

Introduction

Globalization and Environmental Governance

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The Shape of the Future

The world today is in the grip of globalization. Networks of economy, technology, politics, and ecology have encircled the Earth, weakening the historical claims of nation-states, sovereignty, and cultural identity. With the end of the Cold War, worldwide trade liberalization, and the growing influence of multinational corporations, economic waves originating in one region flow out to others, sometimes with tidal force. Information travels instantaneously around the globe through phones, faxes, television, e-mail, and the Internet. As transportation and communication technologies develop, an expanding world population feasts on an increasingly homogeneous diet of fast food (Schlosser 2001), logoized consumer goods, blockbuster movies, international best-sellers, and the culture-defying strains of global popular music. The planet itself, as a self-contained orb, a biosphere of limited resources, challenges human beings to find communally sustainable ways of life, now and in the future (WCED 1987).

Sometimes, an event brings into fleeting focus an image of relative global harmony. The turn of the millennium was one such occasion. A huge, day-long spectacle, in which tens of millions participated from the privacy of their living rooms, focused the world's gaze upon itself as never before. The show began on a small and uninhabited outcrop of land in the Pacific Ocean, newly renamed Millennium Island, in the tiny Republic of Kiribati. Some 70 Micronesian dancers, splendidly attired in natural materials (grass skirts, headresses, bold ornaments), transported there for the occasion from Kiribati's capital Tarawa, staged for the eyes of the global media a "traditional" ceremony to mark the birth of the new millennium. In succeeding hours, celebration moved from obscure Kiribati to Tonga,

boundaries; and, of greatest interest here, the reassertion of local knowledge claims and local identities against the simplifying and universalizing forces of global science, technology, and capital.

In a time when national particularities are under pressure from many directions, it is of no small interest that the idea of the local has emerged as a salient topic in the policy discourses of environment and development. While seeking to establish common transboundary approaches to issues of sustainability, a remarkable variety of international regimes have recognized and accommodated knowledges and perspectives that are tagged as local. This juxtaposition of global and local, universal and particular, serves as the entry point for the work presented in this volume. We confront here a twofold puzzle. On the one hand, it is notable enough that environmentalism, so long associated with place-specific political phenomena such as the NIMBY ("not in my back yard") syndrome, has become global at all. On the other hand, it is equally striking that the implementation of the global environmental agenda should so quickly and on so many levels have led to a rediscovery of the local.

Our aims in exploring these puzzles are both theoretical and pragmatic. On the theoretical front, we draw upon recent experiences in the field of environment-development politics to enrich our understanding of the phenomenon of globalization and its political ramifications. We are persuaded that the reappearance of the local within the discourses and practices of global governance is no passing fad—comparable for instance to global brand-name manufacturers deciding, after September 11, 2001, that business would improve through the incorporation of local style features into their blandly standardized luxury goods. Localism and globalism are far more problematic concepts for us than they appear to be for these suppliers of "glocal" mass markets.² The studies in this volume begin by asking what is *meant* by "global" and "local," and how the meanings of these words connect to political struggles around varied environmental regimes. Each chapter examines how the dynamics of localization and globalization relate to different ways of knowing and evaluating environmental phenomena, as well as to the norms, beliefs, practices, and artifacts through which environmental knowledges gain power in political domains. Issues of this complexity can only be grasped by bringing together perspectives from several disciplines. Most of the contributors draw on more than one field that adds depth and texture to their analysis of environmental global-

ization. Insights from science and technology studies (S&TS) provide the intellectual backbone of the project as a whole, but the chapters are also informed by approaches from such fields as anthropology, sociology, law, political science, and political ecology.

Our pragmatic aims center on the design of institutions and processes of global environmental governance. The cases examined in succeeding chapters tell us much about what it will take to forge robust institutions to address problems that will in the future increasingly refuse to remain encapsulated within national boundaries. Three strong and interrelated themes emerge from these cases:

- Global solutions to environmental governance cannot realistically be contemplated without at the same time finding new opportunities for local self-expression.
 - The construction of both the local and the global crucially depends on the production of knowledge and its interaction with power. How we understand and represent environmental problems is inescapably linked to the ways in which we choose to ameliorate or solve them (Jasanoff 2004). And which issues are defined as meriting the world's attention has everything to do with who has power and resources, including scientific ones, to press for them.
 - Effective governance requires constant translation back and forth across relatively well-articulated global and local knowledge-power formations. This, in turn, calls for procedural innovation in science, politics, governance, and the interactions among them.
- By presenting and analyzing a variety of such experiments, the chapters in this book enlarge our capacity to imagine more flexible, just, and effective approaches to global governance.

In the sections that follow, we first review several global environmental regimes that have established formal niches for local knowledge and politics. We next turn to different ways of theorizing the global and the local in the context of contemporary environmental politics. Drawing on several analytic literatures, we show that there is a need to integrate ethnographic and micro-focused accounts of local institutions and cultures with more systemic and macro-focused perspectives on globalization. This section also elaborates on the central role of knowledge in the formation of local-global relationships and draws out some themes that cut across subsequent chapters. We conclude by presenting an outline of the remaining chapters and showing how they relate to the main concerns of the book.

Recovering the Local in Global Regimes

The discourse of globalization has figured importantly in the framing and dynamics of environmental action since the early 1970s. Satellite images of the "pale blue dot" (Sagan 1994) gave rise to a rhetoric of the Earth's fragility, finiteness, and ecological interconnectedness, as well as a new concern for preserving the biosphere's shared and limited resources (Miller and Edwards 2001, particularly Jasanoff in that volume). Concurrently, *Only One Earth* (Ward and Dubos 1972) and *Our Common Future* (WCED 1987) helped to translate these ecological and ethical ideas into political action. Nations of the North and the South, both developed and developing, were urged to unite in a project of global environmental stewardship.

The terms "sustainable development" and "intergenerational ethics," though vague and imprecise, nonetheless facilitated global negotiations about environmental goals and how to achieve them (Weiss 1989; Litfin 1994). Environmental science, too, became global in its ambitions, identifying new processes and objects for collaborative investigation. The proliferation of multilateral environmental agreements in the last quarter of the twentieth century attests to the wholesale adoption of shared environmental ontologies among the nations of the Earth: the ozone hole, shrinking habitats, biodiversity loss (Takacs 1996), and climate change, among others, were recognized as "real" problems, giving proof, if any were needed, that the severest environmental threats are politically borderless.

Institutional change followed quickly. For the environment as for the economy, mega-institutions such as the United Nations and the World Bank took up the task of management on a global scale. Just as modern states had done in the twentieth century (Price 1965; Mukerji 1989; Ezrahi 1990; Jasanoff 1990; Solingen 1994; Rueschemeyer and Skocpol 1996), and colonizing empires in the century before (Cohn 1996; Drayton 2000), these global bodies soon discovered the need for reliable knowledge to support their administrative and political authority. Producing shared cognitive foundations for global environmental regulation required further institutional innovation, and the new environmental regimes were fitted out with a panoply of scientific and expert bodies, such as the Intergovernmental Panel on Climate Change (IPCC) and the Subsidiary Body for Scientific and Technological Advice (SBSTA) attached to the UN Framework Convention

on Climate Change (UNFCCC). Non-governmental organizations (NGOs) with global missions, such as Greenpeace and the Worldwide Fund for Nature, followed suit, creating their own resources of expertise, or often *comte*expertise. All these actors took up the business of producing for a global audience universally acceptable facts, ideas, and messages about phenomena such as "species protection," "biosafety," "risk assessment," and "precaution." They thus emerged as knowledge brokers for the world, although their political priorities and strategies remained, of course, markedly diverse.

It seems inevitable in retrospect that this vast project of integration—offering some of the starkest evidence, in Hardt and Negri's (2000) terms, of the dawn of "Empire"—could not have unfolded without meeting resistance on many fronts. Environmental politics, as we have already noted, has historically been a politics of the local. It derives emotional force from people's attachment to particular places, landscapes, and livelihoods, and to an ethic of communal living that can sustain stable, long-term regimes for the protection of shared resources (Ostrom 1990). Homely sayings such as "think globally, act locally" and "getting down to earth" point to the continued importance of local self-sufficiency and place-based identities. Not surprisingly, then, as some decision makers, experts, and publics confronted global articulations of environmental problems, it also became evident that other relevant actors, as well as their understandings of nature, could be integrated into environmental governance only at scales much more modest than the planet as a whole.

The paradoxical rediscovery of the local can be readily observed in the science and politics of climate change. Experts in the (global) IPCC and the (national) US government, for example, began to regionalize or localize their studies of climate impacts. Early work on sea level rise, extreme weather events, and crop yields tended to focus on how changes in climate parameters would affect ecological and social systems on global or near-global scales. Newer analyses, by contrast, examine the vulnerability and adaptability of particular social groups and ecological systems—in the Great Plains of the United States, for example, or on small islands such as Samoa. Acting under a 1990 law, the US government in 2000 completed its own assessment of the national consequences of climate variability and change (USGCRP 2000). The process involved stakeholders from all major geographical regions, as well as groups whose interests could not be

physically localized; native peoples and their homelands received an entire chapter in the final overview report, reflecting the quasi-sovereign status and political voice of this 1 percent of America's population.

Similar trends were evident in the politics of development. Thirty years ago, development organizations committed to the Green Revolution disseminated science-based agriculture to developing countries. Their aim was to increase productivity and enhance capacity according to a template of progress then deemed universally valid (Jasanoff and Wynne 1998). These efforts were only partly successful. Reprieve from hunger brought with it many disruptive changes in land tenure, wealth accumulation, and class relations. It aroused from the poor a covert resistance, using what James Scott (1985) has aptly termed the "weapons of the weak." The ecological costs were also considerable and not well accounted for in advance. The new grain varieties need such high inputs of water and fertilizers to "succeed" that some critics call them "high-response varieties" instead of "high-yielding varieties" (Shiva 1993, pp. 39–49).

Today, environmental regimes such as the Convention on Biological Diversity and institutions such as Canada's International Development Research Center recognize the need for more "culturally appropriate" technologies. In other words, even global actors have admitted the need to mobilize indigenous knowledge and promote community participation so as to improve people's lives in the developing world. No longer seen as merely victims of ecological breakdown, local communities and groups are instead assumed to hold some part of the solution to these problems.

International programs for biodiversity loss and forest preservation, for example, advocate participatory approaches, in which individuals—not state-like agencies—are given the opportunity to design, conduct, and evaluate environmental programs. The Convention to Combat Desertification similarly rests on a bottom-up strategy aimed at engaging women, communities, and NGOs in a common fight against dryland degradation. While the UNFCCC has not embraced a particularly populist management style, debates around global warming have catalyzed the formation of unlikely actor coalitions at far below global scales. One example is the Alliance of Small Island States (AOSIS), a group of 42 countries from around the world with disparate governments, economies, and social priorities. They are united only by a common vulnerability—the threat of extinction from sea-level rise. Armed with the strongest of normative claims, the right to live,

this odd association emerged in the 1990s as one of the staunchest advocates of policies to mitigate climate change.

Equally noteworthy is a shift from "science" as the primary cognitive resource for addressing global-scale social and ecological challenges to the broader category of "knowledge." International environmental regime increasingly admit that local, traditional, and indigenous knowledges may serve as useful instruments for sustainable development and for connecting with "on the ground" political constituencies. Some global institutions including the World Bank, have even sought to standardize these resources: collecting and disseminating local knowledges through centralized data bases. The desertification regime has sponsored workshops for sharing traditional and local knowledges and established a Panel of Experts on Traditional Knowledge. Similarly, the Convention on Biological Diversity established an Ad Hoc Working Group for the protection and application of local and traditional knowledge and practices (Martello 2001). Table 1 summarizes these and related provisions.³

In one sense, this move runs counter to the suggestion, made by Haas (1990) and others, that progress on regional and possibly global environmental accords would most likely come about through transnational "epistemic communities"—coalitions of professionals sharing a common causal explanation for perceived problems and an associated normative basis for allocating the costs of prevention and mitigation. The turn to local knowledge seems to make room instead for more fragmented and multiple visions of what is wrong with the environment, what values are at stake, and about all what should be done about perceived harms and threats.

