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STRANGE WEATHER

*Culture, Science, and Technology
in the Age of Limits*



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VERSO

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in the contexts of these environmental issues that people experience limits to their *social growth*, and these are the areas where individuals invest their strongest political passions and feel that their opinions and actions can have the most effect.

Above all, it is in the environment of the politics of the body that a progressive sense of social individualism can be posed as an alternative to the dominant laissez-faire conception of the atomized individual. Prevailing conservative definitions of the individual appeal to a limited sphere of "privacy" where our bodies are either policed by puritan morality or else sanctified by capitalism as a temple of consumer choice. By contrast, an expanded conception of social individualism involves positive, liberatory rights of freedom and choice, drawn from the guarantees of democratic citizenship rather than from the *magna carta* of consumerism.¹⁸ Only through attention to individual rights can we build a radical democracy, guaranteeing respect both for the differences among individuals and for the environments—physical, cultural and social—that we inhabit. In this way, getting the future we deserve might still involve just deserts for all.

CHAPTER SIX

THE DROUGHT THIS TIME

*The ice age is coming, the sun is zooming in
Meltdown expected, the wheat is growing thin*
THE CLASH, "LONDON CALLING"

During a brief appearance at the 1990 Earth Day rally on Capitol Hill, Paul Ehrlich, biologist and ecological futurist, urged the assembled crowd and the television audience to accept that "our problems are absolutely global": "a cow breaks wind in Indonesia, and your grandchildren could die in food riots in the United States." What kind of logic was at work in this remark? Lateral thinking? Instant karma? Weird science? Under any circumstances, it sounds like a strange claim to make, almost a lampoon, hyperbolically warping whatever causal logic might link these two events. But Ehrlich judged his audience well enough; and he could count on his long experience in the ecology movement to know that most of them shared the "paradigm," scientific and political, that framed such a remark. A well-documented history of scientific research and recent scientific claims about the "greenhouse effect" filled out the picture; the politics encouraged by his speech was based on the globalist premises shared by his constituency. Given the media's widespread public airing of both the science and the politics in advance of Earth Day 1990, Ehrlich and others could hope that the remark sounded "logical enough" to pass for "common sense," or, at least, would come to resemble common sense at some point in the near future.

As an attempt to give concrete, or even proverbial, form to a developed political philosophy, Ehrlich's remark wouldn't, of course, rank as a great

success. It was a little too smart, and thus too much of a shortcut for an argument that required many more causal connections to be made along the way. Perhaps its underlying meaning was still too obscure to the public mind. At any rate, the remark seemed to lack the sensuous immediacy that makes good "spontaneous philosophy" out of a mature body of political thought. This is not to say that the ecology movement hasn't produced its own effective behavioral slogans, like "Think Global, Act Local," or Arne Naess's "simple in means, rich in ends," or Barry Commoner's four laws of ecology: "Everything is connected to everything else"; "Everything has to go somewhere"; "There's no such thing as a free lunch"; and "Nature knows best." For the most part, however, they have been trite and touchy-feely—at least when compared, in terms of their rhetorical power, to appeals like "workers of the world unite, you have nothing to lose but your chains!" But the powerful appeal of ecology as a practical politics lies in its capacity to encourage people to make consistent links between the social or emotional shape of everyday actions and a quantitative world-picture of physical causes and effects. Above all, it is a politics of information and knowledge, exceptional among social and political movements in its overriding appeal to science for proof of the justice of ecological claims. In this spirit, Ehrlich's remark asks us to do a certain amount of work in making the scientific connections that support his logic. Let us spell some of these out.

It is no longer only the eco-cognoscenti who know that the flatulence from cows contains high levels of methane, one of the greenhouse gases—along with carbon dioxide (CO₂), nitrous oxide (NO₂), and the chlorofluorocarbons (CFCs)—that is believed to intensify global warming. Cattle exhaust is therefore often unfavorably compared to the capacity of trees to absorb CO₂, especially in developing countries that harbor rainforests, and where the forests are being cleared to make room for cattle ranches—in part to support the West's fast-food appetite. This cycle of commercial development is undermined by another cycle of physical effects, however. For it is widely believed that global warming, as a result of the atmospheric action of the greenhouse gases, will affect food production in certain parts of the world—especially the United States, where the climate of the mid-latitudes, the location of the nation's "breadbasket," will see prolonged droughts during the growing seasons. Consequently, food shortages and

food riots are quite likely, in a country long used to the privilege of being the world's leading grain exporter, and little used to the experience of consumer scarcity for the majority, though by no means all, of its population. Following through Ehrlich's logic, then, we find that the Western narrative of exploitation and neocolonial dependency is overlaid and turned back upon itself by a narrative of retribution.

For those who do not feel implicated in the story of neocolonial underdevelopment in faraway places, the narrative of retribution will seem like an arbitrary form of justice, though it is unlikely to be reduced to the formalistic witticism so beloved of meteorologists: that the motion of a butterfly's wings in Peru can cause tornadoes in Iowa.¹ But the corollary of Ehrlich's story is one in which actions and events in North America have immeasurably more effect on people and social life in Indonesia (or Peru, for that matter) than vice versa. Automobile emissions from North America have a much greater impact on global ecology than does the cattle exhaust (itself partly determined by Western meat consumption) from countries like Indonesia. A similar irony is attached to the projected image of food riots in North America. If uneven distribution of produce and Western exploitation of Third World development have been the primary causes of scarcity in world food markets, the imagery of famine and food riots has nonetheless come, in Western eyes, to be a fixed part of the natural landscape in these distant countries. Food riots in North America are all the more terrifying a prospect because they are not felt to "belong" here; they "belong" in countries like Indonesia, where scarcity is seen as a natural result of the land's carrying capacity or as part of some Malthusian check that limits overpopulation.

However one interprets the burden of cause and influence, there is no getting away from the sure link between events in the West and events in the Third World. The logic of Ehrlich's remark is clearly intended to underscore that relationship. It is only in recent years, however, under the expanding aegis of global politics and ecological science, that this shared dependency has been brought to popular consciousness. The new consciousness, it should be noted, is not a consequence of Western guilt, but rather the result of a perceived threat to Western dominance, so dependent on resources that are now seen to be limited, or dwindling. Ehrlich's remark draws its moral authority primarily from environmental science,

not from any reservoir of counterimperialist sentiment. Far from any belated recognition of the effects of neoimperialist dependency, it is none other than a set of theories from the earth science of climatology that provides the authority for the "common sense" that connects the cow to the food riot.

In this respect, nothing could be more significant than the appearance at the Earth Day rally of Bob Ryan, a well-known weather forecaster from a Washington DC television station, who called attention in his speech to the day's glorious weather, claimed the "sky" as "part of the earth," and then proceeded to scold President Bush for his inaction on environmental issues such as global warming, acid rain, and air pollution: "Mr President, look out the window!" he boomed repeatedly, in the direction of the White House. "This is what clean air looks like. This is the kind of sky we want." Here was the unusual spectacle of a meteorologist speaking as a meteorologist at a political rally, as scientists are rarely wont to do in their professional capacity. Ryan was doing more than arguing for the protection of his career commodity—fine weather. His appearance underlined the newfound celebrity status of meteorological and climatological experts within the ecology movement.

If Ryan had been up on his presidential history, he might have reminded Bush that one of his predecessors, Thomas Jefferson, had been more seriously concerned about the effects of climate change on the national economy. Jefferson, whose passionate interest in meteorology guided his personal search for agricultural improvements appropriate to the national climate, was such a conscientious weather observer that he had even stopped to pay for a new thermometer on his way to the proclamation of the Declaration of Independence! In his *Meteorological Journal* for the years 1810–16, Jefferson had speculated conclusively on trends in temperature statistics collected by himself and other weather enthusiasts across the country:

It is a common opinion that the climates of the several States, of our Union, have undergone a sensible change since the dates of their first settlements; that the degrees both of cold and heat are moderated. The same opinion prevails as to Europe; and facts gleaned from history give reason to believe that, since the time of Augustus Caesar, the climate of Italy, for example, has changed regularly, at the rate of 1 degree of Fahrenheit's temperature for

every century. May we not hope that the methods invented in later times for measuring with accuracy the degrees of heat and cold, and the observations which have been and will be made and preserved, will at length ascertain this curious fact in physical history?²

Despite the authority carried by the word of a meteorologist President, Jefferson's appeal to the "common opinion" that the climate had changed owed as much to popular belief and memory as it did to any evidence of statistical certainty. Popular anxiety about climate change was, and still is, an ever-present component of the US weather culture, in a country whose geographical make-up (a large land-mass that lacks any mountain ranges running horizontally across the country) produces a diversity of climates and a range of temperature extremes unmatched in any other nation-state. It is only recently, however, in the second half of this century, that climatic variability has come to be scientifically recognized as proven; only in the last fifteen years has a historical correlation been established between significant shifts in climates and concentrations of CO₂ in the atmosphere.

At the end of the 1980s, the specter of climate change, induced primarily by the burning of fossil fuels and invoked through the awesome term "global warming," had come to haunt the political soul of popular consciousness. In a short period of time, the thesis of global climate change, supported by what scientists have detected as the "signal" or "fingerprint" of the greenhouse effect, has become firmly rooted in our world-view, a permanent component of the stories we tell each other about the interplay between natural and social laws that affects our everyday life and our picture of its future. Today, in a large part of our culture, it is almost a natural part of our explanation of the everyday world. Appeals to "global warming" have become a catch-all for accounting for almost every kind of environmental anomaly. Faced with the evidence gathered in the last five years of record droughts, record rainfalls, record storms and floods, record hot and cold spells, tornado activity, and other weather extremes, it is as if the scientific ideas about climate change have taken on their material form before our very eyes.

The pathways between scientific theory and the sedimented "common sense" of popular consciousness are far from smooth. They run the gauntlets of corporate interest, political profit, and government funding. Any proper case-study of the career of theories of global warming would

have to account for the thickets of influence, legitimation, and authority that acted as a filtration network for the theory. While the politics of global warming is almost wholly dependent on the word of experts, these other networks of authority and sponsorship are a powerful shaping influence on the way in which the story gets told. One result of this process, for example, is to redefine the field of science itself. Climatology, hitherto considered a second-class adjunct of the more exciting field of meteorology, or at best a branch of physics that had more in common with geography, has seen its object—knowledge about a stable archive of climate statistics—transformed into a volatile, political commodity of the first importance. Climatology is now more an analytic than a descriptive science. Climate is no longer “the average state of the atmosphere” but an unstable set of variable events, subject now to the effect of human industry. It is no longer simply affected by distant external factors like the earth’s orbital tilt, the gravitational force of sunspots, or the tectonics of continental drift; today, climate is the variable outcome of internal oscillations and feedback between the major subcomponents of its system of energy exchange—atmosphere, oceans, ice sheets, land surface, and biota, of which the latter, the site of human production of greenhouse gases, has been the major focus of attention. The fragile, self-regulating economy of this climate system is now perceived to be breaking down. The cause? Excessive human intervention. The symptom? Overproduction of CO₂ waste.

It is perhaps no coincidence that this new threat is often described in terms usually reserved for the liberal market economy, and that human intervention is demonized in the same manner as “state intervention” in that economy. As one climatologist put it, “we still have to learn to live according to our climatic income.”³ Nor is it a surprise to find the moralizing burden for this interference shifted on to humanity as a whole, further Christianized by the language of retribution and penitence. As another commentator put it, global warming must be seen as “the wages of industrialization.”⁴ Certain elements of the new world-view that is being constructed to accommodate the global warming theory resemble pre-Enlightenment conceptions of Nature as a providential interpreter of human affairs, repaying the whole of humanity for its sins with the visiting of meteorological scourges. Other elements, of course, are more oppositional, rechanneling the blame for the gathering crisis on to the more

egregious “sins” of business leaders, corporate institutions, and members of the political class.

Just as the global warming theory has served as an added ingredient for the rich stew of popular millenarianism in the last decades of the century, so too its consequences have been completely naturalized in practical folklore, in much the same way as the weather has always been used to make sense of everyday life. While the new status of the weather has made it an especially favored feature of the folklore of modern scientific philosophy, the theory of global warming itself has had to dislodge recent memories of other theories of climate change equally underscored by scientific authority. In the course of one generation—the thirty-year span that used to be the unit for measuring climatic averages—the strongest memories have been those associated with nuclear activity and global cooling, respectively. In the days of atmospheric bomb testing, cold weather was frequently blamed on nuclear fallout, not just as a result of radioactive dust, but also as the imagined consequence of radical changes wrought in the radiation belts of the upper atmosphere. Survivalist radioactive futures were a meteorological constant in science fiction. Here is a typical SF weather forecast from Philip K. Dick’s *Do Androids Dream of Electric Sheep?*

—ho ho, folks! Zip click zip! Time for a brief note on tomorrow’s weather; first the Eastern seaboard of the U.S.A. Mongoose satellite reports that fallout will be especially pronounced toward noon and then will taper off. So all you dear folks who’ll be venturing out ought to wait until afternoon, eh?⁵

In most projections of a nuclear winter, generated by the atmospheric effect of smoke and dust released in a major war, temperature shifts of up to 30 degrees Centigrade dwarf the single digit figures forecast by the global warming prognoses. The nuclear winter’s scenario of massive crop failures, worldwide famine, and acute environmental diseases make the industrial and agricultural adjustments required to avert global warming seem like fine-tuning in comparison.

Increasingly, apocalyptic fears about widespread droughts and melting ice-caps have displaced the nuclear threat as the dominant feared meteorological disaster. In addition, nuclear winter scenarios have lost a good deal

of their pictorial fascination in recent years with the waning of the Cold War. By contrast, theories about global cooling and the coming ice age have been directly contested and downrated, if not entirely vanquished, by the global warming theorists. In the space of little over a decade, the theory of global cooling, once a dominant thesis among environmental scientists, has been relegated to the margins of legitimacy, espoused today only by crackpots and conspiracy theorists who are ridiculed for their views, as if they still believed the earth is flat.

