-stepping march. It was strangely familiar. It took a few seconds before Coleman recognized Stewart's slow-motion version of reveille. He dipped his shoulders from side to side, strutting in time with his trumpet jabs snapping Coleman's head back. Stewart was serving notice that he was fully awake; and if Coleman put a deaf ear on this wake-up call, he had better be a praying man because that was the only way he would get any mercy. Coleman was impressed by the brashness Stewart added to his trumpet. And he liked the way Stewart called him out, not with a lot of blow-hard and bare knuckles, but with a gloved fist, just loud enough for him to feel the punch. But he wasn't worried. Stepping over to Stewart, Coleman heard his voice crackle with laughter as he slapped him on the back.

"You think what I did was funny?" Stewart asked, unsure of how to take Coleman's good cheer.

"No, Rex. If I did, I'd have slapped my knee and not your back."

Benny Carter had arranged to take Coleman to a number of nightspots, so musicians around town could welcome him back. When they arrived at the Famous Door, a midtown Manhattan club where the Count Basie Band was appear-

ing, guests that included Billie Holiday, Ella Fitzgerald, and Jimmy Lunceford took up several tables. Hands reached out to touch Coleman. Words jumped out at him from every direction but were cut to shreds by slashing sounds from the Basie Band. He was never at ease in large gatherings unless he was playing. And as far as small talk, forget it! Coleman ordered a double scotch. Benny leaned over and whispered that his money was no good for the rest of the night. He downed the scotch, ordered another, and waited for the liquor-coated comfort to take hold. By the second double, Coleman was cut off from everything except the Basie Band, with his ears tuned into the two tenor players: Leon 'Chu' Berry (who'd taken the other tenor chair left empty when Coleman's old adversary, Herschel Evans, died earlier that year) and Lester Young. Basie opened up with an old standby, "Jive at Five," playing a stingy five-note intro followed by the trombonist, Dickie Wells, setting a medium tempo, with mouth rumblings of someone shivering from a chill. The big-as-a-tub Chu Berry took a leap into the cold, gripping the saxophone in a choke hold. He was husky-throated and shouted into his horn until it did what it was told. Before Young took his solo, Coleman watched this large, soft-bodied man cradle his saxophone in his arms like a sleeping child. Standing up, he held the sax in his trademark fashion, cocked to the right as someone would while playing a flute. Those sad-sack, heavy-lidded eyes looked out beyond the bandstand; and then the sound, like slippers, soft-pedaled around Berry's rough edges with an easy-does-it, no-sweat attitude, sliding over the beat like a skater on ice.

Benny poked Coleman in the ribs, and other musicians around the table eyeballed him to check his composure. This

must've been the surprise he was promised. The baiting began just as the band entered the stretch run to end the tune.

"What do you think, Bean?" someone asked.

"About what?"

"About what you just heard."

"You can't beat the Basie Band!"

"What about Chu and Prez? Can you beat them?"

"I just try to play up to my own standard."

"Will that be enough when you go up against Lester like you did at the Cherry Blossom Club in 1933?"

That was always brought up. The night in Kansas City when he took on Ben Webster, Herschel Evans, and a newcomer named Lester Young. He'd gone to the Cherry Blossom to see if Young was everything people said he was. And he was. All that scuttlebutt about his quitting when his wailing on tenor couldn't get Young to spit the bit was never worth the breath it would've taken to give his version of what went down. Coleman believed his playing gave the best account of what he'd done. And since the numbers of people continued to grow who claimed they were there in that closet-sized club the night of the jam session, the less said about it the better.

Coleman tried to ignore the taunts, but it was impossible to block out the voices, bending his ears with shouts. He wanted to kick back and take it easy after such a long day. But as he glanced around, no one in the club was having any of that. No one except Lester Young, whose teabag-lidded eyes lifted to catch Coleman looking his way. And before Young blinked, something in his eyes told Coleman that he wasn't that hot to trot to give the audience what it wanted either. Coleman reached under the table for his saxophone case, got up, and squeezed

his way up to the bandstand. By the time Coleman joined Young, a hush snuffed out any other sound. Lester spoke to Coleman just above a whisper.

"Looks like we got a lotta edge-of-the-seaters out tonight looking to see a cruise where somebody gets bruised."

"Looks that way," Coleman said.

"You down for that?"

"The question is whether we're up for it."

"Where's your head at on that?"

"Same place yours is," Coleman said.

Cracks of restlessness were heard in the silence that held the audience captive.

"What you cats gonna do – " a man shouted, "dribble or shoot!"

"We might just pass," Lester said, shooting his arms forward like a two-handed toss of a basketball.

There was a smattering of laughter, but the uneasiness remained.

"Bean! You got the time?" Lester asked.

"Thanks, Prez. I appreciate that. Everybody else in this joint just wants to tell me what time it is without asking."

"Maybe 'cause they don't know."

"Could be."

"So you wanna take it from letter A on 'Jive at Five'?"

Coleman nodded and roared out of his horn as fast as breath and fingers could carry him, with Lester no more than half a leap behind. The audience was up in arms with yells and whistles. But before they had a chance to get a hold of the speedy groove, Coleman let out a high-pitched whinny, raising his saxophone up like a thoroughbred being reined in until it slowed to loping along. Lester followed Coleman into something sounding like "Home on the Range," where the buffalo roamed and deer and antelope played without butting heads, and where there were no dis-

couraging words or showdowns that left the skies cloudy all day. When Coleman and Lester were done, people began filing out of the club, not knowing quite where they were, using their hands to guide them, like someone walking in the dark. Only the musicians seemed not to be confused by what they'd heard. Some shook their heads with smirks on their mouths.

Coleman caught sight of Lester near the door of the club and went over to him.

"I guess we'll get to do what everybody's waiting for another time," he said.