How should we account for the embrace of "knowledge" as a supplement to "science" in so many environmental regimes? We note to begin with that framings of environmental problems became increasingly more complex and systemic in the final decades of the twentieth century. Endangered species gave way to the ecologically sounder concept of biodiversity loss, encroaching deserts to land degradation, and the linear notion of global warming to the more turbulent concept of climate change. One consequence of these shifts is that policies for mitigating or managing environmental change must be spread across more numerous and diverse actors. Efforts to combat stratospheric ozone depletion, for example, could reasonably focus on the control of a small class of hazardous chemicals, whose properties could be scientifically studied, and on their manufacturers, many

Table 1
Traditional knowledge policies and programs (adapted from Martello 2001).

Treaty or organization	Provisions or actions concerning traditional, local and indigenous knowledge
Agenda 21 (1992) ^a	Traditional knowledge is important for promoting sustainable development and "capacity building." Improvements are needed in understanding and applying indigenous environmental knowledge. Consultations with indigenous people are important for integrating their needs, values and practices into national policies and programs. Respect, preserve, maintain, and apply indigenous, local and traditional knowledge, innovations and practices relevant for the conservation and sustainable use of biological diversity with the approval and involvement of knowledge holders. Protect and encourage biological resource use in accordance with traditional practices that are compatible with conservation or sustainable use. Facilitate exchange of indigenous and traditional knowledge relevant to biodiversity conservation. Encourage development and use of indigenous and traditional technologies.
Convention on Biological Diversity (1992)	National forest policies should support the identity, culture and rights of indigenous people and their communities. Integrate indigenous capacity and local knowledge into programs. Equitably share benefits from the utilization of indigenous knowledge. "Protect, integrate, enhance and validate traditional and local knowledge, know-how and practices," and ensure equitable sharing of benefits. Parties shall, subject to national legislation and capabilities, promote, use, disseminate, adapt and make inventories of relevant traditional and local technology, knowledge, know-how and practices and their use. Integrate such technology with modern technology, as appropriate. Indigenous knowledge is embedded in practices, institutions, and relationships, and is "essentially tacit and not easily codifiable." The sharing and exchange of indigenous knowledge and its integration in assistance programs can help to reduce poverty.
Forest Principles (1992)	
Convention to Combat Desertification (1994)	
World Bank (1998)	

Table 1 (continued)

Treaty or organization	Provisions or actions concerning traditional, local and indigenous knowledge
World Conference on Science (1999)	Declaration on Science and the Use of Scientific Knowledge Traditional and local knowledge systems are dynamic expressions of perceiving and understanding the world. Preserve, protect, research and promote traditional and local knowledge. Bring together scientific and traditional knowledge. Countries should develop their strengths regarding "local knowledge, know-how and human and natural resources." Environment-related science education should utilize traditional and local knowledge.
International Council for Science (ICSU)	Science Agenda—Framework for Action Cairo Meeting 1999 Undertook a study of the concept of "traditional knowledge" because of member concerns about the potential support for 'anti-science' ideas. (Dickson 1999).

a. References to indigenous and traditional knowledge appear in several chapters of Agenda 21. Excerpts in this table are from chapter 26.

of whom were concentrated in developed nations (Benedick 1991). By contrast, policies for coping with climate change must reach into a broad range of economic and social activities whose impacts and interconnections are at best poorly understood, from subsistence agriculture and forestry to sophisticated forms of industrial production. Controls on greenhouse gas emissions are unthinkable without enrolling a far larger cross-section of the world's population, and if possible their knowledges, into management initiatives. Similar observations could be made about many other regimes.

For many of the newer issues, too, ideas of physical and biological causality can scarcely be separated from normative presumptions about the agents and behaviors responsible for environmental harm. Anil Agarwal and Sunita Narain of India's Centre for Science and Environment made this point most forcefully in connection with calculating the warming potential of greenhouse gases. They observed that treating all emissions alike, regardless of their source, would penalize "subsistence" activities just as severely as "luxury" ones; farmers producing greenhouse gases from rice paddies

would be held accountable for warming the Earth on exactly the same scale as car-owners driving to the beach for their summer holidays. The superficial egalitarianism of a scientific calculation, they argued, concealed a profoundly political intention *not* to distinguish among different types of resource consumption or different historical trajectories of development (Agarwal and Narain 1991). Bringing diverse knowledge holders into global deliberations offers a means of counteracting potentially explosive value choices of this kind that often underlie apparently scientific formulations of environmental problems.

Attempts to draw systematically on local knowledge, however, may entail major political adjustments. Unconventional forms of expertise cannot be accommodated in global environmental regimes without renegotiating basic rules of modern technical decision making. New participatory forums must be devised, because local knowledge resides, when all is said and done, in people, not places. Claims to the specificity, even superiority, of local epistemologies are frequently tied to the recognition of new rights for previously marginalized peoples; further, as we will see in succeeding chapters, "common" environmental resources may not be perceived or reliably managed as such unless they are coupled to processes of group identification and self-identification, so that people accept the resource as "theirs" to have, hold, and be responsible for.⁴

The concept of traditional knowledge, at any rate, has become a rallying point for indigenous groups around the world who wish to exercise voice in global forums. The "holder of indigenous and traditional knowledge" has emerged as a new actor in international discourse, with legally recognized claims to sit at international bargaining tables. Translocal actor coalitions have become increasingly prominent players at United Nations meetings and conferences, where they fight not only for their cultural and political rights, but also for the recognition of their knowledges and environmental practices. Constituted by and through their experiences of the environment, such groups have acquired new standing as experts. In desertification negotiations, for example, NGOs that once portrayed themselves as people's advocates now also pattern as possessors of local expertise, with the capacity to provide practical solutions for dryland degradation.

By making room for local or indigenous knowledge, then, global environmental regimes have opened the door to experiments in politics and governance that will occupy us in succeeding chapters. There is, however, a

further point that needs to be emphasized in this introduction. While broadening the epistemological spectrum from "science" to "knowledge," international regimes have continued to invoke, and so to reinforce, the boundary between science and other forms of knowledge; only knowledge that cannot and does not aspire to the status of science is labeled local or indigenous, as against science itself, which remains putatively universal and free from local coloration. The contributors to this volume adopt a more symmetrical position with regard to science and other knowledge,⁵ arguing that both can be seen as local—or, to borrow a term from the feminist historian of science Donna Haraway (1988), *situated*. Haraway and others have shown that communally accepted knowledge derives its robustness not from a free-floating universalism but from its attachment to particular ways of knowing. The authors in this volume argue that it is the *situatedness* of environmental knowledge that gives it force in decision making, whether the knowledge is scientific or of any other kind. The boundary between science and knowledge, moreover, is not given in advance but is constituted through social and political processes (Gieryn 1999; Jasanoff 1990). A major question addressed throughout this volume is how certain cognitive positions and technical skills achieve the privileged status of science, and what it means to attach the label "science" to particular ways of making sense of the world. We hope to show that the practices through which scientific and non-scientific knowledge are assessed, combined or differentiated form an essential component of contemporary environmental governance.

Knowing and Being: The Localisms of Modernity

In everyday speech, "local" connotes belonging to a particular place, a well-defined subunit of a larger geographical or political space, such as a region or a nation-state. A New York accent is local, as are Cajun cooking and Yankee ingenuity; so too are British humor, Italian elegance, and Arab hospitality. The localisms that have sprung up within the perimeter of the global, however, are different in kind. They are, to begin with, not necessarily tied to places. In the context of policies for environment and development, "local" has acquired richer meanings, associated not only with geographic locations but also with particular communities, histories, institutions, and even specialist expert bodies. What is interesting about the local

in all these senses is how it comes into being, sustains itself, competes with other localisms, and sometimes—as in the case of India's famed Chipko movement (Gerlach 1991)—moves beyond the constraints of spatial or cultural particularity.

We argue in this book that the modern local is importantly constituted through its methods of producing situated knowledge; communal affiliations arise and are sustained by knowing the world in particular ways. This argument points to a need to supplement traditional social-science analyses of environmental globalization with perspectives from S&TS. It also underscores the centrality of knowledge making as a site of political engagement.

Between Knowledge and Information: An Analytic Deficit

As yet, the social sciences have not done justice to the resurgence of local epistemologies and their associated politics in the context of globalization. There are several reasons for this neglect. First, the local and the global have tended to be investigated by different disciplines in isolation from one another, thereby overlooking the ways in which they are related and the means by which each participates in the definition of the other.⁶ Second, conventional approaches to globalization tend to reinforce simple dualities, such as “modern” versus “traditional” and “Western” versus “non-Western”; the local comes to be seen in this context as pre-scientific, traditional, doomed to erasure, and hence not requiring rigorous analysis. Third and related, since much of the academic literature on environment and development accepts globalization as inevitable, localization is not recognized as a phenomenon deserving attention. Finally, much relevant work presents a static vision of local and global, as if these categories were fixed in meaning for all time rather than fluid and subject to strategic reinterpretation.

Interestingly, the theme of knowledge has figured more prominently in the scholarship of the local than the global. Localism, as we know from important works of twentieth-century cultural anthropology, is concerned as much with particular ways of knowing things as with being in particular places (Douglas 1970). Today, knowledge deficits are often adduced as an explanation for localisms, such as resistance movements, that hinder the spread of global technologies. Any deeper understanding of modern localism, however, has to liberate itself from the framework of “us” and “other” and from the implicit power relations between subject and object that

characterized older ethnographic traditions. Clifford Geertz's 1983 book *Local Knowledge* took a long step away from assuming the superiority of the observer's position to that of the observed. He advocated a special responsibility on the analyst's part to understand local ways of life within their own logics and frames of reference, and so break down the subject/object divide. But Geertz's work, too, has been criticized for adopting too essentialist a concept of local culture and privileging the eye of the beholder (Clifford and Marcus 1986). For similar reasons, some feminist theorists of science have advocated replacing local knowledge with the less loaded concept of situated knowledge (Haraway 1988). The discussion of new localisms throughout this volume is informed by this more reflexive and critical stance.

Recently, too, an impressive body of research has begun to challenge the assumption latent in many big development projects that local ways of knowing and relating to the natural world are invariably inferior to scientific knowledge and science-based technological practice (Brokensha et al. 1980; Escobar 1995; Fairhead and Leach 1996; Grillo and Stirrat 1997). Based on field studies in Africa, Latin America, and elsewhere, these works contend that practices of indigenous farming, livestock management, and water resource use can be more logical, effective, and fair than imported scientific methods of intervening in socio-ecological processes. James Scott (1998), for example, concluded that many large-scale twentieth-century development schemes failed because they did not incorporate local knowledge or forms of life. From a developing country perspective, Vandana Shiva (1993) has levied comparable charges against scientific forestry and agriculture, which are driven in her view by Western productionist ideologies and may have devastating consequences for local cultures and economies. In a similar vein, though in an altogether different context, Brian Wynne (1989; see also Irwin and Wynne 1994) showed how official UK scientific investigations of Chernobyl's effects ignored to their detriment the Cumbrian farmers' complex knowledge of their local environments and livestock management practices.