THE COOLING

As long as I can remember, we were always about to enter a new ice age. I should say that I grew up in the lowlands of Scotland, a country where history is not free of meteorologically induced hardships, but whose climate has generally been favored by the singular factor of the Gulf Stream's warming influence. Perhaps it was some subterranean effect of Calvinist determinism that encouraged me to accept that the Gulf Stream was destined to change direction, as surely it would soon, ushering in a new ice age. Perhaps another, older politics of memory about the weather was at work, recalling that a prolonged period of cold weather in the second half of the sixteenth century had helped to secure the nation's impoverishment and sealed the fate of its sovereign independence. This was a memory that qualified, if it did not directly challenge, the nationalists' more popular thesis, widely current in the sixties and seventies of my youth, that the Scottish ruling class simply "sold" the nation to England. Nationalist and theological myths aside, there was more than enough climatological support during these years for my fears about shifts in the direction of the Gulf Stream. To begin with, it was widely accepted that we were nearing the very end of an interglacial period, that climate historians had established as lasting, on average, for 11,000 years, between 90–100,000 year glacial cycles. Even within an interglacial period, it had been established that climate was by no means invariant. Comparative studies had suggested the radical effect of climate change on the fall of Mycenae, and on cultures as remote as the Hittites, forced to migrate south in the years after 1200 BC.⁶ In modern times, the Northern hemisphere had undergone a

series of variable climatic regimes: 900–1130, warm (heyday of the English vineyards); 1150–1380, cooler (expansion of the circumpolar "westerlies"); 1550–1850, even colder (the "little ice age"); 1850–1950, warmer.⁷ During the little ice age, it is believed that the Gulf Stream had indeed shifted south, causing repeated harvest failures in Scotland. In the last few decades, since the late forties, the northern hemisphere had seen a relative cooling, and ice cover had begun to increase. The most conservative estimates of climate change during the early seventies forecast a return of the Northern hemisphere to a neo-boreal climate similar to that of the "little ice age," preparatory to the ultimate advance of the glaciers. It was suggested that a decrease of only a few degrees in average annual temperature, sustained over a number of years, would be enough to set the glaciers on the march.⁸

At the beginning of the seventies, weather culture in the Northern hemisphere, used to the relatively stable climate of the mid-century years, was transformed in response to a series of violent fluctuations in global weather patterns, which brought the disastrous drought to the Sahel countries in 1972–75, the devastating failure of the Soviet grain harvest in 1972, and, later in the decade, the first big freezes in Florida. It was a period in which country after country faced weather disasters year after year—floods, droughts, famines, food shortages, monsoon failure, and rapid increase in snow and ice cover. The effects of the OPEC oil agreements in 1974, and later the postrevolutionary curtailment of Iranian oil production, brought new meanings to the meteorologists' metaphor of climate as the world's "energy budget." With the changing face of world "food politics," a game in which grain exports were increasingly used as a political weapon, climate change was becoming a key factor; each major power initiated a national climatic forecasting program geared to short- and long-term economic planning during the mid to late seventies. In the hysterical context of this new economic situation, the weather was no longer "normal," the effects of global cooling no longer remote. Like the flood of global warming books that were to appear at the end of the eighties, a series of books by global cooling scholars was rushed into print in the mid-seventies: among the more serious, Nigel Calder's *The Weather Machine* (1975), Lowell Ponte's *The Cooling* (1976), and John Gribbin's *Forecasts, Famines and Freezes* (1977). Not long after, books with titles that

hedged their bets on the future began to appear, like D.S. Halacy's *Ice or Fire? Can We Survive Climate Change?* (1978).⁹ By the mid-seventies, the CIA had taken notice of the phenomenon and commissioned a series of reports about global cooling, inferring that the new "threat" of climate change was "perhaps the greatest single challenge that America will face in coming years."

To read the CIA reports is to see how efficiently *realpolitik* can convert an issue like climate change into a drama of national strategic advantage. The first report, in 1974, acknowledged that, even by the expansive standards of the CIA, the new concern with climatic issues "ranges far beyond the traditional concept of intelligence." The report established that the expansion of the US's global power had begun in the late nineteenth century, at the end of the neo-boreal period, and had thus been "blessed" with a warmer climate favorable to agricultural production in the Midwest. What was considered to be the "normal" climate of this century was in fact the most beneficial climate for this particular national economy. The second report addressed concerns raised by what was at that time an emerging scientific consensus about the reversion to a neo-boreal climate—historically, "an era of drought, famine, and political unrest." Placed on the alert by the widespread crop failures of the previous years, the United States, the report suggested, would have to reassess its role as the world's major food provider. By the seventies, largely as a result of impositions of agricultural programs by institutions like the World Bank, only seven of the world's 200 nations were net food exporters; the US accounted for three-quarters of all grain exports. The results of global cooling would be to shorten growing seasons in Canada, northern USSR, northern China, and northern Europe, and induce monsoon failures in southern China, western Africa and the Indian subcontinent. Dams and irrigation systems would be useless, the high-yield grains of the green revolution would fail; only the United States and Argentina, of the major agricultural regions, would stand to benefit from global cooling. Faced with the prospect of such an increase in power and influence, the report concludes that "the US might regain the primacy in world affairs it held in the immediate post-World War II era," but "the potential risks to the US would also rise. There would be increasingly desperate attempts on the part of powerful but hungry nations to get grain any way they could. Massive migrations,

sometimes backed by force, would become a live issue and political and economic instability would be widespread." Eventually, the report falls prey to the Cold War logic of paranoia, endemic in the intelligence community. Resentment of US dominance will increase, it suggests, and "the US will become a whipping boy among those who consider themselves left out or only given short shrift. The few other nations which might have some surplus will be tempted to use it for their own political ends." The report's final scenario imagines nuclear blackmail on the part of resentful nations, allied with threats to change the climate by melting the polar ice caps.¹⁰

Ever loyal to its trademark paranoia, the Pentagon suspected for a while that global cooling might be a Soviet plot, consistent with the other side's plans to ruin the climate of the United States. Climate modeling at RAND and DARPA had long been applied to this scenario, while vast schemes of climate modification, some of which revolved around plans, code-named Nile Blue, to counter an alleged Soviet proposal to dam the Bering Strait, had attracted the interest and support of presidents Kennedy and Nixon.¹¹ At the height of the Cold War, the Pentagon was heavily involved in the use of weather modification for military purposes. One of the CIA's programs for destabilizing the Cuban economy involved an attempt to dry out the Cuban sugar crop by seeding clouds before they got to the island. Honduras sued the US for depriving it of rain as a result of a weather modification program in Florida. Eventually, the Pentagon Papers exposed the Department of Defense's costly seven-year attempt at climate modification in Laos, Cambodia, and Vietnam, including a long and focused effort to waterlog the Ho Chi Minh trail. This cast a pall over the practice of using climatic change as a weapon. An international ban was thereafter imposed by UN resolution on all attempts to influence the environment by waging climatic war, ranging from swamping by creation of tsunamis, to striking at targets with artificially induced lightning, to the destructive irradiation of selected regions by blowing holes in the ozone layer.¹² The related practice of using food as a political weapon was stepped up, however, as the US tied its food aid to the UN voting allegiances of other nations. Heinous policies of triage and "lifeboat ethics," which involved choosing among populations bidding for survival, were widely discussed, and a new ruling climatology came into play, exercising its sway over such

organizations as the World Meteorological Organization and World Weather Watch, founded to distribute weather information more evenly and to provide needy nation-states with early weather warnings.

The strategic advantage promised to the US under the cooling regime of climatic change has been entirely reversed by the theory of projected warming conditions. In the event of global warming, it is likely that the growing seasons of northern regions like Canada, northern China, and the northern Soviet Union will be longer, while the midsections of the US will suffer widespread drought. Countries whose exporting power is not climate-sensitive, like Japan and the OPEC nations, would be unaffected. As the debate about global warming moved to the forefront of international politics in the late eighties, pressure to downplay the self-interest of sovereign nation-states became a new moral imperative of environmental global diplomacy, a move that the Bush administration had to be dragged, kicking and screaming, to recognize.¹³ One can only guess at the role played in this drama by Washington fantasies of global food supremacy generated by the cooling theory of the seventies. Even more complex was the political process by which the theory of global warming came to win influence and eventually predominate over other accounts of climate change.

While CO₂ was a known factor in all accounts of atmospheric warming (as a theory, the "greenhouse effect," vital to the life-sustaining climate of the earth, was first suggested by Jean-Baptiste-Joseph Fourier over a hundred years ago), the cold earth theorists argued that it accounted for only 3 per cent of temperature variation (heating mostly in the lower atmosphere), compared to the 90 per cent caused by the cooling factors of manmade dust—from agribusiness, industry, auto and aero exhaust, slash-and-burn agriculture—and volcanic dust. More important, the cold earthers argued, global warming, a documented increase in the world's average temperature of 1 per cent Fahrenheit over the last century, was actually a factor in hastening the *end* of the interglacial period. Far from universal, warming was seen to be uneven, mostly concentrated in southern, subtropical, and low to middle latitudes. As these latitudes warm up, rising air forms moisture-laden clouds that eventually precipitate as snow in the north, adding to the ice sheets. In addition to the effects of an increased tropic-polar temperature differential, causing violent weather

extremes, the increase in the albedo of cloud cover ultimately has radical cooling effects. As early as 1934, Sir George Simpson, head of Britain's Royal Meteorological Office, pointed out that glaciation required a poleward moisture transfer, generated not as a result of a decrease in solar radiation but rather by higher tropical temperatures and increased albedo. Thus, the temperature at the start of glaciation must be higher than the interglacial temperature for cooling to set in, and for polar air to move south. Under the theory of the CO₂-glaciation relation, then, a little global warming was going to lead to a lot of global cooling.

Most of the cold earth theorists still accept some version of this thesis, while the "CO₂ community," backed by government funding that has come finally to accept the warming theory as its unofficial policy, argues for the long-term prevalence of buildup of CO₂ and other trace gases as the decisive factor in the debate, over and above the "local" significance of factors such as cloud albedo increase. Consequently, the global warming thesis became the dominant scientific theory in the early eighties, and has taken on a factual status in public consciousness in recent years. A decade of very strange weather helped to solidify popular acceptance of the warmers' claims. Weather anomalies in the eighties included: the six warmest years of the century (1990 being the warmest in recorded history); the El Niño/Southern Oscillation of 1982–83 that rocked weather patterns everywhere and left hundreds of thousands dead in the wake of massive floods, coastal landslides, dust storms, cyclone blasts, record rains, and mass migrations; and, of course, the *annus mirabilis* of 1988, the year, when, in President Bush's words, "the earth spoke back," giving millions an idea of what global warming must surely feel and look like, with a devastating drought in the Midwest and Plains states, enormous forest fires all over the West, the mighty Mississippi almost dried up, withered crops, slaughtered cattle, virtually uninhabitable urban centers, and, to top things off, the ravages left by Hurricanes Gilbert and Helene in the Caribbean and the Great Flood of Bangladesh. The anomalous weather of 1988 was due, for the most part, to a split in the jet stream in the spring that prevailed throughout the summer. But with the extremity of that summer felt by everyone, there were few who were not tempted to reach for the global warming theory as a ready explanation, while scientists who stuck their necks out to provide authoritative support for the connection between

warming theory and practice were rewarded with the heady oxygen of media publicity. Others remembered that a series of viciously cold winters in the mid to late seventies had provided similar, experiential support for theories of the "coming ice age."

In the face of the new scientific consensus, cold earthers stood their ground. Some, marginalized as conspiracy theorists, continue to cite the warming theory as a government cover-up influenced by the short-term interests of the energy industry (funding for the CO₂ debate comes from the Department of Energy not the EPA). They pointed out that the projected long-term effects of warming involve much less in the way of immediate business regulation than the more urgent action called for by the cold earthers, whose disaster scenarios of glaciation stretching down to New York City are projected for the very near future.¹⁴ Of course, it has not helped their case that projected dates for the great cooling have come and gone—most notably in the case of John Hamaker, the autodidact and experimental farmer much lionized in cold earth circles, who forecast that the end of the interglacial would commence in 1990.¹⁵

BALANCING THE BUDGET

When it comes to actions and reforms relating to environmental protection, the urgency of the necessary remedies may vary, but there is little to choose between cooling and warming. Much the same causal factors are at stake, and both require similar preventative measures on the part of industry and personal consumption: reduction of CO₂ and other trace gas emissions, including CFCs (which are also ozone-depleting); radical regulation of industrial pollution; protection of forests and massive revegetation; restructuring of energy uses aimed at an immediate shift in the energy base; and a transformation of the high-consumption lifestyles of most Western citizens. Mindful of its mission to safeguard the profits of the energy and utilities industries, the Reagan administration recognized the common consequences of both theories by slashing government funding for any kind of CO₂ research—although its environmental policies will best be remembered by Secretary of the Interior Donald Hodel's comment that people should respond to ozone depletion by wearing

baseball caps and sunglasses. In recent years, it has become more difficult for central government to justify its inaction by setting one theory off against the other; in other words, by opposing the coolers' case against manmade dust and particle pollution to the warmers' case against greenhouse gases, as if the respective cooling and warming effects will simply cancel each other out. Nonetheless, the continued existence of debates on climate change (especially around the variability of feedback factors such as clouds, oceans, and biomass) bolsters an air of uncertainty that justifies the Bush administration's moratorium on action, just as its predecessor had deferred making national policy about acid rain. Presidents fiddle while the globe burns.

In the meantime, ecologists and biologists have reminded us that what lies in the balance is the extinction of millions of species as a consequence of extreme variability in weather patterns, the unrealized effects of the greenhouse gases still en route to the stratosphere, or the prospect of a chain reaction whereby melting permafrost in the tundra releases vast quantities of methane from ground-locked biomass compounds. The speculative calculus of disaster, endlessly computable into new configurations, is a favorite game of environmental scientists and corporate-minded ecologists involved at the advisory and lobbying levels of the debate. Manipulations of this calculus have brought the physical world firmly within the purview of technocratic futurology. The experts' models of global warming present a complex, interactive picture of feedback components, with projected statistical effects from one sector—cloud albedo, or ocean absorption of solar radiation—played off against another—CO₂ production from rotting vegetation, or the role played by marine phytoplankton. This modeling is governed by the new corporate logic of planetary management, with its centralized rationalization of the climate system's every conceivable component. The same cost-benefit logic is evident in new forms of global economic management, with its debt-for-nature swaps, and the growth of an international market in tradable pollutant emission rights. While these developments are clear evidence of the political and economic impact of ecology at the highest levels of decision-making, there are reasons to be wary of a distributive system with such an Olympian perspective.