"Yeah, as long as we both got the time," Lester said, giving a two-finger salute against the wide brim of his flat crown top hat, and then turning on his toes and sliding out the door with the same ease that he played.

Coleman ordered another double scotch, returned to his table, and found Jimmy Harrison in a fit of uncontrollable laughter.

"Bean! You and Prez gotta be the most contrary Negroes I've ever seen!"

"Why you say that?"

"You just can't give folks a good time the way they want you to."

"I give them myself. That should be a good enough time for anybody."

"What would it have cost to give them the show they wanted to see?"

"I can't speak for Prez. But it would've cost me my need to do what everyone didn't expect."

"Yeah, like the time we were playing baseball in Fletch's Band, and you showed up wearing a Panama hat, a tuxedo, and patent leather shoes. And when you took the field to play short-stop you had on a first baseman's mitt!"

"I had to protect two of my most important jewels," Coleman said, holding out his hands.

“What were you protecting up on the bandstand?”

“The element of surprise.”

The club continued to thin out, and Coleman was surprised when Louis Armstrong came over to greet him.

“It’s solid having you back on the scene, Bean.”

“Good to be back, Pops!”

“You’re still one clever son of a gun.”

“How so?”

“What you and Prez pulled tonight will make the bread you get for the real showdown smell even better.”

“Well, you must be doing something right because you’re looking as prosperous as ever.”

“I got no need to be kicking.”

Armstrong didn’t linger, and Coleman felt no desire to say more. Aside from his unmistakable gravel throat, Armstrong was laid-back without any of his usual fun-loving joshing around. Truth be told, Coleman never cared much for Armstrong. His first impression when the New Orleans wonder joined the Henderson Band in the early 1920s was that this thick tongued–talking young man, wearing clodhoppers with long johns showing at the ankles below his high-water pants, didn’t square with the trumpet phenom he’d heard so much about. During his time with Mamie Smith, Coleman went through a period of looking country and smelling funky before he was set straight on how to present himself properly. He wasn’t proud of it, but as a younger man he fancied himself as somewhat of a peacock. So how could he take this Armstrong fella seriously? But his head, like everyone else’s in the band, was spun around when he heard him trumpet a story as old as Adam and Eve, but swinging with the sweetness and stink of a new century. Coleman remembered the night Armstrong played ten choruses of

“Shanghai Shuffle” at Roseland Ballroom in New York City. He worked the crowd up into such a frenzy that several men carried him out into the street on their shoulders like a conquering hero.

Armstrong was that one-of-a-kind performer, who burst the seams keeping an audience cooling their heels and roused them with sky-high trumpet howls that stormed the heavens and sang with grunts from deep down in the belly of the earth. There were few who could command the stage even without an instrument in hand. That night at Roseland proved to Coleman that he wasn’t one of them. But Armstrong’s performance made him see his own strength in the undivided attention he gave to the saxophone, playing not to the audience but for himself. Like Armstrong, Coleman was not a big man. But with a chest like a pot-bellied stove, he could blow thick slices of sound that slapped together, making his own size and everything around him seem larger.

Coleman watched Armstrong leave the club. And he had to admit his fondest memory of him came when he opened his mouth, not for a hot trumpet solo or vocal, but to give Fletcher Henderson his notice. Armstrong was a bit tipsy after a night celebrating his decision to return to Chicago and form his own band. He was saying good-bye to everyone and approached Henderson to thank him for all his help. As Armstrong spoke, his stomach heaved, and he threw up all over the bandleader’s suit. Coleman couldn’t stop laughing, especially when the unflappable Henderson thanked Armstrong, as though expressing gratitude for what Satchmo had just done to him. It wouldn’t have surprised Coleman if Armstrong had never forgotten the incident and who laughed the loudest and the longest.

Coleman rented an apartment on Central Park West and began playing gigs on 52nd Street and going to after-hours jam sessions in Harlem. There was great anticipation among musicians and devoted followers of the music for the eventual showdown between Coleman and Lester Young. But the main event was delayed by would-be contenders who Coleman believed were supposed to keep him so busy carving them up during the nightly cutting contests that he wouldn't be ready when the real test came. They would often arrive, sit quietly, and try to unnerve him by never touching their instruments. At other times they hid their horns inside their coats, then pulled them out and began playing in the hope of catching him off guard.

Coleman enjoyed all the attention but wasn't surprised by it. He'd recently gone to see the movie *Stagecoach* and was quite taken by an early scene where a stagecoach, traveling through Indian territory, was stopped in its tracks by a gunshot. Through a camera trick, the man who fired the shot was zoomed out of the distance into a close-up that took up most of the space on the screen. The cowboy holding a rifle and a saddle was played by John Wayne. And the camera singled him out as someone to be reckoned with. A jolt rushed through Coleman that he usually felt after downing a double shot of scotch. He knew something about being front and center, and he'd be damned if he was going to give that up!

One night Coleman appeared as a featured guest soloist at the Famous Door with the Lionel Hampton Band. Waiting to take his solo on the opening tune, he shuffled his feet and bobbed his head like a bronco rider about to be let out of the chute. He'd been thinking about what Chu Berry and Lester Young played that first night of his return. Coleman

stepped into the spotlight and blew a path that stretched out beyond what he'd heard. He took a bit of Berry's rough-edged sputter and Young's slippery glide, mixing them into a ride that had the bumps of rusty roads and the dizziness of flying floors. He nodded his appreciation for the applause from the audience. They'd obviously enjoyed the ride. But it was different when he performed at ballrooms. This was something Coleman noticed in Europe, where he played many more club and concert dates than dances. When folks hit the dance floor during his years with the Henderson Band, it wasn't so much playing for them as it was with them. It would begin with the band leading the charge that kicked the dancers into gear, as they scuffled to match their steps to the tempo. But that could change in an instant, when the dancers hit a stride that turned the band into bystanders, taking their cues from the swinging stuff being played by the flash of feet. On the best nights at the Savoy or Roseland, the band and dancers would take turns huffing and puffing and blowing each other down.