Globalization has become a prominent theme in the quantitative and predictive social sciences over the past decade, but as yet this work displays little of the engagement with epistemological issues that we observe in cultural anthropology and development studies, let alone in science and technology studies. “Information” is the word that comes closest to knowledge in the

globalization literature, but, black-boxed and unproblematicized, information is ordinarily treated as just another commodity flowing—along with goods, money, people, and pollution—through dense networks of communication, trade, and transport that are shrinking space, compressing time, and melding cultures (Keohane and Nye 2001; Castells 2000; Giddens and Hutton 2000; Held et al. 1999; Cvetkovich and Kellner 1997; Appadurai 1990). To the limited extent that the local appears in these accounts of global movement, it is often portrayed as a vanishing social form—lodged in peoples, knowledges, and ways of life that are appropriated, threatened or deservedly overtaken by the liberating forces of the global.⁷

Most works on globalization dwell instead on the novel interdependencies that are created by global flows and networks: upturns and downturns rippling across financial markets; borderless environmental threats such as climate change and transboundary air pollution; migration of people in an increasingly mobile world; non-localizable “cyber crimes” requiring international systems of law enforcement; and the building of a worldwide coalition of nation-states against terrorism. But how do societies undergoing such massive transformation *know* things? Where do they turn for credible information, and what even counts as information in today’s complex and noisy networks of communication? How do widely dispersed actors, with no common experiential base, acquire shared knowledge, and what happens when they disagree about the immensely varied facts that are relevant for their survival? These questions, so critical to the success of global governance, have remained unasked and largely unanswered.

The contributors to this volume avoid these limitations in several ways. First, they approach the local and the global not as fixed in advance but as constituted through the beliefs, actions, and normative commitments of relevant social actors. This orientation is particularly consistent with the aims of STS, a field centrally concerned with the production of authority structures in scientifically and technologically advanced societies. Drawing on STS perspectives, the authors start from the tenet that *all* knowledge, including the “hardest” scientific facts, originates in some sense as local or situated. From this standpoint, the spread of science is something to be accounted for rather than taken for granted. It is well established, for example, that considerable simplification is needed to wrest scientific knowledge from its chaotic and often unreadable contexts and to make it intelligible to varied audiences (see Lachmund, this volume). Indeed, one way to under-

stand the nature of scientific production is to see it as a series of progressive translations from “wild” and excessively signal-rich contexts to the tamed but interpretively constrained currency of representations and publications (Latour 1999).

To such micro-focused accounts of “science in action” (Latour 1987) may be added the perspectives of development critics who stress another kind of reductionism: the displacement of heterogeneous local sensibilities through the particular highly successful local vision that goes by the name of “science”—producing what Vandana Shiva (1993) has provocatively called “monocultures of the mind.” Science, for our purposes, is not automatically exempted from the attributes of parochialism. Localism, correspondingly, is confined neither to remote villages nor to sophisticated laboratories and scientific workplaces, but can appropriately be observed in any site that produces authoritative knowledge. Localness in this sense is just as readily found in United Nations negotiating bodies and international scientific committees as in colonial South Africa or Native American tribal organizations.

Second, and related, our understandings of both local and global include but are not limited to geographic conceptions. Other ways of bounding the processes and preserves of knowledge making turn out to be equally significant for environmental governance: for example, the word “local” can be used to describe residents’ knowledge of a nature conservancy, users’ understanding of a technological system, the conclusions of a policy-making agency, or the practices developed by a scientific discipline or advisory body. By finding the local in such a diversity of sites, the contributors to this volume resist the tendency to equate “global” with progress or inevitability and “local” with tradition or resistance. Accordingly, a third concern of our contributors is to explore the complementarity between the local and the global. How, for example, do different conceptions of the local help to authorize the turn to the global, or vice versa? The answers open up news ways of thinking about what it means to embrace local as against global habits of thought when confronting environmental challenges. It is the mutually constitutive relationship between these allegedly opposing forms of life that commands the greatest interest. Thus, international debates about biodiversity conservation weave into a city’s urban waste-land experiments (Lachmund); assertions of community identity and expertise help to counter corporate notions of universal technical knowledge

(Hes); and international institutions attempting to produce shared meaning around ostensibly global concepts such as biosafety or climate change, reveal that to "assess" environmental risk globally is to take on board a host of locally significant normative and distributive questions (Fogel, Goldman, Gupta).

Finally, all the authors challenge static notions of local and global. They deal in one or another way with processes, be they processes through which scientists and communities negotiate over nature preserves in Berlin, citizens gain access to chemical companies, or plants from South America are translocated into biodiversity information for US corporations. By treating local and global in these terms, the authors illuminate the intensely political character of local-global interactions. They call attention to the mechanisms through which ideas, communities, practices, economies, and knowledges acquire power and achieve currency. This dynamic approach also brings into relief crucial questions about institutional design: Who decides what counts as local or global, and by what criteria; and what weight is accorded to local concerns in translocal forums? Who speaks for the local and the global, and on what authority? How do knowledges, people, and technologies circulate (or fail to do so) in and across local and global arenas? How are these arenas shaped by, and in turn how do they shape, additional knowledge claims and technological developments? And in what ways do new configurations of the local and the global transform the processes of environmental knowledge making, technological innovation, and political action?

What Is at Stake?

Changing notions of locality and globality, then, are more than mere academic curiosities. They have important consequences for the configuration of power and the efficacy of governance in environment and development contexts. They also have far-reaching implications for the production of knowledge acceptable to an emerging global polity. As the chapters in this volume demonstrate, there are myriad ways in which processes of localizing and globalizing bear on the creation of laws and institutions, the allocation of resources, the provision of access to scientific or political forums, and the wielding of voice in public debates. The interplay of the local and the global influences the kinds of knowledges about the environment that are discovered, accepted as authoritative, and put to use in decision making. For now, we restrict ourselves to a few general observations about the

political implications of our analysis; we will return to a more detailed evaluation in the concluding chapter.

Environmental science, as we noted earlier, can be either local or global, situated or portable. Scientific knowledge production begins at one level as a deeply local activity. It takes place in field sites, laboratories, and at computer screens; equally, its production is embedded in particular traditions of securing social trust and credibility. But, as the sociologist of science Bruno Latour has shown in a series of influential works (1987, 1990, 1999), observations that achieve the status of "science" are able to circulate globally through journal articles, mathematical equations, maps, and charts, and through the interactions of international scientific communities. Claims that fail to circulate in these ways are not considered science, which continues to be seen as the only universally valid source of knowledge. Yet studies of environmental management have called into question assumptions about the adequacy, universality, and superiority of much scientific knowledge. The coming together of disparate cultures in international environment-development forums reveals important differences in ways of knowing throughout the world, even among scientifically advanced societies.

Globalization processes, as we have seen, have paradoxically helped to diversify the types of knowledges recognized and used in environment-development policy. Global regimes have not neutralized the politics of knowledge by consolidating all claims under one big, hospitable, relativizing tent, but rather have channeled scientific and political activity in specific directions. Thus, the dominance of computer modeling in an area such as climate change may discourage the use of more locally or regionally oriented methodologies such as forecasting by analogy (Glantz 1988). Sidelining the latter sorts of techniques may, in turn, disfavor framings of climate change that are most directly relevant to place-bound communities such as farmers and natural resource managers.

But it is not only such basic epistemological divisions that have come to light through the globalization of environmental problems; at stake as well is whose knowledge counts when views conflict. The emergence of local knowledge as a resource for achieving sustainable development has, in some cases, broadened the definition of "expert" to include non-scientists and caused expert committees to become more diverse and inclusive. And the resurfacing of local knowledge has also helped to redraw the meanings and goals of capacity building. Early development programs sought to build

capacity in the image of Western know-how by providing local peoples with modern technologies and analytic techniques deemed to be advantageous in all contexts. The new respect for local forms of knowledge and action recognizes the flaws in that approach. It has the potential to transform capacity-building by strengthening and enabling existing, in-situ capabilities among recipients of development assistance. These points are taken up repeatedly in the volume.

Sites of Localization: An Outline of the Volume

Each chapter in this volume takes up most of the themes and issues outlined above. It is thus important to emphasize the synergies among them. At the same time, the various chapters also deal with some recurrent forms of local-global negotiation that deserve recognition. The chapters are therefore organized so as to capture the interplay between the local and the global at three levels of governance: international institutions and their standardization of knowledge; national responses to environmental globalism; and environmental knowledge and cultural identity in communities other than nation-states.

In "Heaven and Earth," Sheila Jasanoff introduces many of the volume's principal themes. She connects the origins of the global perspective on the environment to the history of the US manned space program and notes that the resulting vision of the biosphere as a limited, ecologically interconnected space is not uniformly accepted across the world. In India, for example, environmental needs and values are related to visual representations that are remote from the totalizing image of the Earth floating in space. The adoption of the global view, Jasanoff suggests, entails the overriding of local sensibilities and commitments, without necessarily acknowledging the political consequences at stake.

In part I, Michael Goldman, Clark Miller, Cathleen Fogel, and Aarti Gupta examine how development processes managed by supranational bodies, under the heading of modernization, produce demarcations between local and global. These accounts illustrate how global scientific rationality, operating as a leveler of difference, encounters and deals with local specificity. As well-intentioned analysts seek to develop common languages and create portable claims and artifacts, they often over-simplify or ignore complex local ways of life. In response, local constituencies are increasingly

demanding voice and agency, not only in the forums that develop multi-lateral policies, but also in processes that generate knowledge about global environmental change. Transnational negotiating forums have emerged in consequence as producers of local knowledge as well as global regulatory concepts.

Goldman examines the World Bank's social and environmental assessment practices following the protracted Narmada Dam controversy in India. The Bank, in Goldman's account, functions much like a reductionist planning state, translating local peoples and their complex life worlds into abstract knowledge and data that can circulate globally. Newly devised assessment and consultation procedures ostensibly serve as tools for avoiding the "Narmada effect" by promoting environmental sustainability and creating transparency. In employing these tools, however, the Bank reverts to its old habits and does more to simplify and even erase "local" subjects than to empower them.

Along similar lines, Miller, in his analysis of the International Research Institute for Climate Prediction (IRI), emphasizes the lack of accountability in the scientific expertise and predictive technologies undergirding some international institutions, and he suggests that many of globalization's discontents stem from this weakness. Reviewing IRI's attempts to make El Niño-Southern Oscillation (ENSO) forecasts available worldwide (in Peru in particular), he pleads for greater attention to the ways in which such institutions remake, or attempt to remake, the localities in which they intervene.

Fogel takes forest management as her focus and analyzes the activities of the Intergovernmental Panel on Climate Change and the Kyoto Protocol regime in constructing the identities and roles of indigenous peoples. As Scott (1998) and Shiva (1993) did, Fogel shows how the IPCC's scientific forest assessments have tended to overlook the people who use forests. Indigenous groups, however, have reinserted themselves in climate change negotiations, where they present their own ways of understanding and relating to forests and argue for greater attention, on the part of scientists and policy makers, to peoples and places served by global forest resources.

In partial contrast, Gupta's analysis of the Biosafety Protocol negotiations suggests that a conceptual framework such as biosafety can function as both globally compelling and locally contingent. At one level, negotiators from participating countries appear to be talking about the same thing when referring to biosafety. Yet when they attempt to give the concept a

universal meaning, they run into problems because the scientific principles on which biosafety is allegedly based turn out in reality to be highly contested and culturally variable.

In part II, Myanna Lahsen, Silke Beck, Tim Forsyth, and Astrid Scholz deal with the uptake and redefinition of global knowledge-power settlements in national contexts. The authors ask how knowledge is traded, interpreted, and institutionalized across different levels of governance, and how these exchanges shape the politics of centers and peripheries. When national-level actors confront transnational problems such as climate change, they often discover incongruities between globally constructed framings of environmental phenomena and their own histories, political cultures, and priorities. And while global institutions may operate on the assumption that local groups speak for the disenfranchised, national-level experiences sometimes reveal a different reality. These chapters point to the dangers of stereotyping the local or the global. They illustrate the everyday challenges that people (including indigenous peoples and developing country scientists) face in traversing and mediating between the national and transnational settings in which environmental science engages with politics and ideology.