The consequences, on the ground, of this eco-mercantilism are often quite dismal. The more global the model, the more likely that attention to

the social causes and conditions of the climate crisis will drop from view. We are left with a formal calculus of the world's "energy budget" (it must be balanced) or "climatic income" (we must live within our means). Whether this involves calculating the net insurance premium to be paid by "us," or estimating the gross global deficit—excessive "total respiration" of the biosphere measured against total photosynthesis—the implied aim of restabilizing the planetary economy is to ensure that the "economic climate" of the earth's resources is a favorable one for the future of business. While meteorologists have long sought to advance their profession by selling weather-related services to industry, only in recent years, with the advent of fears about global climate change and ecological degradation, has the language of climatology become a privileged vocabulary for futurological business forecasting.¹⁶ In this respect, the emergent rhetoric of economic climatology reflects anxieties about global crises for climate and for capital alike. Unlike the "weather," which is still locally variable and thus a risky investment, the "climate," once assumed to be regionally stable, is now seen as a global system in a state of uncertainty. The implied solution, then, is to "compete" with nature in (re)creating a favorable climate by balancing resources against expenditure.

Although my comments thus far refer primarily to trends in language use, there is no easy separation, here, between metaphor and action. This budgetary way of looking at the world—fueled, as I have suggested, by anxieties generated by the global warming debate—is continuous with the scientific perspective of quantitatively dominating the physical world. Now that science has shown the clear impact of the "human fingerprint" on a global system so vast as atmospheric behavior, such a logic demands the more stable, guiding influence of a whole hand. If humans are now *competing* inevitably with nature in the fight for a stable climate, they need to win. Such a logic, in other words, demands that attempts be made to control the interaction of the various components of the climate system: oceans, ice sheets, land surface, atmosphere, and biota. As the economic scope of capitalism enters into its truly global phase, it is clear that this logic of reckoning inputs against outputs is entirely complicit with the interests of the new global investors, a spectrum that runs from small-time players on the futures market, so heavily determined by the effect of local meteorological fluctuations on food commodities, to the earth-movers and

shakers at the World Bank, whose efforts profitably to shape the future of the multinational economy are equally dependent on regional climatic stability. According to this logic, all attempts to "deregulate" the climatic economy (in this case, reducing the influence of human industry by curtailing greenhouse emissions and replacing the source products with substitutes) *must* also be seen as opportunities for regulating the physical world that did not exist hitherto. Greater powers of regulatory control are thus claimed in the name of allowing the system to revert to its "natural" self-regulating economy. This is the contradictory form in which laissez-faire economics have been advanced throughout modern capitalist history. If we fail to see how this logic of regulation/deregulation carries over into the claims currently being made in the name of corporate ecology, then we fail to grasp the full significance of the debate about "global warming" that has come to occupy center stage in world politics so soon after the breakup of the fixed Cold War order. The crusade to claim the whole world as "free" for liberal capitalism is currently locked in step with the campaign to "free" the climate from human influence. History suggests to us that both definitions of "freedom" are shot through with the lowest form of irony.

Some of this irony's antisocial force can be brought out by considering the obverse of the logic of human control over planetary management, in the theory that has come to be known as the Gaia hypothesis, first proposed by the English scientist, James Lovelock. According to the Gaia theory, organic life is an active (negative) feedback component of the planetary system; therefore interaction between organic species is one of the features that helps to regulate the system's homeostatic economy. Gaia's adaptive control system includes its self-regulation of climatic and atmospheric composition¹⁷ at optimal levels. What matters most in Gaia's living planetary system is the maintenance of Gaian life, not human life. When the earth's self-regulating organism shifts into a new stable state—global warming, in this case—in order to protect itself, it is likely that conditions are created that will not be favorable to the continuance of human life. Global warming, which might entail the elimination of humanity, an unhealthy species, is thus the planet's "solution" to its ecological crisis. Since human life has proven to be the chief threat to the health of the planetary organism, it is in the Gaian interest to eliminate human life. Gaia, sadly personified by Lovelock as the earth goddess:

is no doting mother tolerant of misdemeanors, nor is she some fragile and delicate damsel in danger from brutal mankind. She is stern and tough, always keeping the world warm and comfortable for those who obey the rules, but ruthless in the destruction of those who transgress. Her unconscious goal is a planet fit for life. If humans stand in the way of this, we shall be eliminated with as little pity as would be shown by the micro-brain of an intercontinental ballistic nuclear missile in full flight to its target.¹⁷

While some deep ecology supporters of the Gaia thesis see it as an effective philosophical myth for countering the chauvinistic logic of human self-interest or as a vehicle for proclaiming the "liberation" of nature, critics see it as a form of macho environmental fascism that necessarily favors the good of the state/earth over the good of social groups and individuals. The Gaian thesis simply inverts the logic of human domination over the natural world: planetary management is seen not as an extension of human control, but as a process to which the fate of humans is utterly subjugated. Under cover of the rhetoric of "biocentric equality" and the "balance of nature," the logic of domination is held intact, and the social specificity of human life drops out of the picture.

Like global models of corporate planetary management, which take the planet as an economic unit, Gaian philosophy demonstrates the danger of taking the planet as a zoological unit. In either case, humanity appears as a mythical species, stripped of all the rich specificity that differentiates human societies and communities, and oblivious to all the differences in race, gender, class, and nationality that serve to justify and police structures of human domination within and between these societies.¹⁸ In both instances, the questions raised by ecology can no longer be explained or answered by social theory or social action; they are resolved at the level of "resource management" by the logic of the multinational corporate state, or by the independent diktat of the "tough" planetary organism. The problem of global warming is no longer an arena for exposing the barbarism of social institutions. From both of these perspectives, it is an experimental opportunity to test the logic of their respective world-views. It is not surprising that a recent book, *Gaia: An Atlas of Planet Management*, has succeeded in combining with ease both philosophies, celebrating the adventure of safeguarding Gaia's health through macromanagement of her resources.¹⁹

To see how this experimental adventurism is shared by the scientific establishment, we need look no further than the words of Roger Revelle and Hans Seuss of the Scripps Institute of Oceanography. In a 1957 paper about CO₂ exchange between the ocean and the atmosphere, often cited as the origin of the modern debate about global warming, they write:

Human beings are now carrying out a large scale geophysical experiment of a kind that could not have happened in the past nor be reproduced in the future. Within a few centuries we are returning to the atmosphere and oceans the concentrated organic carbon stored in sedimentary rocks over hundreds of millions of years. This experiment, if adequately documented, may yield a far-reaching insight into processes determining weather and climate.²⁰

It is possible that a reader could fail to detect the note of warning in these words. But there is no mistaking the euphoria attached by the authors to the very idea of such a grand experiment. The first and last experiment in which modern science can take the entire planet as its test object! Surely this qualifies as a culminating moment in the history of natural science, whose founding proponents chose the physical world as their experimental object to master through the force of rational explanation. While it is important to take note of such an experiment's sublime lure (repeated in a 1986 NASA report—"we are conducting one giant experiment on a global scale"), we should also take care not to aestheticize its attractions further. To see the ecology of global warming as an opportunity for an "experiment" is a profoundly political way of seeing the world that undercuts our best hopes for reclaiming the environmental sciences as an ecological ally.

When I describe this view as political, I do not mean that such an "experiment" would always be framed and influenced by explicit ideological aims, although there is no question that external politics has played a significant role for scientists in the climatic debates over the years. Government funding, career prestige associated with the winning theory, the opportunity to testify, lobby, formulate and administer policy, and the advancement of the discipline of climatology are only a few of these political factors. Nor do I simply mean that such an "experimental

attitude" naively assumes the possibility of objectivity for its observer. The debacle of the "hole" in the ozone layer, undiscovered for so many years because its observers programmed their computer to ignore measurements that diverged too greatly from expected norms, notoriously proved how highly "interpretive" such climatic experiments can be. Rather, what I mean is that the experimental attitude, especially when it takes the whole planet for its laboratory, becomes a form of constructive power that reshapes the world in a different image, detaching it from meaning and value and delivering it up to the rationality of technical description and control. It has often been argued that the goal of natural science, in its intention to construct a world of fact, has proceeded apart from nature, and only in relation to its own intellectual paradigms and self-defined modes of rational inquiry and verification. Historically opposed, by its own founding principles, to the local influence of political coercion and supernatural faith alike, the natural sciences have developed in relation to a much more powerful ideology bound up with the rational organization and domination of nature. Viewing segments of the natural world as controlled experiments is one of the normative instruments of this kind of rationality. The modern history of environmental policy bears the impress of this way of thinking, whether in the traditional conservationist mode, with its protected enclaves of "nature"—wildlife refuges, zoological museums, national parks, and wilderness areas; or in the more technocratic mode of "resource management." With the maturing of the idea of global ecology, publicly dramatized by the global warming debates, the entire planet becomes a protected preserve, the object of an experiment in which the global ecosystem must now be managed and regulated to sustain its organic life-forms and other "resources." The difference is that there is no way of claiming an "outside" in such an experiment, no value-neutral perspective for its observers and supervisors, and no surrogate point of view available for nonexperts who are not part of the intellectual conversation about its outcome.

If this new stage of monitoring a planetary ecology does represent a qualitative shift in the "project" of dominating nature, then it goes hand in hand with the new forms of subjectivity being forged by an emergent global politics. Concerns about planetary survival are a crucial part of what

it means to be a global citizen, to have a global world-view, and how that is going to affect everyday life in places as far apart on the development spectrum as Los Angeles and Upper Volta. We live in the early formative days of globalist ideology, and, as a result, are perhaps well placed to see the full extent of how unevenly developed this ideology and its effects are. Today's debate about global warming, in the forefront of the highest diplomatic discussions among Western industrial powers, can be read as a symptom of the way in which many similar decisions will be made about global matters in the future. The fact that warming across the globe is highly uneven might alert us to some of the geopolitical factors involved. It has been suggested, for example, that the "cooling" theories of the seventies were based on "local" North American weather statistics, and therefore did not accurately reflect global trends. Evidence now suggests that the warming, if it is "global," is not at all uniform, and that the southern hemisphere and the tropics seem to be warming faster than northern regions.²¹ Whether these claims prove true or false in the long term, they are not the kind of claims that play well to Third World nations, justifiably suspicious of Western theoretical science that declares universality for itself. Much of climatic science is based upon records from the northern hemisphere, the exclusive source for almost all of its historical data. The northern view, along with theories that most affect the northern hemisphere, tend to be normative in the history of modern science. As it becomes increasingly capital-intensive, science is exclusively based in the West. Add to this the warranted suspicions of developing countries like India and China (which tend to outweigh the Alliance of Small Island States, whose lands may disappear altogether under a rising sea) that the anti-greenhouse measures which have met with international consensus will have the effect of limiting the growth of their economies in order to protect the shorelines of the most developed nations. The result is part of a familiar logic. No one needs to doubt the urgency of the greenhouse problem to recognize that any Western suggestion of standards for the development of other countries is also a reinforcement of the long history of colonial underdevelopment of the non-European world. It is in such a context, and with such a historical backdrop, that one could justly say, "you don't need a weatherman to know which way the wind blows."

SCIENCE AS CULTURE

Western climatology may be recognized as the primary authority in defining the exact shape of the global crisis, but there are a host of questions related to the climate debates that touch upon local and cultural, rather than global and scientific, interpretations of the weather. Here, we come across the vast spectrum of cultural differences in living with and interpreting the physical world that have little to do with the "universal" claims of global climate modeling. Even in a local context, some of these differences are overtly cross-cultural. For example, Mary Douglas has described two neighboring tribes in the Congo—the Lele and the Bushong who live on different banks of the Kasai river—who experience the same climate quite differently, celebrating their hot and cold seasons at opposite points of the calendar. Meteorological records kept by Belgian authorities showed that there was little "objective difference" to account for each tribe seeing the other's cool season as unbearably hot, and vice versa. Douglas concluded that the phenomenological differences could be explained by the respective agricultural timetables of the tribes.²²

Then there are the complexities of linguistic translation across climates; it is pointless for example to make much sense, in any subtropical culture, of the phrase "Now is the winter of our discontent." In addition, these problems in translation are habitually burdened by ethnocentric assumptions. For example, Jody Berland has pointed out that we tend to see the Inuit's famous multinaming of snow in "terms of an objective, functional nominalism more or less parallel to our own, not in terms of any fundamentally different spirit of naming." Our system of naming snow relates to the degree to which it will restrict our everyday business. In contrast to our regulatory naming of snow by "measuring its nuisance value," Berland points out that any other way of "naming" snow is seen as "a childish inability or refusal to subjugate weather."²³

But it is not just Third and Fourth World cultures, traditionally seen as "closer" to nature, that introduce interpretive "noise" into the experts' weather control systems and climate models. Each northern nation and, more often than not, each region has its own weather pathology, richly seeded with popular memory and historical lore. One region's "warm" is another's "hot": one season's "cool" is another's "warm." For anyone, for

example, who grew up in an agricultural region given to periodic drought, the prospect of long, soaking rains could never have the negative value associated with its appearance as a blight on some urban region's weather.

To acknowledge this welter of interpretive variations, crisscrossed by regional and cultural differences, is to acknowledge, of course, that we don't all share the world in the same way. Despite their inbuilt appeals to universal truth, most weather proverbs are correct only 50 per cent of the time (many carry the facesaving qualifier "oft," but, in most cases, you can usually interpret them to mean the opposite), and are otherwise appropriate only to certain local conditions and climates. People are likely to have allegiances to local cultural formations and identities before they recognize global appeals to their attention. In many regions of North America, a tradition of local pride in "state weather" is imbued with the fierce political legacy of "states' rights." Consequently, there is a long and well documented history of deep-rooted suspicion of centralized weather forecasting, especially when it involves experts reading a computer screen rather than scanning the skies or reading the signs in nature. For many years after the inception of daily national forecasts, local newspapers preferred to publish the forecasts of the local weather prophets, often very colorful characters whose community standing had been challenged by the new professionalism. The history of forecasting is marked by notoriously incorrect prognoses on the part of official meteorologists that were seized upon to fuel local skepticism. Provincial forecasters have, in recent years, acknowledged this resentment and skepticism by drawing upon the observations of local observers and spotters, who report weather variations from their home stations all over the outlying region. The weather, after all, is described and defined by millions of opinions, but the professional's forecast overpowers all other definitions. Not surprisingly, people often feel that professional forecasters, especially those in a centralized national bureaucracy that relies heavily upon computer modeling, are too remote, geographically and culturally, to do a proper job.

A good deal of cultural power rests upon the maintenance of that centralized authority in times of natural emergency and disaster, and even more rests upon the exercise of authority across cultures with unequal access to scientific information. One of my favorite examples is the description in Zora Neale Hurston's *Their Eyes Were Watching God* of

Florida's great Okeechobee flood of 1928, caused by a hurricane that the official meteorologists did not predict until the night before but the Seminole Indians foresaw in good time, thanks to their interpretation of an unseasonable blooming of saw grass. Whole sectors of the animal population joined the Indians in a forced march away from the Everglades, watched over uneasily, in Hurston's fictional version, by the mostly black workers on the swamplands:

Some rabbits scurried through the quarters going east. Some possums slunk by and their route was definite. One or two at a time, then more. By the time the people left the fields, the procession was constant. Snakes, rattlesnakes began to cross the quarters. The men killed a few, but they could not be missed from the crawling horde. People stayed indoors until daylight. Several times during the night Janie heard the snort of big animals like deer. Once the muted voice of a panther. Going east and east. That night the palm and banana trees began that long distance talk with rain. Several people took fright and went in to Palm Beach anyway. A thousand buzzards held a flying meet and then went above the clouds and stayed.