The exchange of air at clubs in Europe and that night at the Famous Door was much quieter. And Coleman had become attuned to what he was getting from the people who came to sit and listen. He could tell, from the slightest rise and fall of their shoulders and chests, who was with him, breath for breath, and who inhaled what he'd blown and then exhaled it back at him when he took another breath. Coleman took it all in: the bobbing heads, the fingers drumming on tabletops, the patter of feet on the floor, the mouthing of words and sounds that were not, and the eyeballing, some of it reckless.

After any set, Coleman was never eager to step out of the time and tempo of

the music and back into what he left behind. Well-wishers, wanting to talk, crowded around him. There was desperation in the way many reached out to him, their eyes pleading for some other piece of himself, in a word or a touch, that was more lasting than what he'd played. His mother hadn't warned him about this part of having a gift that people wanted to be near. Coleman couldn't help but be sympathetic. He needed what they wanted from him even more than they did. But he could only offer it while playing. Afterward, he needed to protect it and himself. So he let them buy him as many rounds of drinks as they wanted.

The much-anticipated shoot-out between Coleman and Lester Young was delayed because the Basie Band was on the road and wouldn't be back until sometime in September. In the meantime, Coleman contented himself with swatting away the unsatisfying challenges from pretenders, big and small alike, buzzing around him like flies. He became bored by the predictable outcome of these encounters but perked up when an offer came to feature him on a recording of several tunes and backed up by an eight-piece band. On the afternoon of the recording session at the Radio City building, he walked past a newsstand with the headlines on all the papers warning of a possible German invasion of Poland. The date also caught his eye, September 2. Coleman wasn't one to keep close tabs on the news of the day. But this date reminded him of the following day in September ten years earlier, when the stock market crashed. Normally, this would have meant very little, except that it convinced him he'd been right to keep his money close at hand rather than in the money-changing hands of a bank.

The other musicians were in the studio when Coleman walked in and a few started to snicker.

"Bean? Was it running out of ladies that got you here on time?" one of them asked.

"Don't you worry about it. Just remember, it's more important to play in time than to be on time."

"You hear that? Bean listens to a different beat from the rest of us."

One of the men in the sound booth called out over a loudspeaker.

"If we don't start soon, we won't have enough time to lay down the tracks of all these tunes."

The band settled in, and the first tune was recorded without much difficulty. The second, "Fine Dinner," was written by Coleman and was one of his favorites. The trumpet and alto saxophone opening gave voice to the tastes that were in their mouths, as they bounced on top of the bass player's finger-plucking that carried them along breezily. The horns took the tempo up a notch and sounded out a "wow!" as if they'd spotted a woman who wasn't satisfied to be served up like dessert on the sidewalk, but stayed on the go, just out of reach, and let it be known that her swivel hips were for her to show and a precious few to know. The brass and reeds hollered for Coleman to size her up. His solo gave her a juicy big buildup, filled with pulp and seeds. But he begged off getting underneath her crust, as if to say, he only handed out those goodies when he had a 'fine dinner' all to himself.

The band took a break before doing "She's Funny That Way," and Coleman talked to the singer, Thelma Carpenter. His eyes lingered on her a while. She couldn't have been more than eighteen, but she seemed eager enough.

“So! You’re what’s up and coming?”
“I don’t know how up and coming I am. But I am a singer.”

“Being a singer is more than carrying a tune. You have to want the song to carry you. If you can do that, then you can treat it like someone you have a thing for but don’t really know. But the more they get next to you, you just can’t get enough of their smell.”

“Mr. Coleman, I don’t mean to be disrespectful but . . .”

“Just hear me out . . . So you start living in every corner of that song to find all of its hiding places, and let it do the same to you. And when your nose is wide open and you’re about to bust from holding in all that sweet sweat, nothing can stop you from letting out all that joy and trembling.”

She was perspiring and didn’t like it.

“Mr. Coleman? What are you talking about?”

“I’m talking about being a singer!”

The band cleared the way for her to enter “She’s Funny That Way.” Coleman’s advice kick-started his hope that her sweat would offer up a secret, which would surprise them both. He coaxed her under, over, around, and through the lyrics and heard some Lady Day in her voice. But what young singer didn’t. She had a ways to go, though, before her tongue put enough mischief in her mouth to make her voice ‘funny’ in the way the song needed it to be.

The band prepared to play the last tune of the session, when the recording engineer called out to Coleman.

“Why don’t you do ‘Body and Soul’ to finish up?”

“I had something else in mind.”

“We can do that another time. I heard you do ‘Body and Soul’ in a club once, and I think it’d be good to have a recording of it.”

Coleman shrugged in agreement.

“Give me an intro to start off,” he said to the piano player.

He laid down a light drizzle of notes. Coleman took a breath and spewed out something gruff, from deep in his chest. For some reason, he still didn’t want to play this tune about the two halves of one person that were often at war, just like the world was about to be. Coleman felt the weight of his legs holding him down. And the steady beat of walking feet from the bass and the drummer’s whispering brushes against the snare weren’t enough to take the floor out from under him.

“Could we do another take, Coleman?” the engineer asked afterward. “The sound levels were a little bit off.”

“We’ll have to do it another time. I’m done for the night.”