Lahsen's analysis of climate scientists in Brazil explores the contradictions of leading an active scientific life in both local and global arenas. Climate scientists are supposed to belong to a unified international research community, but Lahsen's ethnographic investigations reveal a more complicated reality. From a scientific standpoint, climate change is a global problem demanding a unified response from science; yet the consequences of climate change are not evenly distributed around the world, and the politics of knowledge making and knowledge interpretation vary by region and state. Thus, while participation in international forums confers professional rewards, Lahsen's Brazilian scientists realize that these forums also support research and policy agendas at odds with Brazilian needs and priorities.

Beck draws on theories of political culture in examining the appearance of climate change as a national policy issue in Germany. Looking at the work of two parliamentary commissions, she shows that each translated concerns about the climate into a political idiom consistent with German views about the nature of expertise, the role of dissent, and the norms of environmental responsibility. Beck argues that institutions, scientific enterprises, and policy processes put in place to deal with climate change at the

international level are founded on unrealistically monolithic visions of the problem and its management. Not surprisingly, such approaches tend to overlook the national particularities that make international coordination on this issue so difficult to achieve.

Turning to Thailand, Forsyth takes issue with the idealistic view that associates environmental NGOs with the elevation of local knowledge and democratization. Environmental social movements, he observes, are not classless resistance movements, but are themselves tied to particular socio-economically and culturally inflected visions of the environment. NGOs thus may propagate erroneous or ill-considered scientific doctrines, ignore systematic environmental abuses, propagate falsely romantic views of the "local" or ally themselves with repressive policies. In Thailand, he further suggests, environmental social movements have been largely middle class enterprises. Far from representing the voices or knowledges of the poor or marginal, they have more often repressed them.

Scholz tells a more optimistic story about the dynamics of localization and globalization in the emerging field of natural products chemistry, where important relationships between knowledge and power are again at stake. Scholz compares a project of the International Cooperative Biodiversity Group (ICBG) in Panama with its sister projects elsewhere in the program. The Panama program successfully produces natural products for the world, but also gives back resources, knowledge, and technologies to the localities from which the products are derived. Elsewhere in the ICBG program, the delocalization of biodiversity and local knowledge has proceeded without comparable local payoffs.

In part III, Jens Lachmund, Marybeth Long Martello, Alastair Iles, and Stacy VanDeveer examine the intricate links between knowledge making and identity formation in the context of environmental politics and explore how knowledge is mobilized in support of local forms of life that gain their power partly by contesting or dissociating themselves from global environmental regimes. Strategies of localization and globalization have proved to be important resources for scientists, Native Americans, citizens, corporations, and regional communities as they work out their own identities; their definitions of nature, expertise, and place; and their roles in environmental governance. In discussing these examples, the authors ask what it takes to establish or extend the power of knowledge produced in various local settings, be they nature reserves or new scientific disciplines.

Lachmund's analysis of a nature park in Berlin offers fascinating insights into the tenacity of local practices, both symbolic and material, in a globalizing world. Tracing the development of urban ecology in West Berlin, Lachmund describes how ideas about human-nature relationships co-evolved with new conventions of ecological research, and how the results achieved both cognitive and political viability in the unique environment of Germany's once and future capital city. "Living ecologically" and adapting to "global change," in his account, were not scientifically defined endpoints; rather, they were performative goals that allowed both lay and expert actors to participate in determining what should count as natural and how nature should be studied and protected.

Martello looks at the strategic deployment of rhetorics of localization and globalization in the debate over whether the Makah tribe of the Pacific Northwest should be allowed to hunt gray whales. The Makah's very existence as a community depended in this case on their ability to assert unique claims about their relationship to the environment. Exchanges between the Makah and the anti-whaling activists centered on who (if anyone) has the right to define "global nature" on their terms, and on what (if anything) counts as authentic "local" culture, entitled to retain its distinctive environmental practices in a globalizing world.

Illes turns to the corporate sector as a locus of knowledge and identity formation and examines how the American chemical industry reinterpreted the notions of "local" and "expert" in implementing global standards. This quintessentially modern industry once equated the local with notions of inferior, parochial, non-expert, and lay; today, however, a new vision is emerging in which the local is recognized as a source of power, voice, and specialized knowledge. Even the chemical industry has begun to view so-called local people as potential experts and as reliable partners in chemical plant oversight, thus laying the basis for a new, transnational culture of regulatory cooperation.

VanDeveer uses examples from the European Union and eastern Europe to illustrate the emergence of "regions" as a new unit of environmental governance. The identity and autonomy of regions, he suggests, results from the interaction of knowledge about nature and visual representations of nature, such as maps, with associated forms of politics. In a global context that is otherwise largely governed by national entities, regions function as an interesting kind of locality, with power to foster politics and

even identity formation on the basis of shared conceptions of environmental problems.

In a brief concluding chapter, we summarize the insights gleaned from the preceding chapters and their implications for policy institutions and processes. We indicate which kinds of accommodations between the global and the local are most likely to lead to political impasse and injustice, and which by contrast can be expected to produce more balanced, interactive, and knowledge-enhancing relations in future environmental governance.

Notes

1. Others have noted the weaving together of local and global themes and images during the millennium celebrations. We are particularly indebted to Clark Miller for related insights and comments.
2. The words "glocal" and "glocalism" have attained currency in journalistic and popular writing (Ball 2002). They imply that there are ready-made spheres of the global and the local and that the challenge of marketing or governance is simply to hybridize them. The authors of this book resist any such implication.
3. The table does not claim to present an exhaustive account of all transnational initiatives on local, traditional, and/or indigenous knowledge. Agreements and organizations that address traditional knowledge but are not included in the table include the International Undertaking on Plant Genetic Resources, the World Intellectual Property Organization, the General Agreement on Tariffs and Trade, and the Trade-Related Aspects of Intellectual Property Rights Agreement.
4. The co-construction of norms and identities around natural resources has not been sufficiently stressed in the extensive and widely cited literature on common pool resources (e.g., Ostrom 1990). Written from a realist perspective on the natural world, this literature generally takes the "commonness" of natural resources for granted. Particularly in the context of globalization, however, we need to consider how planetary resources come to be seen as held in common and demanding shared stewardship.
5. This methodological approach is consistent with the strong program in the sociology of scientific knowledge, which invites analysts to explore through social scientific means how certain facts and claims acquire or maintain the status of science while others do not (Bloor 1976).
6. For exceptions, see Robertson 1995 and Cvetkovich and Kellner 1997.
7. Roland Robertson (1995) uses the word "glocalization" in calling for sociological analyses that examine the interactions of homogenization and heterogenization that have been part of so much late-twentieth-century life. Robertson argues that focusing exclusively on globalization as a process that overrides the local neglects the role of the trans-local and the super-local in constructing the local and overlooks weaknesses in notions of "universal time" and "particularistic space."

References

- Agarwal, Anil, and Sunita Narain. 1991. *Global Warming in an Unequal World*. New Delhi: Centre for Science and Environment.
- Appadurai, Arjun. 1990. "Disjuncture and Difference in the Global Cultural Economy." In *Global Culture*, ed. M. Featherstone. Sage.
- Ball, Deborah. 2002. "Global—with a Touch of Local." *Wall Street Journal Europe*, June 7–8.
- Benedick, Richard E. 1991. *Ozone Diplomacy: New Directions in Safeguarding the Planet*. Harvard University Press.
- Bloor, David. 1976. *Knowledge and Social Imagery*. University of Chicago Press.
- Brokensha, David, D. M. Warren, and Oswald Werner, eds. 1980. *Indigenous Knowledge Systems and Development*. University Press of America.
- Castells, Manuel. 2000. *End of Millennium*. Blackwell.
- Clifford, James, and George E. Marcus. 1986. *Writing Culture: The Poetics and Politics of Ethnography*. University of California Press.
- Cohn, Bernard S. 1996. *Colonialism and Its Forms of Knowledge*. Princeton University Press.
- Cvetkovich, Ann, and Douglas Kellner. 1997. "Introduction: Thinking Global and Local." In *Articulating the Global and Local*, ed. A. Cvetkovich and D. Kellner. Westview.
- Dickson, David. 1999. "ICSU Seeks to Classify 'Traditional Knowledge.'" *Nature* 401 (6754): 631.
- Douglas, Mary. 1970. *Natural Symbols: Explorations in Cosmology*. Pantheon.
- Donahue, John. 2002. "Market-Based Governance and the Architecture of Accountability." In *Market-Based Governance*, ed. J. Donahue and J. Nye. Brookings Institution.
- Drayton, Richard. 2000. *Nature's Government: Science, Imperial Britain, and the "Improvement" of the World*. Yale University Press.
- Escobar, Arturo. 1995. *Encountering Development: The Making and Unmaking of the Third World*. Princeton University Press.
- European Union. 2001. *European Governance: A White Paper*. Brussels: Commission of the European Communities, COM(2001) 428 final.
- Ezrahi, Yaron. 1990. *The Descent of Icarus: Science and the Transformation of Contemporary Democracy*. Harvard University Press.
- Fairhead, James, and Melissa Leach. 1996. *Misreading the African Landscape: Society and Ecology in a Forest-Savanna Mosaic*. Cambridge University Press.
- Geertz, Clifford. 1983. *Local Knowledge: Further Essays in Interpretive Anthropology*. Basic Books.
- Gerlach, Luther. 1991. "Global Thinking, Local Acting: Movements to Save the Planet." *Evaluation Review* 15, no. 1: 120–148.
- Giddens, Anthony, and Will Hutton. 2000. "In Conversation." In *Global Capitalism*, ed. W. Hutton and A. Giddens. New Press.
- Gieryn, Thomas F. 1999. *Cultural Boundaries of Science: Credibility on the Line*. University of Chicago Press.
- Glantz, Michael H., ed. 1988. *Societal Responses to Regional Climatic Change: Forecasting by Analogy*. Westview.
- Grillo, R. D., and R. L. Sturatt. 1997. *Discourses of Development: Anthropological Perspectives*. Berg.
- Haas, Peter M. 1990. *Saving the Mediterranean: The Politics of International Environmental Cooperation*. Columbia University Press.
- Haraway, Donna J. 1988. "Situated Knowledges: The Science Question in Feminism as a Site of Discourse on the Privilege of Partial Perspective." *Feminist Studies* 14, no. 3: 575–599.
- Hardt, Michael, and Antonio Negri. 2000. *Empire*. Harvard University Press.
- Held, David, Anthony G. McGrew, David Goldblatt, and Jonathan Perraton. 1999. *Global Transformations: Politics, Economics and Culture*. Stanford University Press.
- Huntington, Samuel P. 1996. *The Clash of Civilizations and the Remaking of World Order*. Simon and Schuster.
- Irwin, Alan, and Brian Wynne, eds. 1994. *Misunderstanding Science? The Public Reconstruction of Science and Technology*. Cambridge University Press.
- Jasanoff, Sheila. 1990. *The Fifth Branch: Science Advisers as Policymakers*. Harvard University Press.
- Jasanoff, Sheila, ed. 2004. *States of Knowledge: The Co-Production of Science and Social Order*. Routledge.
- Jasanoff, Sheila, and Brian Wynne. 1998. "Science and Decisionmaking." In *Human Choice and Climate Change*, volume 1, ed. S. Rayner and E. Malone. Batelle.
- Joerges, Bernhard. 2003. "Metropolitan Time: Reflections on the Millennium, Calendars, and Gregorian Hegemony." In *Social Studies of Science and Technology*, ed. B. Joerges and H. Nowotny. Kluwer.
- Keohane, Robert O., and Joseph S. Nye Jr. 2001. *Power and Interdependence*. Longman.
- Keohane, Robert O., and Joseph S. Nye Jr. 2000. "Introduction." In *Governance in a Globalizing World*, ed. J. Nye and J. Donahue. Brookings Institution Press.
- Latour, Bruno. 1990. "Drawing Things Together." In *Representation in Scientific Practice*, ed. M. Lynch and S. Woolgar. MIT Press.
- Latour, Bruno. 1999. *Pandora's Hope: Essays on the Reality of Science Studies*. Harvard University Press.
- Litfin, Karen. 1994. *Ozone Discourses: Science and Politics in Global Environmental Cooperation*. Columbia University Press.