A fellow worker, informed by his uncle of the official hurricane warning that is finally posted in Palm Beach, tries to persuade Tea Cake to leave:

"De Indians gahn east, man. It's dangerous."

"Dey don't always know. Indians don't know much uh nothin', tuh tell de truth. Else dey'd own dis country still. De white folks ain't gone nowhere. Dey oughta know if it's dangerous. You better stay heah, man. Big jumpin' dance heah, when it fair off."²⁴

As it happens, Tea Cake may have been right about the Seminoles. On certain famous occasions, such as this one (and again, in 1944), they proved superior to "white science" in their prediction of the behavior of Florida hurricanes; on many other occasions, however, their homeopathic methods of reading nature's signs have been less successful than the Weather Bureau. But, in view of the disaster that the Okeechobee flood visited upon the workers and local population (up to 2,000 dead), Tea Cake's explanation of the knowledge/power relationship between the native and the white Americans has an especial irony. In particular, it positionally describes his

own people—African-American agricultural workers—as a culture no longer in touch with the "signs" of nature, no longer living "in" the earth like the Seminoles, but subordinated now to the authority of another culture, whose scientific understanding of nature has underlined its ascendancy in the world. Hurston plays this unhappy positionality to its full tragi-comic effect.

A striking contrast to Hurston's coy ethnography is Saul Bellow's *Henderson the Rain King*, a rather condescending narrative about a wealthy white American's absurdist adventures in "darkest Africa." Entering into a wager with the king of the drought-plagued Wariri tribe over the likely success of their rainmaking ceremonies, Henderson impulsively takes part in the ceremony and is ritually accepted as the tribe's "rain king" when his actions are succeeded by rainfall. To play his role as rain king, it doesn't seem to matter that he is a foreigner who has had no functional standing in the tribal culture hitherto. Unlike the nearest equivalent office of "rain king" in his own culture, which would require the authority that comes with accredited learning and professional meteorological expertise, Henderson simply accedes to this important tribal position because he is in the right place at the right time. His accumulated knowledge about how rain is formed, limited as it may be to theories culled from his wife's subscription to *Scientific American*, has absolutely no bearing on his important function in the business of rain formation among the Wariri.

These stories about the relation between cultural power and climatic prediction do not *seem* to be part of the same interpretive system as, say, the eminently scientific theory of global warming, and yet it could be argued that the only difference is that they appeal to differently organized systems of rationality. Global warming theory claims universal scientific truth for itself, against which climatic interpretations like those of the Seminoles or the Wariri are seen as local belief-systems, or, at best, *ethnometeorology*. The distinction, however, is itself an exercise of cultural power. Global warming theory is nothing if not a high cultural expression of Western science, dominant in the field of interpretations of the climatic economy. But one does not have to speculate about what the Wariri would have made of the theory of global warming to recognize the local nature of a worldview that Western science poses as universal. Nor do people need the universal comfort of science to draw their own culturally coded conclusions

about human pollution of the environment. As Claude Lévi-Strauss has shown in *The Origin of Table Manners*, many of the tools and rituals of everyday life—wearing hats and gloves, drinking through straws, using combs and utensils—are ways of regulating our exchanges with the external world, protecting the environment from our own polluting actions by ensuring “that nothing should be brought about too precipitately.”²⁵

Relatively untouched by the precision language of the meteorologist, most people in the industrialized West have their own ways of making sense of the determining role of climate in their everyday lives: from the empirical end of the spectrum—the vestigial memory of weather folklore, and the habitual practice of phenology, “the science of appearances,” by which people drew seasonal conclusions from the signs of nature (appearance of flowers, thaws, animal and bird migrations, and the like)—to the more abstract domains of regional weather pride, the rule of seasonal expectation over cycles of endurance and pleasure, disaster culture, etc. This broad spectrum, and the conception of the world that it supports, has little to do with the interactive global model of atmosphere—oceans/ice sheets/cloud albedo/biota—that constitute the climatologist’s weather system. In some cases, the language is different, but the lived object of experience/knowledge may be the same. For example, the infamous Southern Pacific ocean phenomena that are known colloquially as the Christ Child—El Niño and La Niña (warm and cold respectively)—take their name from the fact that their climatic influence over Central and Latin America begins, in active years, towards the end of December. The meteorological term for this seesaw pattern of rising and falling barometric pressures in two large regions of the Pacific is the Southern Oscillation. The popular connotations of El Niño in Latin religious history give the extreme weather associated with the phenomenon a cultural resonance quite different from that conjured up by the much less colorful term, Southern Oscillation.

But the difference between the language of scientific expertise and the popular culture of experience and local memory is not a difference in kind. Nor, if what is at stake here are different conceptions of the hold the physical world has upon us, can these differences be explained away as cultural relativism. They are precisely ranked on the scale of power, and

they reflect real inequalities not only in the degree of power that different cultural groups have over their relation to the physical world, but also in each group’s ability to make arguments that will affect that relation. In this respect, it is a mistake to think that theories of climate change that take the globe as an experimental object can rest simply upon criteria of empirical verifiability or formal coherence. These theories draw their power in the world from an elite culture peopled by those accustomed, by education and an inherited sense of entitlement, to see the globe as part of their *dominion*, a territory that exists to be rationally surveyed, itemized in a cost–benefit analysis, and protected by political action that further regulates its natural economy.

In making these points, it should be clear that I am not, of course, *disputing* the theory of global warming. To dispute a scientific theory involves vast amounts of laboratory capital and a long history of professional prestige in a specialist discipline. Rather, I am calling attention to the cultural and political conditions under which contests for theoretical dominance take place, and scientific “common sense” is subsequently shaped in the public mind. Nor am I arguing that the environmental consequences of “global warming” should not be acted upon in quite radical ways. Whether the hypothesis of global warming is proven or not, the recent spotlight on the climate debates has provided the single best opportunity for ecological condemnations of capitalist growth and development to win a hearing in the most powerful circles of decision-making. Consensus about this “crisis” will lead to significant ecologically minded steps and programs at all levels of action, from individual consumer choice to multinational regulation. So too, the need to discourage thinking about nation-states as climatic islands is concomitant with the need to construct a global politics that transcends the isolated obsessions of individual nation-states.

But we cannot expect all the changes to be progressive. Globalism will generate new power relations as the old national allegiances lose their sway. Just as the social costs to capitalism of environmental regulation are likely to be internally absorbed and handed on to consumers, so too there are cultural costs to be borne in transforming people into global citizens. This goes well beyond the tendency, already well advanced, of passing on to individuals the deeply moralistic sense of assuming responsibility them-

selves for the very largest ecological problems that ought to be borne primarily by corporate executives and their stockholders. For most individuals, the new "natural" scarcity of a globally conscious economy will be exploited in much the same way as the old "artificial" scarcity was exploited in the "national interest" of a few. This means more than a continuation of deprivation for many in the name of those few who benefit from creating conditions of scarcity. In cultural terms, global consciousness also means an erosion of diversity, a flattening and incorporation of cultural differences that the new "global economy/climate" can no longer "afford" to sustain—except, of course, in the postmodern realm of images, as representations of cultural difference à la Benetton. What is being erased are all those features of cultural difference that cannot be readily translated across cultures into the visual language of the global village, the poly-rhythms of world beat, and the ideology of market pluralism. As the race for global culture quickens, we must be prepared to make the same arguments about cultural diversity as ecologists have made about biological diversity. The attrition of cultural diversity, like the loss of life-species, decreases the chances of sustaining our social survival.

As a world-view, globalism will have to work hard to produce a new sense of cultural allegiance, a new sense of subjective loyalty. Where the divisive course followed by the history of nation-states provides little support for expressions of global subjectivity, the new planetary dimensions of environmental responsibility are already providing the language of necessity required to pull together what has been, until recently, the disparate Babelian vocabularies of global citizenship. The move in this direction is double-edged if one considers the new range of responsibilities to be explored and exploited. Conflicts over the rights of global citizenship are unlikely to center upon the same rights of freedom and justice that have marked the bloody history of citizenship in liberal nation-states. Everyone, after all, *belongs* to a global society. No one, in principle, can be excluded; least of all "indigenous" peoples historically denied full citizen rights in liberal nation-states (although the outlaw class of "international criminals" or "terrorists," even now being extended to whole peoples like "the Arabs," would be first in line to be denied such global rights, a tendency foreshadowed in the Gulf War, the first holding action fought in the name of the "New World Order"). But the extension of citizenship in the name

of laissez faire-ism will also provide further opportunities to extend liberties only at the expense of equality. Bear in mind that the globalist move is not taking place in a political vacuum. Far from being forged in the spirit of internationalism espoused by the more enlightened socialists, globalism is advancing under the aegis of free market ideology, just as environmentalism is increasingly posed as a social cost to be borne equally, by all individuals, rather than by its primary corporate and institutional offenders.

The debate about global warming, as I have discussed it here, promises to generate similar contradictions in the way people think about the natural world. Instead of feeling the weather as we have felt it historically, as part of a shared local, or even national, culture, we are encouraged to think of it globally. On the one hand, this will promote our attention to the interdependency of environmental factors across cultures and continents; on the other, it may help to dissipate people's faith in the efficacy of local actions. It has become convenient, for example, to cite global warming as a distant, almost inevitable, causal explanation for a range of environmental problems and issues with a much more local provenance, accountable to pressure by local communities and open to change by local action.

Global weather culture may be in its infancy, but the phenomenon of weather cultures was not born yesterday. In the pages that follow, I will describe some of the historical features of local, more specifically national weather culture that have served to maintain pre-global ideology until now. In this history, we will find clues and tendencies, rather than iron laws, to suggest the future's possible shapes.

PLUVICULTURE

A student of mine once revealed that he never consulted weather forecasts. "The weather is for other people," he announced, by way of explanation. I responded by suggesting that I didn't think this was a very citizenlike thing to say. Having thought about that reply for some years now, I recognize now that I was both right and wrong in responding the way I did. The weather is not simply for other people, because we share other

people's weather. On the other hand, the history of national weather, as I shall outline it here, holds no simple or single guarantees about what it means to be a responsible weather citizen.

In 1841, at the Académie Française, Louis Arago, a scientist and a gentleman, who no doubt loved to make such pronouncements, observed: "France has its Cuvier, England its Newton, and America its Espy." For those who have never heard James Pollard Espy, the most colorful of fledgling meteorologists, there is much to be learned from his life and work, especially in the days of global warming, about the relation between science, ideology, government funding, and the popular imagination. Author of a polemical volume called *The Philosophy of Storms* (1841), he became a regular lecturer on the lyceum circuit, where he was known and heralded in newspapers as "The Storm-King." To be a success in this capacity was no mean achievement. Of the popular lyceum stage, Thoreau said: "Men are never tired of hearing how far the wind carried men and women, but are bored if you give them a scientific account of it." And yet this is precisely what the celebrated Espy did. For over twenty years, moreover, he was involved in a very public debate with the eminent scientist William Redfield about the nature of storms. Both proclaimed universality for their own laws of storms; both produced rules for mariners to negotiate storms; both entered into conjecture about the nature of the weather in the "far west," beyond the Alleghenies, and thus the borders of the known world; both converged on site in the aftermath of great storm damage in order to study its effects; and both drew entirely opposed conclusions about all of these subjects.

Espy's scientific theories have had mixed reviews. His deductions about storm behavior proved to be wrong; he argued for the elliptical nature of winds around a low pressure system, while Redfield argued for circular wind behavior. On the other hand, Espy is commonly credited with important discoveries about thermal air currents, especially the role of hot rising air in the generation of thunderstorms. Indeed, his notoriety rests upon one particular version of this thesis. For many years, he advertised to the public his theory of artificial precipitation, or rainmaking, based upon his observations that the thermals rising above urban manufacturing areas often produced rainclouds. In *The Philosophy of Storms*, he cites as evidence of his theory the testimony of one Benjamin Matthias from Philadelphia:

"In the course of the last winter, while in England I visited Manchester four or five times, and on each day it rained. Several of the inhabitants assured me that it rains in Manchester more or less every day in the year."²⁶ While Espy acknowledged that this theory sounded like "bad philosophy," he warned that popular opinion will nonetheless show it to be truthful, no doubt by accumulating testimony of the sort provided by Matthias.

As chairman of a committee reporting to the US Congress on meteorological matters, Espy was in a position to push his views further, especially at a time when rainmakers' services were often the basis of a livelihood.²⁷ In fact, as a measure intended to alleviate the prevailing drought-like conditions in Pennsylvania and the Mid-Atlantic States, Espy proposed that areas of forest land be burnt in order to precipitate rainfall (a proposal that could only have been considered at a time when vast areas of forest were being cleared from the land). The success of his experiment, moreover, was to be consequent upon a considerable financial reward from the government: on a scale, from \$5,000 for 10 square miles of precipitation to \$50,000 for the feat of keeping the Ohio River navigable in the summer for steamers.

Aside from a good deal of ridicule, in and out of Congress, nothing much came of his proposal, although at least one populist Senator saw quite clearly that no single individual, no matter how gifted or visionary, ought to have such sovereign control over the Ohio River. John Quincy Adams, the ex-president, had peculiarly harsh words to say about the ambitions of the "storm breeder": "The man is methodologically monomaniac and the dimensions of his organ of self-esteem have been swollen to the size of a goiter by a report of a committee of the national Institute of France, endorsing all of his crackbrained discoveries in meteorology."²⁸ Despite the ridicule and the calumny, Espy turned out to be quite correct about the capacity of rising hot air to affect the weather locally. Indeed, Matthias's observations about rainfall over Manchester have long been borne out: there is a noticeable decrease in precipitation over large industrial areas at weekends, when factory smoke and auto exhaust are diminished. Espy's forest-burning proposals for rainmaking, however, will seem like bad historical faith today in the light of the disastrous consequences of the deforestation of the Amazon, the Sahel, and the slopes of the Himalayas. Two thousand years of clearing forests for profit, reinforced by the

Christian logic of destroying groves sacred to pagan religions, have had a devastating effect on regional climates, and may now be playing a major role in global warming.