Coleman left the studio by himself, since all the other musicians wanted to listen to what they’d recorded. He walked down the hall toward the elevator and passed an open door to another studio. Pausing to glance inside, he saw a raw-boned, slick-haired man kneeling down over an opened long narrow suitcase. He reached inside and pulled out a wooden dummy dressed in a tuxedo. The man impressed Coleman with his stylish double-breasted suit and stick-pinned collared shirt behind a checkered tie. He lifted the dummy into a sitting position and, very carefully, straightened the white bow tie, attached a monocle over the right eye, snapped open a top hat, and placed it on the head. This had to be that guy on the radio, Edgar Bergen, and his smart-mouthed sidekick, Charlie McCarthy. Coleman started listening to the show shortly after he returned to the States. At first, he couldn’t understand how a ventriloquist act could work on the radio. But he got such a kick out of Charlie McCarthy’s wise-cracks that it didn’t matter how good

Bergen really was at making his voice sound like it was coming out of the dummy's mouth.

"May I help you, sir?"

Coleman was a bit startled when Bergen spoke to him.

"I'm sorry. I didn't mean to disturb you. I just finished a recording session down the hall, and I was on my way to the elevator. You're Edgar Bergen, aren't you?"

"Yes, I am."

"I enjoy listening to your show."

"Thank you."

Bergen looked at Coleman's instrument case.

"What do you play?"

"Tenor saxophone."

"I guess you could say we both live our lives out of what's in these cases."

"You'll get no argument from me on that."

"Of course, Charlie has told our listeners that I've got the whole country fooled because I move my lips when he talks."

Coleman raised his instrument case.

"I move my lips too when I make this talk. But I guess the important thing is what Charlie McCarthy and my saxophone are saying when our lips are moving."

"I appreciate you saying that. What is your name, sir?"

"Coleman Hawkins."

"I'm pleased to make your acquaintance."

"Likewise."

"I have a feeling Charlie would like to meet you too."

He pulled over a chair, sat down, and put Charlie on his lap. His mouth opened and a squeaky voice, unlike Bergen's, came out.

"I thought he'd never let me talk. Bergen sometimes forgets that without me he's a body without a soul."

Coleman shot a stare at Bergen.

"Don't look at him, Mr. Coleman. This is me talking!"

Bergen's lips didn't move, and Charlie's voice seemed to be coming right out of his own mouth. Coleman directed his eyes slowly back to Charlie.

"Why are you so surprised? I only tell the listeners that Edgar's lips move, so he'll get some of the credit for my sharp mind and quick wit. But when we're not in front of an audience, we don't have to fake it."

Coleman looked at Bergen again, hoping he would explain.

"Charlie has a very vivid imagination," he said, moving his lips for the first time since Charlie began to speak.

"Of course I do!" Charlie shot back. "I'm no dummy!"

"So if Mr. Bergen doesn't do the thinking for you, how'd you get to be so smart?" Coleman asked.

"Only God could explain it."

"And only a double scotch could make me believe it," Coleman said.

"Bergen! I think W. C. Fields left some of his strong medicine in a drawer, the last time he was on the show. Would you pour us a drink?"

With his free hand, Bergen pulled open a drawer and took out a flask and a shot glass. He poured in two fingers worth and handed it to Coleman.

"Hey Bergen! What about me?"

"Nothing for you, Charlie," Bergen said.

Coleman downed his scotch and shook his head.

"Are you all right, Mr. Hawkins? Why don't you have a seat?" Charlie said.

Coleman settled into a chair, not sure of what he was seeing or hearing. Then Bergen stood up, holding Charlie from behind with one hand.

"So, Mr. Coleman, as a musician, are you paid exuberantly?" Charlie asked.

The scotch kicked in, and Coleman, feeling a little giddy, gave his complete attention to Charlie.

“As a matter of fact, Charlie, I play exuberantly, but the pay is never exorbitant.”

“You hear that Bergen! Mr. Hawkins is quick on the draw, even when he’s sitting down.”

“Yes, he is, Charlie,” Bergen said.

“Mr. Hawkins. Would you be interested in a job as my mouthpiece?” Charlie asked.

“I use one, but I don’t want to be one.”

“I’m glad to hear that,” Charlie said. “Because I don’t want to be one either. But I wonder if you’re as good on your feet as you are sitting down?”

Coleman glared at both Bergen and Charlie, who gave him back the look of seasoned cardsharks, refusing to show their hand until he played his. They’d gotten his juices flowing, and he welcomed the sweat soaking his underarms, just as it did right before he went toe-toe with a worthy challenger in a club or after-hours joint. He’d been waiting to feel like this since returning from Europe. And it was hard to believe that a ventriloquist playing second banana to his wooden buddy would’ve made mischief in their voices that he’d been hoping to hear from other musicians. Coleman opened his saxophone case, pulled out his horn, and stood up. He tightened the mouthpiece, put the strap attached to the sax around his neck, and nestled the lower body of his horn against his stomach. Standing shut-eyed and not giving a thought to what he would play, Coleman heard a rumble rising up from his belly to his throat, which came out in a growl that he recognized as the first few bars of “Body and Soul.” He flashed on what Charlie McCarthy said about Edgar Bergen not being much more than a soulless body without him. Coleman

wondered whether it was said deliberately to see how far he’d go to prove that whatever Bergen did to throw his voice into Charlie’s was nothing compared to what he made come out of a saxophone. But he quickly lost interest in that and began tasting his tenor for the labor of his life from mind to mouth. And with each breath, he sucked into his gums and between his teeth a world tumbling into deep trouble. He was hot with fever; and his fingers burned against the keys, making the skin feel like it was melting into the metal of his horn. Coleman opened his eyes, sweat streaming down his face. Bergen and Charlie were a blur, blending into each other, bone to wood. He played the final notes, letting out a sigh that quivered like the flame on a candlewick before it went out.

“I don’t think anybody could’ve explained how I tick any better than that. Don’t you think so, Bergen?”

“Absolutely!”

