

# 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.”<sup>1</sup>

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.”<sup>2</sup> 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.”<sup>3</sup> 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."<sup>4</sup> The originality of his book resided in its exposi-

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.

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*

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*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.”<sup>5</sup> 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.”<sup>6</sup> 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.<sup>7</sup>

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

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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.<sup>8</sup>

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* (Riverside, Mass.: Riverside 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).<sup>9</sup>

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).

pertise. 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.”<sup>10</sup>

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

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

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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.'"<sup>11</sup>

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.<sup>12</sup> 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."<sup>13</sup> 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.<sup>14</sup>

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.<sup>15</sup> 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-

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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.<sup>16</sup>

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.<sup>17</sup> Carbonic acid consists of – and in the atmosphere dissociates into – water and carbon dioxide (CO<sub>2</sub>). 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 CO<sub>2</sub> 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 – CO<sub>2</sub> 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 CO<sub>2</sub>, 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 CO<sub>2</sub> 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 CO<sub>2</sub>-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 CO<sub>2</sub> 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."<sup>18</sup>

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."<sup>19</sup>

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."<sup>20</sup>

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,'

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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.<sup>21</sup> 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.”<sup>22</sup>

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.<sup>23</sup> 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.”<sup>24</sup> 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 CO<sub>2</sub> into the atmosphere, both by curbing the burning of fossil fuels or managing the surface of the Earth so that more CO<sub>2</sub> 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.”<sup>25</sup> 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.<sup>26</sup>

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.<sup>27</sup>

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

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](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.

tended to be local and traditional. Their efforts have not been targeted at staving off global warming. Trees respire CO<sub>2</sub> 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.<sup>28</sup>

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

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.”<sup>29</sup> 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.”<sup>30</sup> 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.”<sup>31</sup>

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 CO<sub>2</sub> emissions, the United States alone accounted for about 25 percent of them.<sup>32</sup> 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 CO<sub>2</sub> poses vast difficulties for the world precisely

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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 CO<sub>2</sub> 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."<sup>33</sup>

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 CO<sub>2</sub> than in 1990. It is one of the only two industrialized countries that have not ratified the Kyoto Protocol.<sup>34</sup>

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.<sup>35</sup> 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.

<sup>34</sup> Ibid., 151 – 158.

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

<sup>33</sup> 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.

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