The "profit" that Espy proposed to Congress for his rainmaking scheme in the Ohio Valley was tied into a specifically national system of value. His final court of appeal was based on the assessment that the national benefits to industry and agriculture resulting from this artificially produced rainfall would be generated for the sum to each citizen of less than half a cent a year.²⁹ This proposal might be read as an early example of the theory of the popular distribution of social costs, borne for resources like water that can no longer be provided free to industry and agriculture. In addition, Espy's appeal links a national economy of value with what could be called a natural economy of value. In doing so, we could say that his appeal exposes the underpinnings and workings of ideology itself, inasmuch as ideology can be defined as that kind of discourse which conflates these two economies, presenting the social as if it were natural. Nationalist ideology depends explicitly on the conflation of these economies. In looking at the history of "national weather" in the pages that follow, I will consider some of the languages, technologies, and systems of representation that have helped to establish this intimate relationship as if it were a part of manifest destiny. In doing so, we will no longer be talking about the history of "weather" in the physical world; we will have to talk about the history of "the weather" in the ideological world of a national culture.

Espy's place in that history is indisputable, if only because of his rainmaking theories. His was an age of nationalist expansion westwards, governed by Jefferson's agrarian vision, and, at a time when there was a good deal of debate about the effect of land clearing on climate, his rainmaking theories drew upon the popular perception that "rain follows the plow." In other words, as the frontier pushed westward, it "created" the weather at one and the same time, modifying the climate and producing precipitation for the plains, newly under cultivation. The "national weather" was, in effect, exactly coterminous with the ever-expanding boundary of the nation's body. In this respect, we can speak of a "national" weather culture, however imaginary, that corresponds to this first phase of national expansion.

But Espy's place is also assured on account of his attempts to amass and

collate on a national scale the extensively kept daily weather records of private citizens—a great American tradition established and religiously observed by Washington, Jefferson, Franklin and thousands of other unsung weather diarists. A good contemporary example of this tradition was Charles Peirce, who, in 1847, was urged "at the friendly solicitation," as he put it, "of a very considerable number of highly respectable citizens of Philadelphia," to publish a compendious record of weather events and temperatures for the fifty-seven years between 1790 and 1847. To this meteorological record, Peirce appended a number of often extensive historical lists: cold and stormy winters in Europe from the dawn of the Christian era, and in America prior to 1790; storms and hurricanes all over both continents; notes from his records concerning "the formation of the government of the United States"; a detailed history of Philadelphia, its buildings and communications—railroads and steamboats, and the concomitant damage inflicted upon them by the weather; a record of large fires and remarkable earthquakes; and an account of the history of North America from the voyages of Columbus onwards, culled, as Peirce puts it, from "our Tablet of memory," in which we store useful facts and memories "respecting the country of our birth or adoption."³⁰

Each date or event is listed as if it were an itemized line in an account book wherein weather disasters are modified and balanced out by economic improvements and technological innovations. While there is no attempt to hold on to a strict continuity between weather conditions in Old England and New England, as Puritan settlers had done (in 1686, Increase Mather had noted that the Massachusetts climate "agrees well with the temper of our English bodies"; French settlers in New Orleans appraised the Mediterranean features of the Gulf climate), the character of the national weather is still chronicled in relation to European weather events, thereby historicizing its "natural" continuity with the Old World. Aside from his close attention to the historical growth of communications, crucial to the discursive mapping of a continental landmass like the US, what is most striking about Peirce's method is his attachment to facts and statistics. Like Thoreau's obsessive accounting of the costs of living on Walden Pond, Peirce's balance book of statistics establishes social and historical continuity for his record of the economy of nature. In doing so, he helps to

construct in national terms what Daniel Boorstin was later to characterize as a "statistical community."³¹

In contrast to Peirce's amateur-gentlemanly endeavors, Espy's ambitious efforts were publicly tied to a professional concept of national weather, philanthropically conceived as a service for "the Farmer, the Mariner, and all Mankind." Indeed, these professional efforts formed the basis of an early federal meteorological agency, initiated as a service of the Signal Corps of the War Department, and helped along by Joseph Henry at the Smithsonian Institute, who centralized the service by developing a national network of observers reporting to Washington via telegraph. Established as the Weather Bureau in 1870 (administered by the War Department, and later under the civilian auspices of the Department of Agriculture (1891), and the Department of Commerce (1940)), the agency finally became the National Weather Service (NWS) in the 1970s, administered by the Environmental Science Services Administration and, today, by the National Oceanic and Atmospheric Administration. Each stage of its evolution has been marked by political factors, like that of wresting civilian status from the early militarized Bureau, and economic considerations—the shift to the Department of Commerce came at a time when service to aviation surpassed the service to agriculture.³² While the information provided by the NWS today is available for next to nothing, the media, especially TV, spend millions on staffing outlays and simulation technologies in order to humanize this information and to present it as an entertainment segment on news broadcasts. But the NWS no longer functions as a centralized government monopoly. At least one private weather service—Accu-Weather, from Pennsylvania—runs an extensive and highly lucrative weather service for private enterprise, including many television stations. Accu-Weather's claim to greater accuracy was initially based on its close attention to European forecasting systems, which make use of computers that can produce more advanced simulations of weather movements than are available to the NWS. Joel Myers, president of Accu-Weather, claims that the NWS relies "more heavily on their own model than on the European model for nationalistic reasons" (*New York Times*, February 15, 1987). European superiority in this respect, often represented as a matter of grave national concern for the underfunded NWS, is also a major factor in the new transnational geopolitics of information, in which many

sovereign states have limited access to information about their own countries that is gathered and held by multinational companies. In recent years, vast appropriations have been secured from Congress for a complete update of the nation's meteorological technologies.

Decentralization was considerably advanced during the Reagan eighties, when private forecasting services for all sorts of specialized activities flourished. Many private weather users can now receive images direct from satellite, without any centralized mediation or meteorological interpretation, while onboard weather-monitoring hardware has replaced centralized port systems, obviating NWS forecasts that are often outdated by the time they reach ships and planes. Decentralization and deregulation have not entirely displaced federal control over the interpretation and dissemination of national weather information, but it is clear that the concept of transnational weather has become a political and economic commodity in recent years. World weather has been a diplomatic issue, in principle, since the first meeting of the International Meteorological Organization in Vienna in 1873, while Washington's political interest today in the National Climate Program lags well behind its interest in the World Climate Program. On the one hand, the official recognition that weather is a global phenomenon means that acid rain, radioactive fallout, and global warming can be addressed as occurrences that do not respect national borders. On the other hand, the concomitant deterioration of sovereign national control over weather information has meant that decisions about its use and distribution can be controlled by, if not restricted to, private corporate empires or multinational cartels.

TAYLORIZE OR DIE

The efforts of Espy, Henry and others at the early Smithsonian to centralize the nation's weather by making use of the new telegraph technology looked forward to the progressively rational organization of our everyday life through advances in telecommunications systems. They also oversaw the emergence of an imagined national community, united, state by state, by a discourse that links "America" with the rhythms, crises and patterns of "nature"—in other words, a natural community, with natural borders, and

with a natural, even providential destiny in the social world. In recent years, the coherent shape of that national picture has been altered to accommodate global concerns in ways that are still not politically fixed, let alone rooted in appeals to nature.

There is no question that the way we "see" the weather today is different from the way Espy and his contemporaries did. This is not simply because of linear "progress," associated with superior technology, advancements in the science of meteorology, or a less parochial understanding of the workings of the natural world. What stands between us is a dense social history in which "the weather" has been shaped and appropriated by various state and commercial interests. Meteorology, which only came into its own as a scientific discipline based on positivistic laws after the turn of the century, has been especially subject to market forces and military-industrial influence. In his book about the career of Joseph Bjerknes, the Swedish scientist associated with the influential Bergen school of meteorology, Robert Friedman provides a case-book example of this process by showing how Bjerknes sought prestige in the scientific world by legitimizing the new "science" of meteorology at a time when the fledgling aeronautical industry required accurate information about the atmosphere. The new meteorology proved a vital military asset during the Great War, and weather forecasting soon became a lucrative commercial service for air travel after the war. Bjerknes's "discovery" of air-masses moving in discontinuous "fronts" was therefore presented at a particularly opportune moment for transforming the discipline and indeed the whole practice of weather forecasting. Friedman shows that Bjerknes's new explanatory model of discontinuous fronts took its conceptual shape from a militaristic view of the northern hemisphere as a battleground upon which a warm equatorial current struggled against the cold polar current. Consequently, Bjerknes proposed a discursive picture of a single "battlefront" stretched around the hemisphere in a metaphoric extension of the kind of warfare that had been waged recently in Europe. Bjerknes's theory of the front formed the basis for a circumpolar weather service, with a school of disciples spreading the word throughout Europe and North America. With the authority of the theory established in scientific circles, it wasn't long before everyone began to "see" fronts. Friedman's story of the career of Bjerknes is a striking parable about the ways in which this scientific theory

was advanced through power, authority, persuasion and responsiveness to commercial interests.

The existence of the "front" was, of course, a theoretical postulation, not something waiting empirically in nature to be discovered. To transform the accepted method of "seeing" and "reading" the weather, Bjerknes had to invent a weather semiology that would be more stochastic and less static than the old mechanistic method of observing.³³ A system of signs was needed by which observers could interpret the existence of these discontinuous fronts before they arrived. Friedman describes how Bjerknes sought support for his theory on the margins of science, and on the geographic margins of the nation:

Using clouds as signifiers of atmospheric processes occurred to Bjerknes during the setting up of the Bergen forecasting service. While traveling up and down the coast in 1918, to the outermost reefs and to the remote ends of the fjords he acquired new insights into weather prediction. From the farmers, lighthouse keepers, fishermen, and sailors who were to be observers for the forecasting service, he learned a rich folklore of weather prognostics. Interwoven with ancient and superstitious beliefs were useful predictive signs. To help compensate for the missing data from the west, he realized, a system of signs might be devised that, when interpreted correctly, might provide clues to the weather systems approaching from beyond the North Sea horizon.³⁴

Here, surely, are all the marks of a heroic narrative, wherein the intrepid scientist redeems the latent half-truths of popular consciousness by converting followers of folklore and superstition into amateur disciples of science. To provide confirmation for his theories, Bjerknes established a set of forecasting instructions for these untrained observers. The instructions were designed, of course, to fit the theory, to see nothing but evidence of discontinuous fronts in the clouds. The existence of secondary fronts, for example, long suppressed by the Bergen theory of a single polar front, was excluded, and rendered impossible by the forecasting system constructed by Bjerknes. If, in Bjerknes's transformation of the sailors' weather folklore and prognostication into a systematic method of prediction, we see nothing but a shining example of enlightenment progress that we have happily inherited, then we see only half the story. The other half tells us about the

social factors that helped to shape that transformation in ways that had more to do with politics, commerce and prestige than with inevitable advances in science.

A similar caveat could be offered in considering the difference between the weather in Espy's golden age of rainmaking on the frontier, and the weather in today's globally warming world. In the course of that history, too long to recount in detail here, it could be argued that a number of large-scale cultural transformations have taken place: the "gay science" of weather folklore and divination by consulting plant and animal behavior has been replaced by our new "unhappy" relation to the meteorologists' jargon-laden language of forecasting; the everyday cult of "experience" has been replaced by the professionalist ethos of "expertise" in responding to weather semiology; the rich array of weather perceptions—how we listen to the weather, see and feel it coming and going—has been replaced by a spectrum of "weather sensitivity"—the vulnerability of our bodies to the minutiae of weather phenomena (a certain division of mental and manual labor remains in place—working people have weather-sensitive bodies, while intellectuals have weather-sensitive minds); a code of early-warning systems for the defense and survival of local, agrarian communities has been replaced by a massively institutionalized anxiety about the defense of national shorelines; weather-as-news on the scale of local tragedy has been replaced by weather as commentary on regional, national and international events, especially weather disasters high on the scale of geopolitical tragedy; the quackery that once accompanied the culture of almanacks and patent cures for weather-induced ailments has been replaced by the almost complete commodification of bodily maintenance in the face of year-round weather threats and assaults; "looking out the window" has been replaced by the perspective of a geo-stationary satellite; and our mental or cognitive maps of the psycho-geographical environment have been replaced by the objectively simulated representation of an environment under the influence of weather, other people's weather that is only temporarily our own.

This list could go on and on, but its structure already suggests an argument that I don't really want to make. Such a list of changes, narrated in such a manner, lends itself to an already well-known story, told by the left and right alike, about the increasing technorationalization of the object world and the concomitant increase in the methods of social control and

production of passive, commodifiable personalities for us all. While I don't intend to take issue with this narrative (and am otherwise quite sympathetic to many of its political assumptions), I do not think that the story it tells about the exercise of cultural power is an altogether adequate one. This story, governed by a nostalgic narrative of decline and disenchantment, locates "value" in the relative coherence of folk, communitarian *experience*, increasingly eroded and alienated by modern technologies. A counter-narrative would simply assert the primacy of knowledge and information (categories no more value-free or any less mediated than that of "experience") over ignorance and superstition. It would point out that pre-technological "proximity" to nature, far from guaranteeing anything that resembles natural or social equality, was one of the primary means of maintaining a repressive social hierarchy. Indeed, only in recent years has proximity to nature, "untouched" by mankind, acquired a positive value in our culture—a turnabout from centuries of association with barbarism, demonism, and worse.

Raymond Williams has pointed out that the dominant ideas about nature contain "an extraordinary amount of human history." In the modern period of Western culture, Nature has been personified as, respectively, God's (medieval) deputy or minister, an absolute (Renaissance) monarch, an (Enlightenment) constitutional lawyer, a (Darwinian) selective breeder, and a (laissez-faire) free marketeer, among others.³⁵ It could easily be argued that none of those roles guaranteed the general population anything but a passive, dominated fate, subject to the brutal "laws" of "natural" scarcity and necessity as created or interpreted by ruling interests. There are few today who would dispute that theological knowledge about the providential visitation of storms upon a backsliding populace is a less empowering explanation of the weather than scientific knowledge about the disastrous contribution of industrial processes to atmospheric degradation. But this is a false comparison, and offers no real explanation of the different sets of power-relations that could be mobilized around each of these claims. We need to consider each such claim in its own social and historical context, taking the time to describe the interests it served and the local politics to which it gave rise at a particular time and in a particular place. For every example of a repressive pre-technological social hierarchy

there is a counterexample of non-hierarchical social existence at a low level of technological development.