“But I have to ask you something, Mr. Hawkins,” Charlie said. “Since it was you who explained everything about me, did having that drink help you believe what you played any more than if God had done it?”

A fistful of laughter punched its way out of Coleman’s mouth. And he almost choked, stopping another one coming right behind the first. Coleman nodded. Charlie’s comeback was worthy of anything Lester Young could’ve hit him with. He tried to sidetrack the question by playing a nursery rhyme about Little Bo Peep watching her sheep and falling asleep.

“It’s a little early for me to be turning in, Mr. Hawkins,” Charlie said. “Bergen and I still have a show to do.”

Bergen glanced quickly at his watch.

“You’re right, Charlie. Mr. Hawkins, I’m sorry but we’re due in the studio for

tonight's show in five minutes. I know I speak for Charlie . . ."

"Don't even think such a thought, Bergen."

"Charlie, I was only going to say how much we enjoyed our lively conversation with Mr. Hawkins."

"Oh! I'll go along with that. Mr. Hawkins, you have definitely kept me on my toes. W. C. Fields won't know what hit him when he runs into me again."

"I have a W. C. Fields that I'll be tangling with soon. But after going a few rounds with you, I'll be ready for him."

Bergen extended his hand to Coleman.

"It's been a pleasure, Mr. Hawkins."

"The same goes for me," Coleman said, shaking his hand. He then took hold of Charlie's hand and shook it.

"You take care of yourself, Charlie."

"You too, Mr. Hawkins. And when we come back to New York to do another show, maybe you could show me a few things on your saxophone."

"I'd be happy to."

"You know, Charlie," Bergen said. "It's wonderful that Mr. Hawkins has agreed to give you some pointers on playing the saxophone. But I think you should do something for him in return."

"Well, let me see. Oh! I know what! I can show you something even Bergen doesn't know I can do."

"What's that?" Coleman asked.

"When we come back to New York, I'll meet you without Bergen tagging along."

Coleman shot a glance at Bergen, wondering where this was going.

"There you go again, Mr. Hawkins," Charlie said, "looking at him, instead of listening to me. You don't believe I can get along on my own without Bergen, do you?"

"What I believe, Charlie, is that Mr. Bergen would have more trouble getting along without you."

"What makes you say that?" Bergen asked.

"Because like you and Charlie, THIS is what I am wherever I go," Coleman said, lifting his saxophone lengthwise like a baptized child.

"Hey fellas, I got a news flash for you," Charlie said. "You may be joined to us at the heart, but not at the hip."

A smile wormed into Bergen's mouth. Coleman could tell that he was having a great time listening to Charlie give him a lot of grief. This was probably how he prepared for the knockdown, drag-out, sharp-tongued fisticuffs between Charlie and W. C. Fields. It reminded Coleman of his own struggles with the saxophone when he tried to play things he'd only heard in his head. Without these tugs of war between himself and his horn, he would've never built up a full head of ideas and the stamina to take on all comers during those wee-hour jam sessions. While Coleman waited on the elevator, he watched Bergen carrying Charlie down the hall to the radio studio. Charlie's head turned to Bergen, and he spoke loud enough for Coleman to hear.

"You know Bergen, those last few words we just had with Mr. Hawkins make me wonder if I might be better off doing my act as a solo."

Ian Ayres

*on options &
epidemics*

The pricing of call and put options seems to have nothing in common with attempts to control the spread of sexually transmitted diseases. But it turns out that, in both cases, identifying and influencing the variance of a probability distribution can be more important than identifying and influencing the mean.

It is easy to see that additional volatility in the underlying asset of a call option leads to greater option value. An option holder can cash in on the added gains from an upward fluctuation but loses no more if the price fluctuates wildly downward. For example, if you own an option to buy a share of Google stock at \$200, you want Google's stock price to fluctuate. In fact, option holders should be willing to trade a lower mean for a

higher volatility. A person holding the Google call should prefer a world where there is an equal (1/3) chance that the price of Google stock will end up at \$100, \$200, or \$300 than a world where there is an equal (1/3) chance that the price of Google stock will end up at \$200, \$210, or \$220. Even though the latter distribution has a higher mean (\$210 versus \$200), the higher volatility of the former distribution has a bigger impact on the option value. Under the first distribution, the call option will be worth \$33 (.33 x \$100). The second distribution, even though it has a higher expected stock value, produces a lower call value of \$10 (.33 x \$10 + .33 x \$20).

A folk theorem of finance theory is that whenever you identify an implicit option, there is almost always an interesting volatility story to tell. And there are implicit, or 'real,' options in all kinds of real-world settings. For example, consider an extremely stylized nuisance dispute. Imagine that Scholes and Samuelson are neighbors and that Scholes wants to stop Samuelson from singing in the morning. How should a court allocate the singing entitlement? One traditional answer (which is even codified into the Restatement (Second) of Torts § 826(a)) is that courts should give the entitlement to the litigant that the court believes to have the higher valuation. If Scholes values silence more than Samuelson values singing, then the court should give Scholes the entitlement to control whether his neighbor sings in the morning. This simple rule seems to make eminent economic sense.

But in resolving nuisance disputes, courts often go beyond merely deciding whether to enjoin singing (or pollution). Sometimes courts give the underlying entitlement to one party, but simultaneously give the other litigant a call option to buy the entitlement for a specified

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price. For example, in the famous case of *Boomer v. Atlantic Cement Co.*, 257 N.E. 2d 870 (NY 1970), a court enjoined a factory's pollution but simultaneously gave the factory the option to continue. If the factory paid their plaintiff-neighbors the court's best assessment of the monetary value of the neighbors' damages, the factory could resume polluting. In other cases, courts give the underlying nuisance entitlement to the defendant but simultaneously give the plaintiff the option of purchasing an injunction by paying the defendant a specified amount of damages. In these cases, the courts are allocating two entitlements: they are giving a call option to one side and the underlying nuisance entitlement (subject to the option) to the other.