- Martello, Marybeth. 2001. "A Paradox of Virtue: 'Other' Knowledges and Environment-Development Politics." *Global Environmental Politics* 1, no. 3: 114-141.
- Miller, Clark A., and Paul Edwards, eds. 2001. *Changing the Atmosphere: Science and the Politics of Global Warming*. MIT Press.
- Mukerji, Chandra. 1989. *A Fragile Power: Scientists and the State*. Princeton University Press.
- Ostrom, Elinor. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge University Press.
- Price, Don K. 1965. *The Scientific Estate*. Harvard University Press.
- Robertson, Roland. 1995. "Globalization and Glocalization." In *Global Modernities*, ed. M. Featherstone et al. Sage.
- Rueschmeyer, Dietrich, and Theda Skocpol, eds. 1996. *States, Social Knowledge, and the Origins of Modern Social Policies*. Princeton University Press.
- Sagan, Carl. 1994. *The Pale Blue Dot*. Random House.
- Schlosser, Eric. 2001. *Fast Food Nation: The Dark Side of the All-American Meal*. Houghton Mifflin.
- Schmitter, Philippe C. 2001. "What is there to legitimize in the European Union . . . and how might this be accomplished?" No. 75, Political Science Series, Institute for Advanced Studies, Vienna.
- Scott, James C. 1985. *Weapons of the Weak: Everyday Forms of Peasant Resistance*. Yale University Press.
- Scott, James C. 1998. *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed*. Yale University Press.
- Shiva, Vandana. 1993. *Monocultures of the Mind: Perspectives on Biodiversity and Biotechnology*. Zed Books.
- Solingen, Eitel. 1994. *Scientists and the State*. Ann Arbor: University of Michigan Press.
- Takacs, David. 1996. *The Idea of Biodiversity: Philosophies of Paradise*. Baltimore: Johns Hopkins University Press.
- United Nations. 1992a. Agenda 21: The United Nations Programme of Action from Rio. United Nations Department of Public Information.
- United Nations. 1992b. Convention on Biological Diversity. Geneva: Interim Secretariat for the Convention on Biological Diversity.
- United Nations. 1994. United Nations Convention to Combat Desertification in Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa. Nairobi: UNEP.
- United Nations Conference on Environment and Development (UNCED). 1992. Non-Legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of all Types of Forests.
- US Global Change Research Program. 2000. *Climate Change Impacts on the United States: The Potential Consequences of Climate Variability and Change: Overview*. Cambridge University Press.
- Ward, Barbara, and Rene Dubos. 1972. *Only One Earth: The Care and Maintenance of a Small Planet*. Norton.
- Weiss, Edith Brown. 1989. *In Fairness to Future Generations: International Law, Common Patrimony, and Intergenerational Equity*. Transnational Publishers and United Nations University.
- World Bank Knowledge and Learning Center, African Region. 1998. Indigenous Knowledge for Development: A Framework for Action.
- World Commission on Environment and Development (WCED). 1987. *Our Common Future*. Oxford University Press.
- World Conference on Science (WCS). 1992a. Declaration on Science and the Use of Scientific Knowledge.
- World Conference on Science (WCS). 1999b. Science Agenda—Framework for Action. Text adopted by the WCS, July 1.
- Wynne, Brian. 1989. "Sheepfarming after Chernobyl." *Environment* 31: 11-15, 33-39.

Heaven and Earth: The Politics of Environmental Images

Sheila Jasanoff

Environmentalism without Borders

The year 2002 featured several important anniversaries for global environmentalism. On September 2-11, Johannesburg hosted the World Summit on Sustainable Development, a ten-year retrospective on the 1992 United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro. Widely billed as the year of "Rio Plus Ten," 2002 marked the end of a decade that propelled the environment into an issue of global significance, inextricably linked it to development, and energized non-governmental organizations around the world to play a more active, participatory role in environmental governance. It was 15 years after the publication of *Our Common Future* (WCED 1987), the report whose commanding title and insistence on the idea of sustainability achieved a resonance beyond anything contemplated by the international committee that authored it. It was 30 years since the 1972 United Nations conference in Stockholm, which, arguably for the first time, placed the environment on the international policy agenda. That event, in turn, followed by just one year the 1971 Earth Day demonstrations that framed the environment as a people's cause and established April 22 as a date to remember on the calendar of an emerging global civil society. And it was 40 years since *Silent Spring* (Carson 1962) began the consciousness-raising work that many now credit with the birth of environmentalism as a social movement in America.

Among the achievements leading to this year of multiple anniversaries, few are so remarkable as the world community's apparent willingness to see the environmental dilemma as a truly planetary problem, calling for concerted action on an equally expansive scale. In just a generation, the

idea that there is "only one Earth" seems to have lost its sloganeering quality and been accepted as reality by activists and policy makers, the media, and the public. How this happened, how far this reality has influenced belief and action, and whose realities have been ignored or sidelined along the way are the primary topics of this chapter.

Citizens of postmodern times need few reminders of the multiplicity of human responses to the world. Relativism has been a recognized strain in humanistic and social thought since the early decades of the twentieth century, when people of different cultures and conditions first confronted "the other" through technological achievements in transport, communication, and military conflict. (See, for example, Fussell 1975.) We may still fight wars to settle ideological conflicts, but the fact of cultural difference no longer threatens in and of itself; indeed, within certain limits, rights to be different and to behave differently have been significantly expanded. It has become an axiom of critical theory that one's perception of the world legitimately reflects the position from which one looks at it, whether in politics, in culture, or in law (Said 1978; Guha and Spivak 1987; Kelman 1987). Even scientific knowledge, built up over centuries as the one domain of human experience that is independent of personal and cultural biases, is now widely, if still controversially, acknowledged to be a social achievement (Kircher 2001; Jasanoff et al. 1995; *contra* see Gross and Levitt 1994). Today's puzzles, for academics and activists, are less about why difference exists and more about how people can overcome their positional differences and come together on issues of common concern.

The rise of global environmentalism in the latter decades of the twentieth century promises much illumination, then, as a case study of global norms-making. If the environment is a space of thought and action in which the people of the world have learned—however partially—to set aside their differences, then understanding how and why this happened is of paramount importance. Environmentalism can take its place beside a few other emerging global norms (human rights, nuclear non-proliferation, anti-terrorism) that are, with luck, laying the basis for supranational governance in the twenty-first century. Environmental action can be seen in this sense as part of a larger process of global constitution making (Jasanoff 2003). Unlike norms against biological weapons or chemical warfare, moreover, environmentalism has grown as much from the bottom-up politics of civil society (Keck and Sikkink 1998) as from the top-down interventions of

policy makers and technical experts. It is, in this respect, a particularly appealing model for global democracy.

I hope to show in this chapter that global environmentalism is a more complex, incomplete, and heterogeneous construct than some of its most ardent celebrators have suggested. To do this, I concentrate on one aspect of environmental discourse—the visual repertoire of environmentalism—that has not received as much analytic attention as more formal developments in environmental science, law, and politics. Using the examples of the United States and India, I suggest that the Earth is imaged and imagined in strikingly different ways by different polities around the world, with consequences that matter for all aspects of environmental action, from scientific research to political campaigns. The concept "global" in contemporary environmentalism remains in this respect as essentially contested as "liberty" and "accountability" in democratic politics. This lack of agreement, however, need not be a cause for despondency. For now, the struggle to define "global" may be one of the best avenues we have for engaging in a meaningful politics of globalism.

The Politics of Global Environmentalism

Three well-known theories of convergence have been applied to the global environment, but each has flaws. The simplest is the model that attributes social change either to exogenous events that everyone can see (e.g., new scientific findings, crises, disasters) or to the work of entrepreneurial individuals and institutions determined to elevate their private scientific or moral concerns into wider political causes. Environmentalism, according to this way of thinking, fits into a well-established linear and positivist explanation of why issues appear on social and political agendas. This approach is enshrined in the work of political analysts such as John Kingdon (1984) and ratified by a long commitment to scientific and technological determinism in American thought (Ogburn 1923; Smith and Marx 1994).

Others have recognized that the ideas shared by transnational alliances do not travel in and of themselves, independent of human agency. A second line of theorizing therefore attributes environmental policy change to the work of transnational "epistemic communities": groups of professionals and policy makers who are motivated by both technical and normative

commitments to pursue programs of international coordination (Haas 1990, 1992). Similar arguments have been offered by scholars who stress the role of advocacy coalition frameworks in policy making (Sabatier 1999, pp. 117-166). A related body of work argues that the power to mobilize rests not only with policy elites, as in much of the epistemic community literature, but also with networks of activist citizens. In a detailed elaboration of this position, Margaret Keck and Kathryn Sikkink (1998) suggested that non-governmental organizations succeed in promoting transnational social agendas such as environmentalism through a mix of communicative strategies, one of which is the exchange of information.

A third body of analysis has stressed the importance of discourses rather than actors in building consensus on environmental issues, especially across national boundaries. In a study of the Montreal Protocol on ozone-depleting chemicals, Karen Litfin (1994) argued that nations came together through a common discourse of prevention, even before a definitive cause-effect relationship was established between the discharge of chlorofluorocarbons and the destruction of the stratospheric ozone layer. Cooperation occurred simply because the fact of the "ozone hole" was widely accepted and there were no plausible non-anthropogenic causes for the phenomenon. A contrasting perspective, championed for example by Maarten Hajer (1995) in his work on the European politics of acid rain, takes issue with the idea that activists simply find or generate knowledge and instrumentally use it to advance preconceived positions. Rather, Hajer suggests, actors' cognitive and moral sensibilities are shaped by their own discourses, rendering them more or less inclined to interpret facts, evidence, and the credibility of scientific findings in particular ways. The spread of a given discourse (precaution, for example) thus promotes accord on previously contested claims.

Research in the sociology and politics of scientific knowledge has rendered problematic both the knowledge-centered and the actor-centered approach to global environmental cooperation. In the linear model of policy formulation, citizens and society at large are implicitly cast as passive entities, easily led by charismatic leaders and untoward events, seemingly without independent will, purpose, cognition, or imagination of their own. The public is granted agency only when its response diverges from expert technical judgments, as for example in the resistance to nuclear power in the 1970s, to environmental chemicals in the 1980s, and to agricultural

biotechnology in the 1990s. In these cases, the public is often characterized as a collectively irrational entity that either is ignorant of the facts or has been misled by the press and politics and that hence does not understand how to act in its own best interests (Breyer 1993).

Empirical research has increasingly called into question the adequacy of these explanations. Pioneering work in the sociology of scientific knowledge has shown that social factors can be invoked to explain true as well as false beliefs (Fleck 1979 [1935]; Kuhn 1962; Bloor 1976). We have learned to see scientific knowledge making as an activity deserving every bit as much analysis as, say, the manufacture of paintings, novels, or widgets. Science is a form of organized work, a site of politics, a marketplace of ideas, an exercise in meaning-making, and an instrument of power. Therefore, when studying the role of science and technology in policy or in politics, it no longer suffices to say that facts or inventions simply drive responses and outcomes. We have to ask a series of deeper questions: How did people recognize some facts as salient or as relevant to their problems? Whose knowledge was deemed important? How were uncertainties and disputes resolved? Who participated in their resolution?