Dominant ideas, whether in science or theology, are legitimized and enforced at any time by presenting them as part of a natural order of things. Ever since science, in the Enlightenment narrative of progress, was posed *against* an intractably stable order of nature, the maintenance of cultural and economic power has rested upon a dialectic of change and constancy, innovation and stability, progress and conservation. Consequently, the game of winning general consent for ideas in the history of modern capitalism has been waged on a balanced terrain of contradictions, where narratives about traditional values are played off against narratives of progress. Something always has to be sacrificed for progress to be made, and yet progress is only sanctioned if what it displaces is preserved in some other region of social life. It is in the context of this play of values that any history of modern weather can best demonstrate its role in the national culture. For the way in which we talk about weather patterns of change and repetition is fundamentally linked to the dialectic of change and constancy that lies at the heart of a developed capitalist culture. To focus on the ever-modified shape of that dialectic from moment to moment is to reject the explanatory power of ultimate linear narratives about progress, whether those of progressive domination or progressive emancipation.

In this respect, the recent hysteria about global climate change—the transformation of a natural phenomenal order that was hitherto assumed to be constant—can be seen as a continuation of historically regional and national anxieties. The history of US weather is full of examples. Take the annus mirabilis of 1816—the famous “year without a summer” in which frosts and snows persisted all summer as far south as Pennsylvania and New Jersey. Crops failed, famine followed, the shift in New England from an agrarian base to industrial manufacturing was initiated, and the great migration to the Middle West was begun. The popular perception of these events, reflected in Jefferson’s suspicions about climate change cited earlier, was that the weather had permanently altered, and thus that years without summers had become the rule and not the exception. Or consider the coincidence of severe economic depression in the 1930s with drought-like conditions in the Dust Bowl midsection of the country, from Mexico to Canada, and from the Great Lakes to the Sierras. The Dust Bowl disaster

proved that semi-arid lands in the West could not support the same farming methods used in the more humid East, precipitating a similar migration west to California. Again, the popular perception was that the weather had changed permanently—for the worse—a perception that meteorologists at the NWS were hard put to combat. A third example, somewhat more impressionistic, is the recent generational memory that the US, in the period from the early fifties to the early seventies, enjoyed a prolonged bout of benign weather, discursively linked, of course, to the climate of national health: the period of political consensus, affluence, unimpeded economic growth, and consumer benefits for all. In contrast, ever since the OPEC oil embargo, the rise of multinational capitalism, and the onset of ecological anxieties, we have seen the breakup of that national weather consensus and the growth of a disaster culture, fed by the new global fears about melting ice-caps and the like, which is now presumed to be a fixed feature of the climatic future.

Instances of prolonged meteorological abnormality expose popular and official anxieties about the economy of change and constancy that regulates our everyday lives. Historical weather events, no matter how singular or prolonged, are remembered as material instances of radical abnormality long after contemporaneous political or social events and upheavals have faded from the popular memory. Famous blizzards, droughts, tornadoes, and hurricanes punctuate regional and national history with a social meaning that often far surpasses the resonance of the political events with which they coincided or were causally associated. The great Texas drought of 1885–87, for example, was such a significant moment in the history of white “conquest” of the state that Texans’ everyday reference to historical events was qualified by the markers “before the drought” and “after the drought” far into the next century.³⁶ More recently, the summer of 1988 has played a similar role as a memory marker for popular ecological consciousness. The long-standing endurance of these popular memories is no doubt partly due to the perception that, unlike remote political events, natural hardships, at least in principle, affect everyone almost equally. But it is surely also an example of the way in which change, even the most extreme instances of change, is habitually naturalized, or at least presented as the result of natural, not human or social, causes.

Changes in the weather from day to day are our most palpable contact

with the phenomenon of change, and so it is no surprise that they often come to be associated with patterns of social change. When the weather does not change for weeks, anxiety about stagnation sets in, just as business economists worry about an inactive economy in need of stimulation. Under drought-like conditions, the weather affects the economy directly because it withdraws its services to industry that nature provides (or used to provide) for free. On the other hand, when the weather calls particular attention to its mutability, we call it "changeable weather" and reserve for it those terms that are patriarchally associated with the feminine; March, for example, is "fickle," July is "sultry," and the practice of feminine naming of hurricanes was, until recently, reserved for the most unpredictably violent of tropical storms.

In national weather cultures like that of Britain, weather mutability and the climate of endurance it inspires are so deeply pervasive that the weather is often described in the ambivalent terms reserved in the popular consciousness for a nationalized institution. In the wake of Mrs Thatcher's victory in the general election of 1987, for example, the debate about the intransigency of nationalized public services was stepped up by conservatives. William Plowden, Director General of the Royal Institute of Public Administration, tried to characterize a now outdated consensus mood in the following way: "It was widely agreed that public services, though in principle admirable, were inherently conservative, extravagant in their use of resources, labyrinthine in structure, liable to give their customers not quite what they wanted, and impervious to criticism. Little more could be done about all this than about the weather" (*The Independent*, June 24, 1987). In the United States, the weather may be national but it is not nationalized; we submit to it not as we would submit to the State—like it or lump it—but rather as we would submit to the "invisible hand" of the market and its so-called free and natural laws. In this respect, everyday change is necessary, no matter how random and contingent it may appear, if the appearance of the system's stability is to be guaranteed; as weather citizens, we are prompted to greet and encourage our investment in change. Things have to change for the system to reproduce itself; this is the fundamental principle of a market economy, and who would expect anything but capitalist weather in an economy where the ultimate reward for a lifetime's service to business is to go into weather retirement in one of

the Sun States or the SunBelt. This, then, is the built-in incentive of the capitalist weather system. No other nation is geographically equipped to promise and deliver such benign rewards for such a large population, while maintaining its Puritan work ethic by invoking the rigorous extremes of seasonal changes in the North. The contrast between the climates of the two non-contiguous states, Alaska—frozen hell of labor and oil production—and Hawaii—balmy paradise of recreation and vacation—expresses the symbolic extremes of the pre-retirement weather system. In contrast to an imperial weather system like that of the old British Empire, covering territories where "the sun never sets" and thus marked as a timeless, boundless, and changeless (political) condition, the American weather system, like its earliest system of industrial mass production in the nineteenth century, is a dynamic mechanism of interchangeable parts.

Consider Mark Twain's famous characterization of New England weather, in which this economy of "production" can be seen, reproduced on a regional basis:

I reverently believe that the maker who makes us all makes everything in New England but the weather. I don't know who makes that, but I think it must be raw apprentices in the weather-clerk's factory who experiment and learn how, in New England; for board and clothes, and then are promoted to make weather for countries that require a good article, and will take their custom elsewhere if they don't get it. There is a sumptuous variety about the New England weather that compels the stranger's admiration—and regret. The weather is always doing something there; always attending strictly to business; always getting up new designs and trying them on the people to see how they will go. But it gets through more business in spring than in any other season. In the spring I have counted one hundred and and thirty-six different kinds of weather inside of four-and-twenty hours. It was I that made the fame and fortune of that man that had the marvellous collection of weather on exhibition at the Centennial, that so astounded the foreigners. He was going to travel all over the world and get specimens from all the climes. I said, "Don't you do it; you come to New England on a favorable spring day." I told him what we could do in the way of style, variety and quantity. Well, he came and he made his collection in four days. As to variety, why, he confessed that he got hundreds of kinds of weather that he never heard of before. And as to quantity—well, after he had picked out and discarded all that was blemished in any way, he not only had weather

enough, but weather to spare; weather to hire out; weather to sell; to deposit, weather to invest, weather to give to the poor.³⁷

It would be impossible to better Twain's canny feel for the local business pride and acumen of the well-to-do members of the New England Society, to whom he addressed this official dinner toast. His is a character act that does wry justice to the culture of the huckster and the genteel industrialist alike, gently demolishing the boundary of "good taste" between the two that his audience would no doubt have preferred to maintain. In juxtaposing the traditional system of craftsmen/apprentice labor with the more mercenary exploits of the roving showman—profiteer, Twain gives us a concise picture of the changing styles of business culture in the newly industrializing mid-nineteenth-century North-East. The profiteer is still posed as an outsider, a "stranger," but his methods and ways bring him "fame and fortune" by exploiting the local product, labor, and natural resources of the region. The "dazzling uncertainty" afforded by the sheer diversity of these natural resources is a testament to the cornucopia of opportunities available to all would-be profiteers. What Twain goes on to call the "inhuman perversity of the New England weather" is here transformed into a marvelous investment opportunity. Nature's variability, a source of great discomfort to the "patient and forbearing" New Englanders, becomes a commodity of the highest promise, a second nature whose inconstancy will be transformed into a source of constant revenue.³⁸

If Twain's story can be read as a parable of the exploitation of natural resources, it also describes the reverse. Natural diversity is invoked to describe a system of variable production as if it were coherent: commodity production as a natural process of risks and opportunities. Twain's New England weather system would be extended in the following century to its fully national dimensions where what he called the "size" of the region's weather still retained its cornucopian promise. A century later, Archibald MacLeish, in a celebratory Popular Front mood, would invoke this promise with none of Twain's deft skepticism: Americans "had the luck to be born on a continent where the heat was hotter, the cold was colder and the mornings were more like mornings than anywhere else on earth."

The ideological maintenance of the national weather system depends, as I have suggested and as Twain's speech illustrates, upon its naturalization

of social causes and effects. If extreme weather conditions can cause suffering, then people's suffering can always be explained (away) in turn by weather conditions; the foreclosure of a family farm can then be seen as an inevitable component of a natural cycle. Inequalities are evenly distributed throughout the country according to the current weather configuration of highs and lows; some like it hot, some like it cold, some times are good, some are bad, wherever there are winners, there will be losers elsewhere. Rewards and punishments are disbursed in a cost-benefit analysis that balances out across the breadth of the nation. This weather system of credits and debits refers as much to a political model—the US constitutional system of checks and balances—as to an ideology—the holistic maxim that "Mother Nature will balance everything out." Such appeals make it seem as natural as the weather that some people must experience hardship so that others may enjoy abundance.

Similarly, on the global scale, regional and hemispheric inequalities can be explained according to geography and not history. Nature intended the distribution of weather wealth to be this way, and if the developed countries happened to have enjoyed the benefits of a temperate climate, then that is because human industry naturally favors such a climate. Famine in underdeveloped cultures comes to be seen as a determined effect of the climate rather than a result of agricultural decisions (to grow monocultural crops for export, like cotton and coffee and bananas, instead of grain and other local food crops) imposed upon such countries by the World Bank. Modern "civilization" belongs in the northern hemisphere; nature has determined that it cannot flourish elsewhere. A climatological map is used to *explain*—and increasingly, in the age of global warming, to *enforce*—unequal development, where a map of colonial exploitation, influence, and dependency would give us a much more accurate picture of the histories behind these inequalities.

PUTTING THE MAP IN MOTION

Until now, I have been stressing the way in which the weather is used to naturalize the social: appeals to weather and climate help to explain a set of contingent events as if it were a condition of nature and not a condition of

society. In an imagined national community, the weather plays nature to the culture of our social and political life, while it provides a broadly understood language for helping us to make sense of that social and political life. This is the primary function of the long weather segment in local news broadcasting, where the weather acts as an insider trader, playfully mediating between news and sports. Here, the point is often to make weather out of the news events by underlining the links between hardship and good fortune, between nation and region, between the unalterable nature of political logic and its often contingent, local effects. A similar function applies to the economic climate. Statistical estimations of the day's weather are often presented before or after an announcement of the stock prices of local companies. This function came into its own during the Wall Street "crash" of 1987 when the specter of falling stock prices was a newscaster's favorite segue to the forecast (in the eastern half of the nation) of falling temperatures. In reports about the situation in Britain, the "storm" that hit the London Stock Exchange was figuratively matched with the hurricane-force storm that had hit southern England a day or two before; both were cast as terrible acts of nature that had arbitrary effects upon, but no explicable causes in, the social world.

With the advent of the Weather Channel in 1982, a 24-hour cable service broadcast by Landmark Communications in Atlanta, the institution of weather forecasting took on a decidedly new national "character" and a new purpose—to make news out of the weather, rather than to make weather out of the news. The channel's commercial success is driven by what its managers describe as its "continuing goal of becoming the nation's primary source of weather information." Programming on the Weather Channel consists of a ceaseless flow of different narrative segments and features strung together in a highly organized schedule. Fast-paced regional weather information in the morning (moving across the time zones—eastern, central and western—as the morning progresses), is succeeded by more relaxed entertainment and lifestyle features—"Weather and You"—in the afternoon, followed by a faster series of updates as the evening progresses, to capture the "zapper" audience at the top and bottom of entertainment shows on network TV. Local forecasts are broadcast twelve times per hour in the morning, eight in the afternoon, and ten in the evening. Regular features at least once every hour throughout the day

include Aviation Weather, Boat & Beach Reports (in the summer)/Skiers Forecast (in the winter), Business Travellers' Report, Fishing Forecast, Michelin Drivers' Report, Schoolday Forecast, Tropical Update/Winter Storm Update, and the Weekend Outlook/Look Ahead. Even the average viewer (10 million households per week tune in) who habitually watches a few minutes each day recognizes that he or she has hooked into a highly developed universe of discourse about the weather. The Weather Channel is self-contained: "the programming works," claim its managers, "because weather is a universal subject, and everyone has some kind of weather need." Viewers find a constantly varied presentation of scientific information, friendly advice, and spontaneous philosophy; accessible, concrete displays of otherwise abstract weather events; immediate, almost indexical, relations between commercial sponsorship and weather features after the fashion of the direct sponsorship favored on radio and early television (features on cold snaps are sponsored by Thermalite Thermal Wear; allergy and health features by Afrin Nasal Spray; international weather by AT&T); and a corresponding dynamic between weather threats or crises, both national and local, and pragmatic solutions to be found in the commercial world's advertised products. Indeed, much of the channel's commercial success has been due to its pioneering use of a cooperative advertising program that allows local dealers to tag national network spots. This "creative advertising" allows a filmed national commercial to include the insertion of local text tags, identifying only the dealer(s) covering each area or neighborhood. The program is made possible by the same technology, called the Weather Star, that allows local weather broadcasts to be inserted into the national flow of the cable transmission. With this technology, the local joins seamlessly with the national; the local economy of the national weather system is delivered by the same logic with which a national corporation hooks up with a local affiliate.