In allocating this implicit option, courts would do well to consider the implicit volatility of litigants' valuations. From the courts' perspective, the litigant with the more speculative valuation has the higher volatility and therefore is likely to be the more efficient option holder. To see the importance of valuation volatility in a simple example, imagine that a court believes that a Resident's harm from pollution is somewhere between \$5 and \$105, uniformly distributed, but that the Polluter's costs of stopping pollution are somewhere between \$40 and \$60, uniformly distributed. Our first intuition might again be to give the initial entitlement to the Resident – because she has a higher expected value (\$55 versus \$50) – and the call option to the Polluter – to make up for the fact that parties may have trouble reaching agreement when the Polluter turns out to have the higher value.

But in this example, the Resident's valuation has both a higher mean and a higher variance. Because options are worth more when the underlying entitlement is more variable, it turns out

that giving the Polluter the entitlement and then giving the Resident a call option produces much higher allocative efficiency. Even though from the court's perspective the Polluter has a lower expected valuation, giving it an entitlement subject to the Resident's call is more efficient because the Resident with an option to enjoin pollution for \$50 will do so whenever she has a particularly high valuation. If we give the Polluter the call option instead, we can end up with a truly inefficient outcome of pollution that creates \$105 of damage. When we give the Resident the call option, this never happens. This simple and admittedly stylized example shows that valuation variance can be more important than the mean in deciding legal cases. When options are at stake, we need to attend to both.

The need to attend to volatility is important whenever options come into play. A number of years ago when I was teaching at Stanford, the university had a home mortgage program. The university would lend you half the purchase price of your house, if you give the university half the appreciation at the time of the sale. The program gave the university something akin to a call option on half your house. The university didn't have to bear any cost of home depreciation, but got half the upside if the housing value increased. I had a choice of buying a house in an unincorporated (and unzoned) new section of Mountain View or a relatively staid and seasoned development just south of the campus called College Terrace. Attending to volatility, you should be able to tell which house was more subsidized.

The mathematics of epidemiology developed independently from the mathematics of option pricing. But like call option prices, the force of an epidemic

also rises with both the mean and variance of an underlying distribution. The force of an STD epidemic is, like an option, a kind of ‘derivative,’ in that it is derived from the mean and variance of the number of partners in a population.

It is immediately intuitive that an STD is more likely to spread when the average person in a population has a larger number of sexual partners, but the *variance* in number of sexual partners in a population also positively impacts an STD’s expected replication rate. Epidemiologists have modeled the force of an epidemic in populations with heterogeneous sexual frequency to equal:

$$R_0 = \rho_0 \left(\mu + \frac{\sigma^2}{\mu} \right) \text{ where:}$$

ρ_0 is the product of the transmission probability per partner (sometimes referred to as the ‘efficiency’ of transmission) and the average duration of the disease,

μ is the mean number of partners per unit time, and

σ^2 is the variance of the number of partners.

R_0 measures the ‘reproductive rate’: the average number of secondary infections produced by a single index case in a population of susceptible persons. The disease rate is stable (or ‘endemic’) when the infector number (R_0) equals one; epidemic when greater than one; and eventually zero (the disease will die out over time) when less than one.

The equation teaches us that for any given mean, increasing the variance in the number of partners will increase the epidemiological force of a disease. The intuition for the positive impact of variance is that populations with high variances in the number of sexual partners are likely to exhibit large connected net-

works of sexual nodes. The few members of the population with many sexual partners are likely to form connections with one another, as well as with members of the population who have few other sexual partners. Randomly infecting someone in a high variance network is therefore likely to spread the disease quickly, through these longer connecting chains. In a population with high variance, the few people with many sexual partners are the ‘superspreaders’ who tend to connect the rest of the population.

The importance of variance to the epidemiological force of infection matters because human sexuality often exhibits extremely high variance in the number of sexual partners. Furthermore, as an empirical matter, the distribution of the number of sexual partners is highly skewed. The great majority of people have had only one or zero sexual partners in the last year (and only a handful during the course of their lives), but a few people report dozens or even hundreds of partners. Partnership distributions have such a heavy tail that some researchers have found evidence suggesting that human sexuality might be an example of a ‘scale-free’ network with an infinite variance. If human sexuality is scale-free, policies aimed at reducing heterogeneity in the number of partners are likely to be highly effective means of reducing infection.

We tend to focus on policies that reduce the mean number of sexual partners, but we should also think about the impact of policies on the variance as well. We can reduce both the mean and the variance by inducing people in the right-hand tail of the sexuality distribution to have few partners. Kathy Baker and I have suggested one indirect way of achieving this result is to promote condom use particularly for first sexual

encounters (i.e., the first time two people have sex with each other). Inducing people to use condoms the first time has a dramatic impact on reducing the effective average number of partners because 46 percent of sexual pairings have sex only one time. Condoms are an effective barrier for many STDs, and hence protected first-encounter sex renders these pairings from an epidemiological standpoint a nullity. But promoting first-encounter condom use has an even larger impact on the variance because it disproportionately impacts the effective sexuality of the right-hand tail of the distribution. Baker and I found that promiscuous people are much more likely to have ‘one night stands’; so, first-encounter condom use particularly mitigates the impact of superspreaders. Promoting the idea that people should use a condom in their first encounter, no matter what, is best justified as a regulation of effective sexual variance.

But policymakers can also reduce the variance by inducing people in the left-hand tail of the sexuality distribution to have *more* pairings. Indeed, the title of Steven Landsburg’s recent book *More Sex is Safer Sex* builds on just this idea. More sex by the left-hand tail of the distribution can be safer sex because it reduces population variance. More pairings by relatively nonpromiscuous people can reduce the chance that an infected person will sleep with a truly promiscuous person.