There is too the problem of science's translation to new audiences. Given increasing specialization within the sciences, even experts in one or another scientific domain pattern at best as semi-educated lay persons when confronted by findings in fields outside their own. A mathematician can no more knowledgeably take sides in disputes over climate science than a geneticist can convincingly elaborate the "laws" of game theory. Public trust in science is even less a given. Why then do people believe assertions based on science? What are the sources of science's special claim to credibility (Shapin 1994), and how is that credibility maintained even when the public sees only heavily mediated representations of scientific reality? To get to the bottom of these questions, we must interrogate the role of science and technology in constructing collective beliefs. Instead of assuming that science compels belief simply through its correspondence with the truth, we have to undertake more situated, localized investigations, asking how science's claims are interpreted within particular institutionalized frameworks for making sense of the world.

The actor-centered and discourse-centered approaches to understanding collective environmental action seem at first to avoid the deficiencies of the deterministic, knowledge-centered model. By putting forms of human

agency at the center of analysis, these approaches at least recognize that facts about the environment are embedded in social contexts; without human actors to mobilize them, even scientific claims have no power to move others. Yet even when, as in the epistemic community framework, allegiance to a shared episteme is at the heart of the theory, issues of persuasiveness and credibility remain curiously outside the analysts' purview. (For a more extended critique, see Jasanoff 1996.) That scientific claims may be uncertain, controversial, or interest-ridden, let alone historically and culturally situated, has received little acknowledgment in the work on advocacy coalitions and social movements. The boundary between science and political action (Gieryn 1999) is mostly taken for granted in such work. Keck and Sikkink, for example, distinguish "information politics" from "symbolic," "leverage," and "accountability" politics. The implication is that the standard resources of politics—language, symbols, interests, legitimacy—are not influenced by the production of information, or vice versa. This view is profoundly at odds with fundamental observations in the sociology of knowledge.

Discourse analysts are more attuned to the notion that so-called facts are always interpreted within pre-existing hermeneutic traditions. How else can we explain the rifts that repeatedly occur about the meanings of particular scientific observations? The discursive approach also helps us understand how gaps in scientific knowledge can be repaired or rendered invisible in the course of building political coalitions. In foregrounding discourse, however, this framework downplays the role of material instruments and that of human interpretive faculties other than language (most notably the power of seeing and witnessing). It also pays more attention to the high culture of environmentalism—the formal discourses of policy and law—than to the vernacular traditions of television, advertising, cartoons, or popular art. Yet if environmental norms are changing to accommodate a truly global perspective, then it is precisely in the interplay of high and low, elite and vernacular, that we should find evidence of this swing.

Making Planet Earth: Destiny Manifested

In the middle of the twentieth century, we saw our planet from space for the first time. Historians may eventually find that this vision had a greater impact on thought than did the Copernican revolution of the 16th century, which upset humans' self-image by revealing that the Earth is not the center of the universe.

From space, we see a small and fragile ball dominated not by human activity and edifice but by a pattern of clouds, oceans, greenery, and soils. Humanity's inability to fit its activities into that pattern is changing planetary systems fundamentally. (WCED 1987, p. 308)

This exceptionally eloquent statement from the report of the World Commission on Environment and Development set forth some of the major themes of global environmental discourse during the final decades of the twentieth century. The commission linked the image of the whole Earth as seen from outer space to a moment of changed awareness, similar to a scientific revolution or paradigm shift (Kuhn 1962). The effect of this image, the commission implied, was to unseat human beings from the center of environmental analysis and to replace the humanistic gaze with an ecological one, focused on "a pattern of clouds, oceans, greenery, and soils." The Earth, seen as a "small and fragile ball," needs human stewardship, the commission suggested, but it also indicated that the concerns of humankind might have to be backgrounded in favor of more systemic, less human-centered understandings of environmental phenomena.

The commission offered at one level a newly thought out message about the obligations of environmental ethics, but its message could also be read as deeply political. Without much of a stretch, one can see the WCED as advocating a new kind of globalism transcending the old nationalisms of the past two centuries. This imagined global polity is held together in the commission's view through a shared custodial responsibility for the Earth, symbolized by an image that dramatically subordinates "human activity and edifice" to the dynamics of large natural systems.

In *Imagined Communities* (first published in 1983), the political theorist Benedict Anderson called attention to the pull that nation-states exercise on the imagination of their citizens. It is a force strong enough to make people die for an object that has no tangible reality and may not even occupy a piece of contiguous space upon a map.¹ At first, Anderson credited mainly print capitalism with the power to commandeer people's imaginative faculties in this way, but he later turned to other forms of representation that have also played their part in cementing the identity of newly emerging nations, such as the census, the map, and the museum. The power of the map, in particular, derives from its ability to project what Anderson called a "logoized" image of political space, erasing differences that exist within the depicted national boundaries. The planetary image, as described by the

World Commission, serves just such a function: it unites the Earth by making invisible the divisions within it.

But is it so simple? Unquestionably, the image of Planet Earth captured by the Apollo 17 astronauts in December 1972, on the last manned flight to the moon, has achieved an iconic status reserved for very few images in our visual culture (Jasanoff 2001; Sachs 1999). It appears everywhere. Often, it is tied specifically to environmental causes and messages, as when the image is used to advertise books, conferences, organic foods, and, increasingly, environmental organizations on the Internet. In these contexts, it stands not only for a global associationism, but also for an awareness of the Earth's environment as an integrated system. At other times, the image conveys more a sense of dissolving boundaries, implying that physical and social borders do not matter, as when the image is appropriated by a credit card or a telephone company, by CNN or Barnes and Noble, or by an airline. It is also used in odd juxtapositions that attest to its "found" or vernacular character, as in an advertisement for pet food showing a dog and a cat gazing up at the planetary image. In these displacements and relocations, the Earth image resembles nothing so much as the inscrutable face of Mona Lisa, on which artists and pranksters have inscribed their personal readings for the past hundred years.

Even celebrated icons, however, are made, not born, and the most familiar image of Earth ever created is no exception. It can be tied to three successive phases of meaning-making: first as an extension of the military adventures of twentieth-century superpowers, second as a symbol of environmentalism, and third as a foundation for scientific investigations of the global environment.

In the Beginning: The Earth from Space

Neil Armstrong's first footsteps on the moon are often cited as the beginning of a new era in human self-perception, as revolutionary in its way as the Copernican revolution (see, for example, WCED 1987, p. 308; Sachs 1999, pp. 110–111; Jasanoff 2001). That moment is said to have reversed the direction of the ordinary human gaze *toward* the Earth rather than always looking up from it. Yet the human mind "saw" the Earth from space long before we as a species acquired the technological capacity for flight. There is in the British Library's map collection a complete copy of the most famous celestial atlas of the seventeenth century, Andreas Cellarius's

Harmonia Macrocosmica (1660). In its elaborate, beautifully engraved pages, the German-Dutch cosmographer Cellarius depicted the Earth from all kinds of perspectives, both spatial and scientific. The plates illustrate the planet's position in the solar system according to the astronomical theories of Ptolemy, Copernicus, and Tycho Brahe. They show the equatorial view as well as the views from both poles. One plate displays the old world, with its meridians, its climate zones, and the dwelling places of its distinctive races. One, as described on the British Library's web site, "presents a novel view of the Earth, the Pacific and Antarctic regions, as if seen through the starry sphere from a deep point in space"; though "ingenious," the caption asserts, this view was of doubtful practical utility to astronomers. In several engravings, the Earth appears suspended within concentric circles representing the motions of various celestial bodies; the planet in these images is small, blue, distant, and beautiful.

Modern warfare brought another kind of utility to images from points in the sky, if not yet from space. When aerial combat became a reality in World War II, the US government acknowledged the altered topography of national vulnerability by producing new maps. The view from the North Pole figured prominently in the Air Force's and the government's calculus of where the threats to the nation's security would originate in the future. A report sponsored by the Council on Foreign Relations in 1947, for example, copied the polar perspective from an official chart used by the Air Force. The map cuts off the Earth below the 30th parallel, showing only the northernmost regions of Africa, Iran, and India, and nothing of Latin America. The missing parts of the world were neither visually nor strategically important. The report observed that "strategists term the area between the 30th and 65th parallels the key zone since all modern wars have started there" (Baldwin 1947). Appropriately for the beginning of the Cold War, the land masses of North America and the former Soviet Union almost entirely dominated the frame.² It is instructive to compare this apparently natural, geopolitically bipolar representation with the roughly contemporaneous United Nations flag, officially adopted in December 1946. That flag also shows the Earth from the North Pole, but it is an inclusive image, with the globe flattened out so as to take in most of the southern hemisphere, including the Australian continent.

Sputnik initiated another new age in Earth viewing. On October 4, 1957, the Soviet Union announced that it had launched a satellite into space,

thereby confounding US expectations of being the first in space and causing near panic among American defense experts and policy makers. While people tried to digest the meaning of this event, some even belittling the Soviet achievement because of the satellite's small size (a mere 184 pounds), a second, much larger satellite was launched on November 3, 1957, with a dog on board. At 1,120 pounds, Sputnik 2 was large enough to be a weapon, and its ability to circle the Earth, crossing all national boundaries, contributed to a sense of deepening crisis and insecurity. Within days, the outlines of a US space program were under discussion, culminating under the leadership of Senate Majority Leader Lyndon B. Johnson in the passage of the National Aeronautics and Space Act of 1958. In retrospect, many of the experts who guided the legislation agreed that the US response was more ambitious and sweeping than it would have been in the absence of Sputnik. With confidence in the nation's educational system shaken, congressional leaders opted for a program to claim back the lead in every aspect of space science and technology (NASA 1998).

But more was at stake than national defense. The idea of space conjured a different vision. George Reedy, press secretary and senior adviser to Johnson, recalls how he was talked into taking the space program seriously. Charles Brewton, an experienced Democratic staff assistant in the Senate, came to see him in Texas about two weeks after Sputnik 1:

He insisted we drive out of Austin and out into the hill country night around Austin. We found a little mound where we could look and see hundreds of miles of practically nothing. He began to talk about the space program; that man had really mastered the drift of it, the poetry. He didn't know very much about outer space, but he had grasped immediately that this was something that could change the whole way that we lived; it could change our nation. He convinced me. I remember going back that night. My mind was just full of it. (NASA 1998, p. 1)

Mission, catharsis, and radical transformation—themes that would be sounded by the World Commission 30 years on in *Our Common Future*—were already germinating here. Important, too, is the imagery of distance and altered perception. Space for Brewton and Reedy meant the erasure of ordinary visual signals, replaced by the grandeur of “hundreds of miles of practically nothing,” until one's mind was “just full of it.”

Features that loom large on Earth vanish when seen from space. Lines that do not correspond to physical demarcations, like most political boundaries, disappear entirely. What looms as monumental is the form of the planet itself, brightly outlined against the dense blackness of space. Perhaps

for this reason, in spite of its roots in military competition, the thought of space was coupled early on with ideas of human cooperation, especially in the thinking of some noted liberals of the 1960s. Barbara Ward, a distinguished British economist and an early proponent of global environmentalism, speculated that the flights of the Soviet and American astronauts would build solidarity between the superpowers:

When the astronauts spin through more than a dozen sunrises and sunsets in a single day and night; when the whole globe lies below them with California one minute and Japan the next; when, as they return from space, they feel spontaneously, with the first Soviet spaceman: “How beautiful it is, *our Earth*”; it is inconceivable that no modification of consciousness or imagination occurs, no sense that quarrels are meaningless before the majestic yet vulnerable reality of a single planet carrying a single human species through infinite space.” (Ward 1966, p. 146)

For Ward, seeing the same Earth, and seeing it whole, could not but obliterate differences among human beings. How could such a sight fail to produce a new political imagination, transcending national rivalries and centering on the future of the entire species?