For weather addicts and enthusiasts like myself, the world of the Weather Channel is a coherent fiction, with its own generic narratives and its own formal agents, like the jet stream, developing fronts, anticyclones, troughs of low pressure, and so on. The interpretive commentaries of the On-Camera Meteorologists (OCMs) are a pleasurable invitation to travel through this fictional world: "let's put the map into motion . . . well, the weather is making a quiet start across the country, but as daytime heating

occurs, we'll see developments"; "not much to talk about in the West, but there's an evolving storm over the Rockies, and an interesting batch of rain over the Great Lakes"; "another hot day on tap in the southwest, but there's a cool spot up there in Maine, and let's see what's causing all this rain in the Ohio Valley"; "a dome of high pressure over the Great Basin is responsible for this oppressively hot temperature regime in the Plains States," while "a trough of low pressure down in the Gulf is acting like a factory, generating storms throughout the southeast." The prevailing discourse is one of national checks and balances: "temperatures are building in the East, with compensation in terms of Western cooling"; "it's very quiet in the Caribbean, but up here in the Pacific northwest, the storms are lined up, back to back." And the international forecasts are shaped by a national world-view that sees continental blocs as comparatively equal to the meteorological unity of the US. "If you're wondering what the weather's doing overseas . . . here's the international forecast" (usually only Europe, but more recently the Persian Gulf region, where weather-for-war was a vital military and commodity interest) where the same "scale" and "range" of coverage is applied to the length and breadth of a continent with highly distinctive nation-states: "not much in the way of precipitation, except up in Finland"; "the heat is on in Greece and Italy, while a ridge of low pressure extends all the way from Western Russia to Western Ireland." As a transplanted European, I know that such a continental forecast would make little or no practical sense to the national weather citizen of any European country. Rather, the forecast is tailored to the Brobdignagian perspective of the American weather citizen, who is addressed as a weather tourist rather than as a real, or potential, travel tourist and who is asked to extend his or her macro-geographical perspective of the United States to that of Europe. Countries sharing the North American continent receive attention only when "their" weather is seen to be affecting "ours," or when they "share" bioregions like the Great Lakes, the high plains, the Pacific Northwest, or the Mexican Gulf. On the weather map, Cuba, for the most part, still does not "exist"; it does not influence US weather, since the US has no influence over it.

It is clear that this fictional world of the Weather Channel is selectively shaped by a social and political mapping of the world as much as it is determined by the atmospheric map of shifting fronts and air-masses. The

same could be said of its commercially inflected appeals to everyday life. Here, the Weather Channel fully embodies the specialized division of labor between meteorological services that support weather aimed at consumers/households—who use weather information for welfare, safety, health, and planning leisure activities—and weather aimed at producers/companies—who use it for short-term profit. Producer weather is for agriculture, forestry, marine and aviation needs, and for industry. On the Weather Channel, there is no weather-for-work, only for leisure and consumer time. Thus while the channel regularly features gardening segments—frost freeze maps, planting calendars, and "lawn and garden" reports—no attention is given to the exigencies of agricultural production, except, of course, in the case of extreme or emergency conditions of drought, flooding, hurricanes, or unseasonable frosts which may directly affect consumer markets. In the Weather Channel's world, people do everything but work; weather affects how they "drive" to work, and travel to work if they are "business travellers," but it has no bearing on their actual work environments, which are assumed to be immune to the weather. The absence of "producer" weather makes this a postindustrial world, where any evidence of labor is located in the service sector ads, on the business class air routes, in the household, for women, and in DIY activities for men at home. Consumer activities are limited to the range of average upkeep. Fashion discourse, similarly, is restricted to thermal underwear, or clothing the children for school, or keeping the elderly well wrapped up. Eco-conscious discourse is restricted to water and energy conservation tips: among the many Weather Channel maps, there are no maps of acid rain damage, deforestation, oil spill concentrations, toxic dump locations, or downwind nuclear zones. In the absence of these politically complex health and safety hazards, the responsible weather citizen's rights are only threatened with natural and not social erosion. So too, the channel's multiple address to individual, (his) family, and nation is pluralist in principle but speaks primarily to the citizen identity of a white male property-owner. Ideal Weather Channel "citizens" are assumed to be comfortably off, white-collar, with cars, boats, vacation options, families, and gardens and homes that require extensive upkeep.

While the Weather Channel shares many of the structural formats of the respective TV products of the news industry, the culture industry and the

leisure industry, it services each of these industries in its own right. In fact, it is the first fully developed product of a commercial service industry we have seen on national television. The Weather Channel no longer "produces" the weather, and layers of discourse about the weather, as a service designed to meet certain perceived needs, but rather as an entire outlook on everyday life, even a "conception of the world" as determined and explained by the weather.

"You need us for everything you do," the slogan that most frequently announces a station identification on the Weather Channel, also announces the complete "weatherization" of everyday life. The weather-effect is presented as omnipresent in our lives, from the dust that settles around us as we sleep to the pockets of air stagnation we pass through on our way to work, to the larger psychopathologies associated with storm behavior. To remind us of our exact physical location in this spectrum of influence, the Weather Channel offers an almost inexhaustible series of national maps (aside from general elections, weather forecasting is the only time most of us see a national map): fishing maps, business travel maps, picnic maps, indoor relative humidity maps, outdoor relative humidity maps, tanning maps, allergy maps, humidity maps, the ominously named "aches and pains index," influenza maps, precipitation maps, radar maps, storm history maps, windy travel maps, and many more—each charting in detail the geographical distribution of daily weather effects on our bodies, and each sponsored in turn by the manufacturer of an appropriate product.

But this complete weatherproofing of every commodifiable moment of our lives suggests more than a relation of dependency on the "weather fix," i.e. specific consumer solutions for specific weather-related problems. Rather, it suggests an advanced form of weather-consciousness. We might be tempted to call this "false weather-consciousness," but I think there are good reasons for not doing so—even if, at times in this chapter, "weather" could be read as substitutable for "ideology."³⁹ In expanding the definition of weather to include all of the ways, forms and contexts through which our body responds to and is constructed by discourse about the environment, the success of the Weather Channel, the success of the full-color weather page in the national newspaper *USA Today*, and the general explosion of interest in the weather throughout the eighties, speaks to new configurations of power that increasingly devolve upon the everyday body.

"Weather-sensitivity" has become a pressing new feature of our concerns about social adaptation. As the author of one popular guide puts it, "Learning what the weather can do to your body and emotions is the first step toward coping with weather sensitivity and functioning at your full potential. Understanding the weather sensitivity of others can help you on the job, in your love life and with your own family."⁴⁰ Executives at the Weather Channel attribute the new weather-consciousness to the needs generated by increased mobility of the general population. Some commentators point more directly to the new interest in environmental issues, while others see the exploitation value of disaster weather as entertainment. Hooking both of these together, newspapers like the *San Francisco Chronicle* and the *Chicago Tribune* now run a regular global weather feature called "earth week," "a diary of the planet" that pinpoints fearsome floods, tornadoes, volcanoes, earthquakes, space exploration, ecological problem areas, and the like.

What is less clear is the shape of the new biopolitics that is emerging from advanced weather-consciousness. If we are to extend Michel Foucault's speculations about the exercise of modern power as disciplinary knowledge in the form of scrutiny or surveillance about the body, then we would say that it is the weather-sensitive body rather than the weather itself that is the visible object of all of this new knowledge. Anyone who watches the Weather Channel for the first time is surely left with an altered perceptual sense of how his or her body functions in a number of environments. So too, the barrage of statistics, from the present, the past and the future, that accompanies the weather forecast creates a field of knowledge and constraint for the body. Discourse that situates the current weather in relation to a history of weather statistics functions as a way of normalizing our physical life, regulating its mean or average behavior in relation to an archive of temperature records. Abnormalities like record highs or record lows are part of the regulatory field of differences that locate our current degree of deviation from a norm of environmental behavior for which we are then made to feel responsible in some way. Statistics about the mean, norm or average belie the fact that there is no such thing as "normal" weather, let alone a "normal" climate; these average figures play the role of normalization for us. We, no more than our ancestors who may have been subject to the same climate, did not *create* these statistics, but

they are now part of our responsibility, both to the local community and to the national community, with whom we share the weather in different ways. Weather citizenship now comes with that quantified sense of historical and geographical responsibility. Knowledge about global warming will add a new layer of responsibility, a new level of concern whenever and wherever the weather exceeds or deviates from the average, statistical norms, while the disaster culture to which "global warming" belongs will continue to function as an effective way of symbolically managing the behavior of mass populations.

But these new forms of normalization and regulation, however constraining, are also accompanied by new and emergent forms of politics, waged with scientific knowledge and information, around bodily and environmental concerns. The "weather" has become a politicized environment precisely because it is an effective medium for linking biopolitics to large-scale forces in the social and physical world. The global warming debate, as I have argued, may yet become a powerful vehicle for the controlled re-formation of citizen subjectivity, but it also brings into play the opportunity to wage other kinds of politics, with other kinds of rights, liberties, and responsibilities than those attendant upon a laissez-faire view of the world.

It would be a mistake, then, to conclude that what I have called "advanced weather consciousness" is simply part of an extension of social control over our everyday lives, and that the Weather Channel, say, is a highly engineered commercial exploitation of that process. It is likely, for example, that viewers use the Weather Channel for all sorts of different purposes, in ways that cannot be wholly explained or anticipated by a "textual" analysis of its own mode of address or presentation, and its construction of weather-vulnerable individuals who belong to a coherent, national community. We cannot afford to see the Weather Channel's organization of these features as a coherent TV discourse, inevitably producing a similarly coherent TV viewer, inert, socially isolated, and incapable of re-formation. TV is never, or rarely, watched as such. We know that television today is the "great reproducer" of existing social relations, but in the overall course of its production of social knowledge it is many other things as well. To merely describe the reproductive capacities of television would be to defer to the kind of history I have tried to avoid, a

history that equates advances in technological rationalization with increases in social control and domination, and thus a mode of information that inevitably produces blindly patriotic, weather-fearing citizens.

A similar caveat might apply to arguments about nationalism that have surfaced in the course of this chapter. To use Benedict Anderson's term, a "nation" is an "imagined community," the construction of a "deep horizontal comradeship in anonymity," bound together by a created sense of common history—or, just as relevant to weather scholarship, a common geography.⁴¹ In other words, the nation is not a false or artificial community, least of all today, when it still stands as one of the most universally legitimate values in political life. But to *only* describe its creation or historical formation is always to take the side of the creator. And to insist, in our histories, on the overriding importance of the construction of nationalism is, more often than not, to over-subscribe to the power of its effects. Rather than stress alternative narratives of US nationalism, which emphasize its republican, revolutionary origins, we cannot afford to assume that national identity can be fixed or given in ways that are simply more attractive to the left. We ought to be able to emphasize the limits and failures of national identity just as insistently as we describe the successes of its construction. In many countries, where nationalism has summoned up more collective hates, desires, and deathwishes than class struggle has ever done, the "effects" of nationalism have sometimes been politically progressive. In the US, where the narratives of nationalism have traditionally been a conservative preserve, this is less often the case. Unlike those countries where, historically and even now, nationalism is associated with populist revolt, US nationalism emerged out of a fear of lower-class mobilization; a fear evoked originally by the prospect of extending tolerance, if not freedoms, to seditious slaves. In this respect, the structural history of US nationalism has been one of containment rather than one of self-determination. This no doubt accounts for its relative weakness, and, consequently, for the paranoid-aggressive terms in which it is periodically affirmed by the right wing. Indeed, as Anderson points out, the affective bonds created by the earliest formation of nationalism were hardly so strong that they could not prevent a war of secession a century after the Declaration of Independence. (Nowhere in the Constitution can the term

"national" be found, incidentally.) A century later, the short-lived moment of the US nation-state was virtually over.

The upsurge in nationalistic fervor of the Reagan-Bush years may have been a sorry symptom of the decline of the nation-state, nothing more than a slick cover for speculators to plunder and pillage in the name of national pride. The pageantry of red, white and blue was an especially hollow response to citizens of color whose rights and aspirations were clearly at odds with the dominant version of American nationalism. As 1992, the quincentenary year of Columbus's voyages, approaches, let us hope that there will be ample public opportunities to contest the official definition of "America" and to recount its imperialist history as one nation-state among others in the Americas.

On the other hand, the successes of Reaganist and Thatcherist nationalism clearly exploited public indifference to any conception of global identity, even of the genre favored by the media in its sustained enthusiasm for McLuhan's picture of the global village. Eco-idealists are speaking of entering an age of global democracy, where the environmental rights of all global citizens will be more important than the interests of individual sovereign states with their restricted conception of citizenship. In view of the uneven and incomplete picture of social rights that is apparent in most existing nation-states, this sunny vision seems premature. More to the point, perhaps, it is a vision as dear to the heart of multinational corporate philosophy as McLuhan's globalism was over twenty years ago. But there is nothing to be gained from ceding the globalist ground in advance. Environmental rights, in particular, will be a necessary feature of the kind of globalism that might yet be truly internationalist.

POSTSCRIPT: BEYOND THE NATION'S SERVICE

The 1990 Weather Guide Calendar, published by the Weather Channel, carried a side-feature about the national network of amateur observers, active at over 10,000 locations across the nation, who maintain the volunteer service established over a hundred years ago at the Smithsonian. One such observer, Rudy Villareal, is quoted under the heading, "Why Do

They Do It?": "Being a Cooperative Weather Observer (gratis) is my way of paying the country for all the good and riches that I have received as an American citizen."⁴² His remark, of which James Pollard Espy would have been proud, is intended to show the degree to which the amateur spirit is still infused with a sense of the economy of national identity. Clearly, this is the Weather Channel's idea of a responsible weather citizen. But a closer look at the culture of amateur weather observers (Why do they do it?) revealed a much wider range of motives and interests. The rough sampling of volunteer observers to whom I talked in upstate New York had much more to say about local community service than any sense of national, or even patriotic, duty, even when asked to comment specifically on the "national" angle of their voluntary activities. The stories they told about these activities were very personal histories of their respective interests in weather observing: for some, regular observations were a way of organizing daily life; for most it was related to their occupations in some way, as farmers, teachers, or in environmentally oriented jobs; for others, it was an extension of their enthusiasm for "nature"; one or two even confessed that it was a way of getting free weather technology from the government. Many expressed a skeptical attitude toward the consensus opinions of experts. When asked to comment on the "effects" of global warming, almost all referred to their own experience and memories of recent weather trends rather than to the data they collected for the NWS.

Most of the "official" weather observers I talked to were relatively isolated in their activities. Occasionally, they would get together with an acquaintance who shared their interest in order to talk about the weather, but none of them had confessed to having any social contact with the other official observers in the region. By contrast, socializing runs high in the regular meetings of many of the chapters and organizations affiliated with the Association of American Weather Observers. The Association's monthly magazine, *American Weather Observer*, is a lively record of the enthusiasm of weather fans for sharing weather stories and information. It features columns about historical weather, sensational features about storm-chasing in Tornado Alley (Oklahoma-Texas Panhandle-Missouri), short submissions from readers about weather anomalies, purple passages about awesome weather sightings, and records of observational data from around the country.