Even though more sex by the left-hand tail increases the mean of distribution, it simultaneously reduces the variance and hence the force of the epidemic. Indeed, Michael Kremer earlier pointed out that reductions in the mean number of partners that simultaneously increase the variance can increase the force of an STD epidemic. The variance effect can dominate.

The real world is of course much more complicated than any single, highly stylized equation – especially one based on the assumption of random pairings. But enlightened policymakers should always ask themselves, “How does this policy impact variance?” Abstinence-only education that induces relatively nonpromiscuous people to have fewer partners can perversely increase infectivity by increasing variance.

As a nation, we lack a vocabulary for communicating with one another about volatility. Only a small fraction of the population understands what it means to say that the standard deviation of adult male height in the United States is about three inches. The particular and counterintuitive importance of variability to the value of options and the force of STD epidemics is yet another reason for teaching statistical numeracy more widely.

Richard Kraut

*on philosophy as a
guide to well-being*

Philosophers disagree about whether philosophy can teach us much about human well-being. A long Western tradition, whose roots lie in Plato and Aristotle, holds that philosophical methods, skillfully and wisely deployed, can yield substantive conclusions about what is ultimately worthwhile. For example, according to Aristotle, the best sort of life for a human being will assign a central place to activities that make excellent use of practical reason and the social emotions that are responsive to reason.

One of the distinguishing features of the modern period in philosophy is the abandonment, by some of its most im-

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portant figures, of that high ambition for moral theory. Thomas Hobbes provides a striking example. In *Leviathan*, he says: "There is no such *finis ultimus*, utmost aim, nor *summum bonum*, greatest good, as is spoken of in the books of the old moral philosophers." His point is that philosophical reflection is powerless to pass judgment on the worth of someone's ultimate aims; they therefore cannot be found defective, except insofar as they might conflict with each other. As he says, "Whatsoever is the object of any man's appetite or desires, that is it which he for his part calleth good." There is no basis, he thinks, for criticizing "the object of any man's appetites," and so we must let stand that man's designation of that object as good.

The idea that there is no standard for the assessment of ultimate aims – some rational method for deciding which among them are good and which bad – became the orthodoxy of the modern period. "Ultimate ends . . . can never . . . be accounted for by reason," David Hume says in *An Enquiry Concerning the Principles of Morals*. Similarly, when in *Utilitarianism* J. S. Mill asks, "What proof is it possible to give that pleasure is good?" he replies that the only test of a thing's desirability is the fact that it actually is desired.

All of these philosophers – both the ancients and the moderns – are, in a sense, engaged in the task of saying what human well-being is. Their disagreement concerns whether sustained and careful reflection has a role to play in guiding human aspirations. Hobbes, like the "old moral philosophers" he opposes, has his own answer to the question of what is good for us. He holds that what is good for someone is the satisfaction of that person's appetites. Mill likewise argues that pleasure is the only thing that is desirable in itself, because everything

we desire for itself gives us pleasure when we attain it. So Hobbes and Mill are as interested as were Plato and Aristotle in the question of what is good for human beings. But unlike their ancient predecessors, they see no room for philosophical methods to criticize the ultimate ends that someone is pursuing. Mill looks instead to the voice of discriminating experience as a guide to life: to decide which of two kinds of pleasure is more desirable, we can do nothing but determine the preferences of those who have experienced both kinds. (And if there is disagreement, he claims that the majority is more likely to be correct.)

If one wants to find, among major twentieth-century moral philosophers, defenders of a theory about what is good that is closer to the views of Plato and Aristotle than those of Hobbes, Hume, and Mill, to whom should one look? Two leading figures of the early twentieth century proposed a view that has some kinship to the classical approach to well-being. G. E. Moore (*Principia Ethica*) and W. D. Ross (*The Right and the Good*) hold that careful philosophical reflection can arrive at a conception of what is good, and that such a conception can serve as a standard that is independent of what we seek, want, or find pleasant. Ross, for example, believes that if we carefully perform a thought experiment, we will see that virtue and knowledge are good – whether or not they lead to pleasure or the satisfaction of desire. Imagine two worlds: in both, the inhabitants experience the same amount of pleasure; but in one world people possess and exercise the moral virtues, whereas in the other they are full of moral deficiencies. It is clear to our rational faculty, Ross insists, that the world containing moral virtue has a higher degree of intrinsic goodness. We can thus see that the moral virtues are indeed good,

and that their goodness does not consist in their being pleasant or the objects of desire.

Unfortunately, regardless of whether we find Ross's astonishingly simple argument persuasive, it does not really establish any thesis about what human well-being is. The topic of well-being has to do with what is good *for* someone. To say, for example, that being a just person is a component of well-being is simply a way of saying that if someone is just, that is good for him, not because justice is a means to something else, but even apart from its consequences. But Ross's thought experiment does not show that justice is good *for* the person who has this virtue, and is not intended to do so. He, like Moore, is not interested in well-being at all. He is talking about what he calls good "sans phrase" – or what Moore sometimes called "absolute" goodness. So they stand at some remove from the Platonic-Aristotelian tradition. They uphold the power of philosophical reflection to detect objects of aspiration that are independent of pleasure and the desires we already have. But they do not claim that possession of those objects is good for anyone. On the contrary, they think that moral philosophy would be utterly misguided to take anything but an incidental interest in whether such moral virtues as justice are good for those who possess these qualities. The question that Plato places at the heart of his *Republic* – is justice good for the just person? – is one they decline to address, because they do not take that to be a proper topic for moral philosophy.