By the time the Apollo program began producing its unforgettable images, the groundwork had thus been laid for interpreting the planet as a space without political boundaries, or at least a place in which old political distinctions lost their meaning. Carl Sagan, the astronomer who did more than anyone else to make space accessible to millions on Earth, followed in the tradition of Ward and others in seeing the space program as a negation of standard geopolitics. Sagan (1994, pp. 5–6) suggested that the Apollo 17 picture of the full Earth undermined the very basis for nationalism: “We are too small and our statecraft too feeble to be seen by a spacecraft between the Earth and the Moon. From this vantage point, our obsession with nationalism is nowhere in evidence.” Ironically, the image that triggered this observation showed parts of the world—Africa and the Arabian peninsula—where vigorous nationalisms still flourish, wars are fought, and heavy penalties are exacted in maimed lives, destroyed environments, and wrecked economies.

Spaceship Earth

The moon voyagers of the Apollo program were not, as a rule, a gregarious lot. Only a few of the astronauts who journeyed to the moon recorded their experience in identifiable voices. Among them was William Anders, one of the first three men to circle the moon on Apollo 8 and the first to see

an Earthrise. Recorded on color film with a hand-held camera in an unscheduled photographic session, the resulting image is one of the most widely diffused products of the Apollo program. The spectacle left Anders and his fellow crew members with an overwhelming impression of Earth's beauty and frailty. Later, Anders compared the planet to a fragile Christmas tree ornament. It remained, in retrospect, the most vivid legacy of his voyage. "We came all this way," Anders observed, "to explore the moon, and the most important thing is that we discovered the Earth." (Chaikin 1994, p. 119)

The environmental philosopher Wolfgang Sachs (1999) has called attention to the not entirely innocent character of this "discovery." Sachs is aware that images have the power not merely to represent the Earth but to construct it. He is sensitive to the ontological function of photography, its ability to render things visually and cognitively graspable from angles and perspectives not available to unaided human sight. What are the salient features of the Earth's iconography as read from space? First, there is the very ability of the depicted object to lay claim to physical reality, in a way that Cellarius's images either could not do or, embellished by intricate borders and mythological creatures, chose not to. Second, it is the demarcation of Earth from space that matters; all other boundaries and features are subordinated. Blue or silver against black, the spherical shape possesses a thoroughly monumental quality. Third, the image makes the Earth seem small, a feat that Sachs argues calls forth contradictory sentiments of stewardship (it needs our care) and aggrandizement (we can manage it). Fourth, the view is synoptic, providing spurs to systemic thinking and undermining, Sachs suggests, progressive ideals associated with ideas of frontiers still ahead. Finally, quoting Susan Sontag (1977), Sachs suggests that imaging the Earth produces a probing, measuring, and instrumental response to it, because there is no longer anything about it that should not be seen and recorded.

Themes of the planet's small size and the systematicity of its environmental dynamics, along with ideas of management and control, were already circulating in the environmental discourses of the 1960s, before the production of the Earth as a modern icon. These discussions provide some support for the view that the Apollo images brought about something of a change in consciousness. Particularly interesting is the image of "Spaceship Earth," coined by the inventor and engineer R. Buckminster

Fuller, who imagined the planet as a beautifully designed spacecraft lacking only an intelligible operating manual, a gap he promptly proceeded to rectify (Fuller 1969). It was a catchy idea, but it took on very different connotations in other people's minds. The economist Kenneth Boulding read it as a sign that an economy of unbounded consumption would have to give way to a new "spaceman economy," marked by constraints and concern for future generations (Boulding 1966). Adlai Stevenson, in a speech at the United Nations shortly before his death, gave the notion a characteristically normative spin, Lincolnesque in its portrayal of socioeconomic inequality:

We travel together, passengers on a little spaceship, dependent on its vulnerable resources of air and soil; all committed for our safety to its security and peace; preserved from annihilation only by the care, the work, and I will say, the love we give our fragile craft. We cannot maintain it half fortunate, half miserable, half confident, half despairing, half slave—to the ancient enemies of man—half free in the liberation of resources undreamed of until this day. (Stevenson 1972, volume 8, p. 828)

Before the end of the decade, the distinguished environmentalist René Dubos, both alone and as co-author with Barbara Ward, had also picked up on the image of humanity on Spaceship Earth (Dubos 1970; Ward and Dubos 1972). But in Dubos's writing the metaphor became identified with caution and humility rather than management. While admitting a place for human agency, Dubos represented the human condition as dire, threatened, and likely to be overtaken by events unless there was a fundamental reorientation in the uses of human science and reason. If Fuller's spaceship had a rational human hand confidently at the helm, Dubos's craft was under far less competent control. It was headed for virtually certain ruin under scenarios that would soon be modeled, but also heavily critiqued, by the first great classic of world modeling, the Club of Rome's commissioned study *Limits to Growth* (Meadows et al. 1972).

In all these accounts of the Earth in space, humanity occupies a place, although an ambiguous one. Human overconsumption may be polluting land and water, human cities be fostering violence and anomie, and human carelessness be exacerbating the gaps between rich and poor. But the Spaceship Earth of the 1960s is still a vehicle with direction and forward thrust, guided by energetic, well-informed operators toward brighter destinations than the bleak ones foretold by predictive models. In Sachs's iconography of the 1990s, by contrast, planet Earth hangs isolated in space,

blue, beautiful, and infinitely remote from human intervention. Humanity, in turn, is reduced to the status of detached observer, situated outside and at a great distance from the silent representation of its own abode, rather than in the control room of a throbbing machine, at the nerve center of thought and action.

Earthly Knowledge: The Sciences of Earth

Just as cartographers and cosmologists began to "see" Earth from space long before there were technological means for physically situating themselves at external points of vision, so scientific efforts to comprehend global phenomena were well underway before the capacity existed to collect and record data on a global scale. Large-scale understandings of natural phenomena can be built up in several ways: through the compilation of discrete, site-specific observations, collected into maps or charts and, now, computerized databases; through instruments that can observe phenomena on scales beyond the reach of individual recorders; and through computerized modeling and simulation that aggregate data and build scenarios of possible future events. The first approach relies on social coordination to achieve results that are taken over by machines and instruments in the latter approaches. Historically, that is how global modeling of the environment began, but the process has changed.

One important effort was the International Geophysical Year (IGY), spanning 1957 and 1958. The project allowed scientists from various parts of the world to participate in coordinated efforts to observe various geophysical phenomena on a global scale. Modeled on the International Polar Years of 1882-83 and 1932-33, IGY began with 46 participating countries and ended with 67. Two years before the beginning of IGY, in the summer of 1955, both the United States and the Soviet Union announced that they would launch a scientific satellite during IGY. One source close to the US space program observes that no one took the Soviet plan seriously or believed that the USSR would be the first to reach the goal. That complacency made the launch of Sputnik all the more dismaying when it happened. (See comments of Glen P. Wilson, *NASA 1998*, p. 49).

By the 1960s, computing power had grown, and mathematical techniques for modeling all kinds of complex phenomena were on the rise (Kwa 1994). Side by side with the production of the Earth as a new polit-

ical space, scientific characterizations of environmental change also went from local or regional to global, and in some cases back again (Miller and Edwards 2001). These transformations have had many noteworthy consequences for the nature of scientific work, the building of institutions, and the framing of policy responses.

For the earth sciences, the availability of new instruments, sometimes energetically propagated by government agencies, altered fundamental theoretical framings and methodological approaches. One field particularly affected by satellite-based imaging techniques was Northern ecosystems ecology, whose practitioners turned increasingly from close investigation of small plots of land and specific types of vegetation to using remote sensing as a tool for looking at global change. In this process, ecology became more interdisciplinary and useful, because its findings were needed by climatologists and oceanographers for purposes of predicting the impacts of climate change. Yet this is a field that does not "scale up" so easily, since knowledge gained from one type of ecosystem does not necessarily allow for more general claims-making at larger scales (Kwa, forthcoming). It is as if the process of seeing the Earth whole produced pressures on ecology to generate a kind of "legibility" (Scott 1998) that the field could deliver only at the cost of losing the local specificity associated with its earlier disciplinary traditions.

Producing facts on a planetary scale requires not only scientific instruments and work, but also institutions capable of interpreting and disseminating knowledge. The IGY and the more ambitious International Geosphere-Biosphere Program (IGBP), begun in 1986, are examples of social technologies developed by global change scientists to record the Earth at such a scale. Other institutions, too, arose to produce simulations and statistics about the Earth that could more readily serve as a basis for global policy. These bodies straddle the worlds of science and governance by hybridizing knowledge and power. For example, the Intergovernmental Panel on Climate Change (IPCC) added an important layer of support to the global framing of environmental change through its periodic assessments of the nature, impacts, and policy implications of climate change. These assessments also provided a framework within which the conceptual underpinnings of global environmentalism (e.g., sustainability, equity, vulnerability) were given a newly "scientific" reading.

No Other Worlds? A Southern Perspective

If global environmentalism since the 1960s has been achieved through certain kinds of erasure—the elimination of people, places, and political boundaries—the spread of this framing has not been uniform by any means. Representing the environment in many quarters of the world involves bringing places back in, along with the people who inhabit them, their communities, their lifestyles, and not least their histories and memories. A brief contrasting case of visualizing and modeling the environment, from India, helps make this point.

Down to Earth

The Centre for Science and Environment (CSE), one of India's most prominent environmental organizations, has been occupied since the mid 1970s with trying to raise the nation's environmental awareness. CSE has also emerged as a leading Indian voice on global environmental change (Agarwal et al. 1999). Its representatives are involved in shaping not only the Indian government's position on many topics, but also those of the G77, the group of "Southern" or "developing" nations that has formed a relatively stable negotiating bloc on issues from climate change to biodiversity.

CSE's representational strategies are, for the most part, resolutely place-based, and they combine the visual, the normative, and the discursive modes in quite different ways from those adopted in the United States. Elements of CSE's approach emerged in 1991, when the organization's leaders Anil Agarwal and Sunita Narain issued a slim report entitled *Global Warming in an Unequal World* (Agarwal and Narain 1991). In it, they argued that the basis on which Northern nations were allocating responsibility for greenhouse gas emissions was fundamentally flawed because it failed to deal with history and equity. History, in the Indian context, meant colonialism and its aftermath. According to many Indian intellectuals, colonialism did not end with the formal handing over of the symbols of power at the moment of national independence. Rather, the forces of hegemony persist as former colonizers continually reassert their power to shape Indian circumstances through multiple, invisible pathways. The global environment, Agarwal and Narain argued, is one site where

these rituals of dominance are being reenacted; they translated their claim into discourses, images, and action.

At the discursive level, CSE and its allies not only deploy overtly polemical language, such as "environmental colonialism," but also, more interestingly, a variety of hybrid concepts that purposefully blur the line between facts and values or that between science and equity. In their global warming report, for example, Agarwal and Narain rejected the proposition that greenhouse gases should be accounted for in the same way regardless of their sources and origins. Instead, they proposed to divide the basket of greenhouse gases into "subsistence emissions" and "luxury emissions": the former generated by the poor to meet their basic needs, the latter produced through the needless consumption of the wealthy.

Images used by Indian activists have consistently sought to depict environmental degradation as a problem of the poor. One ghastly CSE cartoon shows a dying African child lying close up to its mother. "Mummy," the caption reads, "I wish we were whales." Another widely disseminated image, used on the cover of CSE's global warming report, shows a large man in a Hawaiian shirt and sunglasses, an obvious American, pulling up in a smoke-belching pick-up truck beside a small, skinny figure with an axe, standing beside a tree with a donkey at his side. The man from the developed world calls out, "Yo! Amigo!! We need that tree to protect us from the greenhouse effect!"³ These images intertwine with action. CSE and other activists have mobilized Indian environmental law to draw the boundary between humans and nature differently from US law in numerous ways, recognizing for instance that urban environments need legal protection as much as wildernesses or endangered species; access to clean water for a pavement dweller in Mumbai could be, from this perspective, an essential environmental right.