It is likely that any properly ethnographic study of amateur weather culture (beyond the scope of my research) would uncover a range of motives much more diverse—and even contradictory—than those suggested in the single quotation selected by the Weather Channel to represent the voluntary work of the amateur observer; motives that fall short of the demands of national service, duty, and responsibility; motives so attached to the local, regional, and everyday that they are even opposed to the dominant idea of national service, which puts the “nation’s interests” above all else. It is likely that these motives would range from the articulate desire for an amateur community that does the work of professional experts in its own nonbureaucratic way, to the realm of more personal, liberatory desires. As one respondent to the *American Weather Observer’s* readers questionnaire put it: “the AAWO has unshackled my repressed desire to express myself regarding weather and associated activities.”⁴³

While few of the observers I talked to had a well-informed understanding of the theories and data that occupy the experts on global warming, all of them spoke with enthusiasm about related environmental issues. Republicans in their number openly lamented the Reagan–Bush policies, and, while maintaining their general opposition to “government regulation,” all agreed on the need for strong environmental regulation across the globe. One or two confessed to a more theological acceptance of planetary behavior; global warming was probably God’s will. While all agreed that the anxieties about global warming had probably prompted people to think more about the supranationalist nature of the problems, few thought that ordinary people had access to the political resources to do anything about it.⁴⁴

These stories offer a brief and messy picture of the uneven conditions for any emerging sense of “global citizenship,” although they can be read as supporting the thesis that “global warming” presents a pathway toward such an identity. Globalism is already a well advanced ideology in the highest political and corporate circles, displacing the sovereign powers of individual states and the internationalist blocs that have made world history until now. In the geopolitical arena, globalism has begun to masquerade as the New World Order, a front, at least in the Gulf War, for a new first world alliance of neocolonial interests. In spite of the media picture for a world “united” behind the Western war campaign in the

Gulf, there is no doubt that globalist sentiment and globalist awareness is still thin on the ground among the majority of the population. Let us assume that the widespread anxiety about global warming is about to bring us across one of the first hurdles. Before the race for globalism goes any further, we will have to do our best to ensure that it will not be a short dash, favoring the most highly trained and the most lavishly sponsored, but rather that the rules of the event, which must be open to all participants, have yet to be decided.

CHAPTER 6

1. Who can forget Ray Bradbury's short story, "The Sound of Thunder," an SF biological variant of this witticism, in which a time-traveller accidentally kills a butterfly in the remote past, and returns to find the present quite altered as a result?
2. Thomas Jefferson, "Jefferson's Summary of his Meteorological Journal for the Years 1810 through 1816 at Monticello," in *Thomas Jefferson's Garden Book*, annotated by Edwin Morris Betts (Philadelphia: American Philosophical Society, 1944), pp. 622-4.
3. A.A. Miller, "The Use and Misuse of Climatic Resources," *Advancement of Science*, 13, p. 58.
4. Michael Oppenheimer and Robert H. Boyle, *Dead Heat: The Race Against the Greenhouse Effect* (New York: Basic Books, 1990), p. 18.
5. Philip K. Dick, *Do Androids Dream of Electric Sheep?* (New York: Ballantine, 1968), p. 54.
6. See Rhys Carpenter, *Discontinuity in Greek Civilization* (New York: Norton, 1968).
7. Emmanuel Le Roy Ladurie has examined the history of glacial shifts in medieval Europe in *Times of Feast, Times of Famine: A History of Climate Since the Year 1000*, trans. Barbara Bray (Garden City, New Jersey: Doubleday, 1971).
8. The pioneering work on climate change was completed by H.H. Lamb at the University of East Anglia's Climatic Research Unit, collected in *Climate: Past, Present and Future* (New York: Barnes and Noble, 1972), 2 vols. Other, competing schools of philosophy in climatology stemmed from the work of the Soviet scientist M.I. Budyko, and the Princeton climatologist Joseph Smagorinsky. The chief source for theories of global cooling was the work of Reid Bryson and colleagues at the University of Wisconsin in the early seventies. See Reid A. Bryson and Thomas J. Murray, *Climates of Hunger: Mankind and the World's Changing Weather* (Madison: University of Wisconsin Press, 1977).
9. Nigel Calder, *The Weather Machine* (New York: Viking, 1974); Lowell Ponte, *The Cooling* (Englewood Cliffs: Prentice Hall, 1976); John Gribbin, *Forecasts, Famines and Freezes* (New York: Walker, 1976); D.S. Halacy, *Ice or Fire? Can We Survive Climate Change?* (New York: Harper & Row, 1978). Halacy's book really belongs to the cooling earth school, but it also reflects the growing interest in warming theories.
10. The two reports, "A Study of Climatological Research as it Pertains to Intelligence Problems" and "Potential Implications of Trends in the World's Population, Food Production, and Climate" (August 1974), are reprinted in Impact Team, *The Weather Conspiracy: The Coming of the New Ice Age* (New York: Ballantine, 1977).
11. See Lowell Ponte, *The Cooling*, pp. 169-74.
12. UN General Assembly, December 1974, Resolution 3264, "Prohibition of action to influence the environment and climate for military and other purposes incompatible with the maintenance of international security, human well-being and health."
13. By comparison, the British government's comparative alacrity in supporting broad measures to combat the greenhouse effect can perhaps be attributed more to its nationalist phobia about unstoppable "waves" of immigration than to Margaret Thatcher's efforts to coopt green politics. Crispin Tickell, Britain's UN ambassador

- at the time and author of *Climatic Change and World Affairs* (1977), was most persuasive in reminding Prime Minister Thatcher of the potential proportions of the "greenhouse refugee" problem: "even if some people and governments wished to seal themselves off from the rest of the world, they could not do so," he pointed out. "In no country or city can the rich fortify themselves for long against the poor." Quoted in Boyle and Oppenheimer, p. 200, from a newspaper article in *The Independent*, entitled "How Warming Could Create Refugee Crisis" (June 6, 1989).
14. See, for example, Larry Ephron, *The End: The Imminent Ice Age and How We Can Stop It!* (Berkeley: Celestial Arts, 1988).
 15. John Hamaker's papers are collected in *The Survival of Civilization* with annotations by Donald Weaver (Burlingame, CA: Hamaker-Weaver Publishers, 1982). Hamaker attributes the death of forests to calcium depletion of soil, caused by the long process of demineralization and acidification in the wake of the glacial retreat. He advocates the project of remineralizing the earth's soil with ground-up rock before the glaciers return to do the job for us.
 16. W.J. Maunder, a New Zealand meteorological scientist, has argued that the atmosphere, a "variable and elite resource," must be "accepted as an integral part of the management package" for industry and for all important decision-making at corporate and political levels. *The Uncertainty Business: Risks and Opportunities in Weather and Climate* (London: Methuen, 1986); and *The Value of the Weather* (London: Methuen, 1970). The aim of such arguments is quite explicitly to push weather as a "product." As a result of the global warming debate, however, the rhetoric of atmospheric forecasting has seen a boom that far exceeds Maunder's expectations.
 17. James Lovelock, *The Ages of Gaia* (New York: Norton, 1988), p. 212.
 18. See Murray Bookchin's eloquent attack on de-socializing tendencies in the ecology movement, in *Remaking Society: Pathways to a Green Future* (Boston: South End Press, 1990).
 19. Norman Myers and Gaia Ltd. Staff, *Gaia: An Atlas of Planet Management* (New York: Anchor, 1984).
 20. Roger Revelle and Hans E. Suess, "Carbon Dioxide Exchange Between Atmosphere and Ocean and the Question of an Increase of Atmospheric CO₂ During the Past Decades," *Tellus*, 9 (1957), pp. 18-27.
 21. W.J. Maunder notes the disparity between Northern cooling in the 1950s and 1960s and warming in the southern hemisphere throughout the same period. *The Uncertainty Business*, p. 78. Stephen Schneider accounts for US cooling in the same period as a local effect, with only minor significance for the overall global temperatures. *Global Warming: Are We Entering the Greenhouse Century?* (San Francisco: Sierra Club Books, 1989), p. 200. More recently, he has suggested that the transient cooling may have been caused by a sharp increase in sulphur emissions from coal- and oil-burning factories and power plants. These emissions generate sulphate particles that act as condensation nuclei for the formation of cloud droplets, brightening clouds and thus increasing their cooling effects. Stephen H. Schneider, "The Changing Climate: A Risky Planetwide Experiment," in Terrell J. Minger, ed., *Greenhouse Glasnost: The Crisis of Global Warming* (New York: Ecco Press/Institute for Resources Management, 1990), p. 126. Schneider's *Global Warming*, and his earlier *The Genesis Strategy*:

Climate and Global Survival (with L.E. Mesirow) (New York: Plenum, 1976), are good guides to the climate debates written by an active participant at the highest levels.

Other information sources about the greenhouse effect that I have found useful include Francesca Lyman et al., *The Greenhouse Trap* (Boston: Beacon Press, 1990); Jim Falk and Kevin Brownlow, *The Greenhouse Challenge* (New York: Viking Penguin, 1989).

22. Mary Douglas, *Implicit Meanings: Essays in Anthropology* (London: Routledge and Kegan Paul, 1975), pp. 234-6.
23. Jody Berland, "Weathering the North: Climate, Colonialism and the Mediated Body," *Provincial Essays*, vol. 8 (1989), p. 37.
24. Zora Neale Hurston, *Their Eyes Were Watching God* (New York: Harper & Row, 1990), pp. 147, 148.
25. Claude Lévi-Strauss, *The Origin of Table Manners*, trans. John and Doreen Weightman (New York: Harper & Row, 1978), p. 507. Lévi-Strauss concludes that the origin of table manners may lie "in deference towards the world—good manners existing precisely in respecting its obligations," rather than in fearful ways of warding off pollution from the external world: "Whereas we think of good manners as a way of protecting the internal purity of the subject against the external impurity of beings and things, in savage societies, they are a means of protecting the purity of beings and things against the impurity of the subject." p. 504.
26. James Pollard Espy, *The Philosophy of Storms* (Boston: Charles Little and James Brown, 1841), p. 495.
27. For a history of rainmaking, see Clark C. Spence, *The Rainmakers: American Pluviculture to World War II* (Lincoln: University of Nebraska Press, 1980).
28. Quoted in Gary Lockhart, *The Weather Companion* (New York: John Wiley, 1988), p. 100.
29. W.E. Knowles Middleton, *A History of the Theories of Rain: And Other Forms of Precipitation* (New York: Franklin Watts, expression of the American character," p. 160. A century later, more "scientific" rainmakers still urged their claims with appeals to a calculus of distributed costs. The last of the great freelance rainmakers, Irving Langmuir, operating an iodide generator in New Mexico in the late 1940s, estimated the cost of his efforts to local citizens: "Assuming the atmosphere to be 5 miles thick, one thus finds that to get a 30 per cent chance of rain within a given area in New Mexico the cost of the silver iodide is only \$1 for 4,000 square miles." To complete the estimate on a national scale, to double the United States rainfall, assuming conditions were the same as in New Mexico, Langmuir felt that it would cost only about \$200 a week. Quoted in D.S. Halany, *Ice or Fire? Can We Survive Climate Change?* (New York: Harper and Row, 1978), p. 64.
30. Charles Peirce, *Peirce's Statistics of the Weather: A Meteorological Account of the Weather in Philadelphia from January 1 1790 to January 1 1847* (Philadelphia: Lindsay & Blakiston, 1847).
31. Daniel Boorstin, "The Rise of the Average Man," in *The Decline of Radicalism: Reflections on America Today* (New York: Random House, 1969).
32. See Donald R. Whitnah, *A History of the United States Weather Bureau* (Urbana: University of Illinois Press, 1961).

33. Consider, by way of contrast, the instructions given to voluntary observers of the US Signal Service: no interpretive skills were required of the observer, only a willingness to faithfully measure the temperature, humidity, atmospheric pressure, amount and frequency of rain, direction and velocity of wind, and the electrical condition of the atmosphere. *Instructions for Voluntary Observers of the Signal Service, U.S. Army* (Washington: Government Printing Office, 1882).
34. Robert Marc Friedman, *Appropriating the Weather: Wilhelm Bjerknes and the Construction of a Modern Meteorology* (Ithaca: Cornell University Press, 1989), p. 164.
35. Raymond Williams, "Ideas of Nature," in *Problems in Materialism and Culture* (London: Verso, 1980), pp. 67-85.
36. John Edward Weems, "If You Don't Like the Weather . . .": *Stories of Texas Weather* (Austin: Texas Monthly Press, 1986), p. 61. The drought had forced many of the white settlers to evacuate and return to the East, but for those who survived, it became a moment of pioneer heroism, monumentalized in the state's history of the conquest of nature and territory.
37. Mark Twain, "Speech on the Weather," *The Family Mark Twain* (New York: Harper, 1935), pp. 1109-10.
38. Twain's more famous observation about the weather (attributed to the editor of the *Hartford Courant*) is that "everybody talks about the weather, but no-one does anything about it." This remark took on a new significance in the early stages of the debate about climate change, when Stephen Schneider made the much publicized comment at an AAAS meeting that "nowadays, everybody is doing something about the weather, but nobody is talking about it." Schneider, *Global Warming*, p. 200.
39. Nonetheless, the history of the weather contains many Althusserian moments when "science" interrupts "ideology." The seventeenth-century discovery of barometric variations, for example, ran counter to all doctrines of "common sense." Atmospheric pressure is something for which we have no sensible perceptions, the lived experience of which is the basis of any notion, Marxist or otherwise, of ideology/common sense.
40. Julius Fast, *Weather Language* (New York: Wyden Books, 1979), pp. 7-8.
41. Benedict Anderson, *Imagined Communities: Reflections on the Origin and Spread of Nationalism* (London: Verso, 1985).
42. Quoted from the Weather Channel's *Weather Guide Calendar*, 1990 (Denver: Accord Publishing, 1989).
43. *American Weather Observer*, 7, 6 (June 1990), p. 2.
44. A more serious ethnographic study of the way in which people are conceptualizing the greenhouse effect can be found in Willett Kempton, "Lay Perspectives on Global Climate Change," Report No. 251, Center for Energy and Environmental Studies, Princeton University, August 1990. Kempton's study shows that most informants had heard of the greenhouse effect but had fundamental misconceptions, from a scientific perspective, of its causes, especially its relation to personal energy consumption.