Turning to the later years of the twentieth century, we find in the moral and political philosophy of John Rawls a conception of well-being whose roots lie in the modern dissenters from the classical tradition. Taking the Victorian English philosopher Henry Sidgwick as his prin-

cial guide, he holds, in *A Theory of Justice*, that “the good is . . . the satisfaction of rational desire.” Or, as he puts it, “a person’s good is determined by what is for him the most rational long-term plan of life given reasonably favorable circumstances. A man is happy when he is more or less successfully in the way of carrying out his plan.” The rationality of a plan is, roughly speaking, a matter of its internal consistency. Rationality is not meant to serve as a substantive basis by means of which to assess the worth of someone’s ultimate ends; it is rather a matter of the adjustment of one’s ends to each other in a coherent schedule of activities. So, for Rawls, what matters for well-being is not the content of what we pursue, but our degree of success in attaining it.

Since it can be good for someone, according to this way of thinking, to pursue goals that are normally (and rightly) regarded as morally objectionable, Rawls claims that there is a type of reason that must be given priority over what is good: moral rightness. No matter how good it may be for someone to own slaves, for example, or to violate the rights of others, the fact that it benefits him should count for nothing in our deliberations. In fact, Rawls holds that even if owning slaves did a great deal of good for a large segment of the population, that should carry no weight at all. The total amount of goodness should not be our practical goal; the utilitarian principle of good-maximization, favored by Mill, Sidgwick, and the other classical utilitarians, should not guide our personal conduct or the design of political institutions.

What Rawls has done, in effect, is to recognize that the conception of the good that guided a distinctive tradition of modern moral philosophy, from Hobbes to Sidgwick, cannot be the sole

or even the principal objective of our practical thinking. We are to pursue the good (that is, the achievement of our rational plans, whatever they are), but only within the boundaries of what is right. His distinctive contribution to moral and political philosophy was to propose a standard of rightness – namely, the agreement of hypothetical contractors – that is not itself a matter of satisfying whatever desires people happen to have. Well-being, in other words, is a reflection of our diverse individual tastes and highly variable preferences. Moral principles must therefore rest on something that does not vary so greatly from one person to another. Rawls’s affirmation of the priority of rightness over goodness stands in marked contrast to the Platonic-Aristotelian thesis that what is good for human beings must be the fundamental starting point of practical reasoning.

Rawls’s priority thesis rests on his commitment to the distinctively modern conception of well-being that runs through Hobbes, Hume, and Mill. It is because he thinks that well-being varies according to our preferences and plans that he takes goodness to be weightless in comparison with rightness. But is he right to suppose that “the good is . . . the satisfaction of rational desire”? Something close to the Platonic-Aristotelian alternative continues to thrive. Derek Parfit, for example, gives, in *Reasons and Persons*, respectful attention to what he calls “Objective List Theories” of well-being, which he contrasts with “Desire-Fulfillment Theories” and “Hedonistic Theories.” The best theory of well-being, he suggests, might be one that combines these alternatives. Such a theory might say that “what is good for someone is to have knowledge, to be engaged in rational activity, to experience mutual love, and to be aware of beauty, while

strongly wanting just these things.” That idea bears a strong similarity to Ross’s thesis that knowledge and virtue are good (although, he insists, they are good ‘sans phrase’ rather than good *for* someone), and also to Aristotle’s thesis that well-being consists in excellent rational activity. What they have in common is the conviction that careful philosophical reflection can vindicate a standard, other than mere internal consistency, for assessing the value of our goals. Philosophy, so conceived, can guide the formation of our aspirations.

It should be clear that this philosophical debate has to do not with *subjective* well-being (that is, happiness, or a sense of fulfillment), but with *objective* well-being. All parties to it, ancient and modern, agree that we can be wrong about what is good for us. (Hobbes thought that Aristotle was wrong to conclude that what is best for us is the excellent deployment of reason and emotion.) To say that the topic under discussion is objective well-being is simply a way of expressing the commonsense thought that what someone believes about what is good for human beings could be wrong, and is not made right simply by the fact that it is believed. Subjective well-being is a fit object for psychological experiment, since it is a state of mind. But to speak of our objective well-being is to enter into the business of evaluating our lives. It is a normative and not a purely empirical enterprise.

The philosophical debate about well-being continues. James Griffin, for example, defends a theory that follows Parfit’s lead by combining elements of an “Objective List Theory” and a “Desire-Fulfillment Theory” in his *Well-Being: Its Meaning, Measurement, and Moral Importance*. Philippa Foot proposes, in *Natural Goodness*, an approach to well-being that is consciously patterned af-

ter Aristotle’s. By contrast, L. W. Sumner, in *Welfare, Happiness, and Ethics*, plumps for a theory that identifies well-being with what he calls “authentic happiness,” and is a close relative to hedonism. My own thinking about these matters puts me firmly in the camp of Plato and Aristotle. The suggestion I make, in *What is Good and Why*, is that the notion of flourishing – that is, the development and exercise of inherent biological powers – can serve as a powerful organizing idea for the articulation of a theory of well-being.

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Inside back cover: A picture of divine harmony, inspired by Isaiah 11:6 (“... the calf and the lion and the fatling together, and a little child shall lead them”), and painted by the American artist Edwards Hicks (1780–1849): *The Peaceable Kingdom* also shows a delegation from the Lenape people (sometimes called the Delaware Indians) signing a treaty with William Penn (the founder of Pennsylvania). See Leo Marx on *The idea of nature in America*, pages 8–21: “It was exceptional in its immensity, its spectacular beauty, its variety of habitats, its promise of wealth, ... and, above all, in the scarcity of its indigenous population. Hence the remarkable extent of its underdevelopment – its wildness – as depicted in myriad representations of the initial landfall of European explorers on the Atlantic seaboard of North America. In that stock image, the newly discovered terrain appears to be untouched by civilization, ... and not easy to distinguish from a state of nature.” Photograph © Brooklyn Museum/Corbis.



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