In this political context, what becomes of Planet Earth? Even when Indian environmentalists represent the whole Earth, it is not the space-age icon, Carl Sagan's "pale blue dot," that occupies their imagination. Rather, it is an altogether more ancient and mundane representation, the globe not the planet, recognizable most often from the circles of latitude and longitude that are clearly inscribed on its spherical form. Often, too, the signs of human habitation, such as houses and trees, remain very much part of cartoon representations. To the extent that there is an image whose deployment signals India's particular environmental predicament, it is significantly

not the Earth of Apollo 17. It is the picture of the Earth in drought, the land as it looks before the life-giving monsoon, cracked and parched, a place where nothing grows. It is one of the images that CSE selected for the millennial cover of its appropriately named journal, *Down to Earth*. It gave its name to a book on Indian environmental history, *This Fissured Land* (1992), by two of the country's foremost environmentalists, Madhav Gadgil and Ramachandra Guha.

Gadgil and Guha are Western-trained, cosmopolitan scientists, fully conversant with recent trends in ecology and in the social and human sciences. Yet they have interpreted the post-space age environmental order differently from the global ecologists participating in the climate change program. Instead of taking the globe image as the dwelling place of a single, faceless "humanity," Gadgil and Guha emphasize three radically different social orders that persist in the era of globalism. More than half of India's huge population, a group they characterize as "ecosystem people," live today without any of the benefits of globalization. They "must scratch the earth and hope for rains in order to grow their own food, must gather wood or dung to cook it, must build their own huts with bamboo or sticks of sorghum dabbled with mud and must try to keep out mosquitoes by engulfing them with smoke from the cooking hearth. Such people depend on the natural environments of their own locality to meet most of their material needs." (Gadgil and Guha 1995, p. 3) Only one-sixth of India's people belong to the same class as the bulk of those in the North, reaping the material and social rewards of globalization; the rest are displaced, as ecological refugees.

This threefold classification of India's human ecology, with its hybrid scientific and normative categories, challenges the epistemology of Western global environmentalism in interesting ways. Let us note only the most significant of these. Whereas Western globalism has sought to override old categories of social analysis with new terms (e.g., sustainability, vulnerability, security), and sought to make them scientifically meaningful, Gadgil and Guha suggest that ancient ills of poverty and class persist in a country like India, perhaps exacerbated by the new global affiliations of the twenty-first century. The former tradition produces a global ontology by making people either fungible or invisible; the latter produces legibility by reinvesting ecological categories with humanistic and normative content.

Conclusion

In a secular, multicultural age, the image of Earth is the nearest thing we have to an icon, a universal common property with shared meaning and, for many, spiritual resonance. It has been appropriated by environmentalists as *their* image. At the same time, it is an image which, as I have tried to show, sets up an unresolved dialectic between those who wish to approach environmental problems on a global scale, with gaze averted from the particularities of culture or place, and those who believe that the work of saving the planet must begin with more down-to-earth considerations, in the realities of lived experience, with questions about the kinds of lives people want to forge for themselves, their communities, and their descendants.

These contradictory pulls should not astonish us. Although the image may have attained universal currency, the means of producing and reproducing it, as well as the ability to translate the mandate to "think globally" into science and action, are unequally distributed around the world. The space-based view of Earth remains a uniquely American achievement, born of a conjunction of wealth, pride, and insecurity, and a culture of separating science from values, not shared by most other nations. The image's meanings are secured, I have suggested, through multiple iterations of interpretive practice, both scientific and social. When people from other countries and cultures look at the Earth, unsurprisingly they do not perceive it in the same way.

Where then should we look for collective solutions to earthly problems? Nearly 500 years ago, John Donne wrestled with the right place to seek for atonement. The seventh of his Holy Sonnets begins with the magnificent line, "At the round earths imagin'd corners, blow your trumpets, Angels." Immediately, we are back on the pages of Cellarius, with the image of Earth in its roundness fitted within the four corners of the printed page, rich with angels, cherubs, and figures invoking the order of the pre-modern, Copernican world. But although Donne contemplates the rising up of "numberless infinities of soules" to see God, he turns back to earth for his personal work of salvation: "... here on this lowly ground, teach me how to repent." The growth of interest in local knowledge and local environmental action today suggests that much of the rest of the world is inviting the United States (and perhaps the North more generally) to supplement its detached planetary gaze, and the global sciences of sustainability that it has

usefully fostered, with a more situated, historical, and ethical understanding of human-nature relationships. Can today's environmental globalists meet the rest of the world halfway without catering to the sometimes divisive selfishness of local particularism? Sustainability in the twenty-first century will depend on finding ways.

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Notes

1. Shakespeare's Hamlet was Anderson's intellectual precursor. Hamlet speculated on the enigma of sacrifice for a national project when contrasting his own indecision with the decisiveness of Fortinbras. The followers of Fortinbras, Hamlet mused, were ready to die for a nothing, a plot of land not large enough to hold the tombs of the dead, and all for "a fantasy and trick of fame."
2. The association with Cold War politics gave the image wider currency. The same projection appears as a logo on publications of Harvard University's Belfer Center for Science and International Affairs. Created in the 1960s during a period of intense bipolar politics, this security studies group developed its geopolitical imagination in ways congruent with looking down on Earth from the North Pole.
3. Created in 1989 by Scott Willis of the *San Jose Mercury News*, this cartoon has entered the lexicon of global environmental images. It is reproduced in *Managing Planet Earth* (Freeman 1990).

References

- Agarwal, Anil, and Sunita Narain. 1991. *Global Warming in an Unequal World*. New Delhi: Centre for Science and Environment.
- Agarwal, Anil, Sunita Narain, and Anju Sharma. 1999. *Green Politics*. New Delhi: Centre for Science and Environment.
- Anderson, Benedict. 1991 [1983]. *Imagined Communities*. Revised and expanded second edition. Verso.
- Baldwin, Hanson W. 1947. *The Price of Power*. Harper.
- Bloor, David. 1976. *Knowledge and Social Imagery*. University of Chicago Press.

- Boulding, Kenneth E. 1966. "The Economics of the Coming Spaceship Earth." In *Environmental Quality in a Growing Economy*, ed. H. Jarrett. Johns Hopkins University Press.
- Breyer, Stephen. 1993. *Breaking the Vicious Circle: Toward Effective Risk Regulation*. Harvard University Press.
- Carson, Rachel. 1962. *Silent Spring*. Houghton Mifflin.
- Cellarius, Andreas. 1660. *Harmonia Macrocosmica*. Amsterdam: Johannes Janssonius.
- Chaikin, Andrew. 1994. *A Man on the Moon*. Viking.
- Dubos, René. 1970. *Reason Awake: Science for Man*. Columbia University Press.
- Fleck, Ludwik. 1979 [1935]. *Genesis and Development of a Scientific Fact*. University of Chicago Press.
- Fuller, R. Buckminster. 1969. *Operating Manual for Spaceship Earth*. Southern Illinois University Press.
- Fussell, Paul. 1975. *The Great War and Modern Memory*. Oxford University Press.
- Gadgil, Madhav, and Ramachandra Guha. 1992. *This Fissured Land: An Ecological History of India*. Oxford University Press.
- Gadgil, Madhav, and Ramachandra Guha. 1995. *The Use and Abuse of Nature in Contemporary India*. Routledge.
- Gieryn, Thomas F. 1999. *Cultural Boundaries of Science: Credibility on the Line*. University of Chicago Press.
- Gross, Paul R., and Norman Levitt. 1994. *Higher Superstition: The Academic Left and Its Quarrels with Science*. Johns Hopkins University Press.
- Guha, Ranajit, and Gayatri Spivak, ed. 1988. *Selected Subaltern Studies*. Oxford University Press.
- Haas, Peter M. 1990. *Saving the Mediterranean: The Politics of International Environmental Cooperation*. Columbia University Press.
- Haas, Peter M., ed. 1992. *Power, Knowledge, and International Policy Coordination. International Organization* 46.
- Hajer, Maarten A. 1995. *The Politics of Environmental Discourse*. Clarendon.
- Jasanoff, Sheila. 1996. "Science and Norms in International Environmental Regimes." In *Earthly Goods*, ed. F. Hampson and J. Reppy. Cornell University Press.
- Jasanoff, Sheila. 2001. "Image and Imagination: The Formation of Global Environmental Consciousness." In *Changing the Atmosphere*, ed. P. Edwards and C. Miller. MIT Press.
- Jasanoff, Sheila. 2003. "In a Constitutional Moment: Science and Social Order at the Millennium." In *Social Studies of Science and Technology*, ed. B. Joerges and H. Nowotny. Kluwer.
- Jasanoff, Sheila, Gerald Markle, James Petersen, and Trevor Pinch, eds. 1995. *Handbook of Science and Technology Studies*. Sage.

- Keck, Margaret E., and Kathryn Sikkink. 1998. *Activists Beyond Borders: Advocacy Network in International Politics*. Cornell University Press.
- Kelman, Mark. 1987. *A Guide to Critical Legal Studies*. Harvard University Press.
- Kingdon, John W. 1984. *Agendas, Alternatives, and Public Policies*. Little, Brown.
- Kitcher, Philip. 2001. *Science, Truth, and Democracy*. Oxford University Press.
- Kuhn, Thomas. 1962. *The Structure of Scientific Revolutions*. University of Chicago Press.
- Kwa, Chunglin. 1994. "Modelling Technologies of Control." *Science as Culture* 4, no. 20: 363-391.
- Kwa, Chunglin. Forthcoming. "Local Ecologies and Global Science: Discourses and Strategies of the IGBR."
- Litfin, Karen T. 1994. *Ozone Discourses: Science and Politics in Global Environmental Cooperation*. Columbia University Press.
- Meadows, Donella H., et al. 1972. *The Limits to Growth*. Universe Books.
- Miller, Clark, and Paul Edwards, eds. 2001. *Changing the Atmosphere: Expert Knowledge and Environmental Governance*. MIT Press.
- National Aeronautics and Space Administration. 1998. *Legislative Origins of the National Aeronautics and Space Act of 1958*. Monographs in Aerospace History No. 8.
- Ogburn, William Fielding. 1923. *Social Change with Respect to Culture and Original Nature*. Huebsch.
- Sabatier, Paul A. 1999. *Theories of the Policy Process*. Westview.
- Sachs, Wolfgang. 1999. *Planet Dialectics: Explorations in Environment and Development*. Fernwood.
- Sagan, Carl. 1994. *The Pale Blue Dot: A Vision of the Human Future in Space*. Random House.
- Said, Edward. 1978. *Orientalism*. Pantheon.
- Scott, James C. 1998. *Seeing Like a State*. Yale University Press.
- Shapin, Steven. 1994. *A Social History of Truth*. University of Chicago Press.
- Smith, Merritt Roe, and Leo Marx, eds. 1994. *Does Technology Drive History?* MIT Press.
- Sontag, Susan. 1977. *On Photography*. Farrar, Straus and Giroux.
- Stevenson, Adlai. 1972. *The Papers of Adlai E. Stevenson*, volume 8, ed. W. Johnson. Little, Brown.
- Ward, Barbara. 1966. *Spaceship Earth*. Columbia University Press.
- Ward, Barbara, and René Dubos. 1972. *Only One Earth: The Care and Maintenance of a Small Planet*. Norton.
- World Commission on Environment and Development. 1987. *Our Common Future*. Oxford University Press.

I Knowing and Ruling