A New Climate for Society

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Abstract
This article argues that climate change produces discordances in established ways of understanding the human place in nature, and so offers unique challenges and opportunities for the interpretive social sciences. Scientific assessments such as those of the Intergovernmental Panel on Climate Change helped establish climate change as a global phenomenon, but in the process they detached knowledge from meaning. Climate facts arise from impersonal observation whereas meanings emerge from embedded experience. Climate science thus cuts against the grain of common sense and undermines existing social institutions and ethical commitments at four levels: communal, political, spatial and temporal. The article explores the tensions that arise when the impersonal, apolitical and universal imaginary of climate change projected by science comes into conflict with the subjective, situated and normative imaginations of human actors engaging with nature. It points to current environmental debates in which a reintegration of scientific representations of the climate with social responses to those representations is taking place. It suggests how the interpretive social sciences can foster a more complex understanding of humanity's climate predicament. An important aim of this analysis is to offer a framework in which to think about the human and the social in a climate that seems to render obsolete important prior categories of solidarity and experience.

Key words
climate change ■ civic epistemology ■ co-production ■ environment ■ interpretive social science

If we had a keen vision and feeling of all ordinary human life, it would be like hearing the grass grow and the squirrel's heart beat, and we should die of that roar which lies on the other side of silence. As it is, the quickest of us walk about well wadded with stupidity. (George Eliot, *Middlemarch*)

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IF THE novelist's mission is to celebrate the specificity of 'all ordinary human life', science's mission has been to transcend it. In *Middlemarch*, George Eliot raised a young woman's marital mistakes to the level of universal truth through a thick description of her emotional and spiritual existence. Dorothea Brooke is the triumphant portrait of an 'insignificant' woman whose ardent nature 'spent itself in channels which had no great name on the earth'. Recounting Dorothea's life in casual generalities, as a statistician might, makes it colorless and empty of meaning: 'she was spoken of to a younger generation as a fine girl who married a sickly clergyman old enough to be her father, and in a little more than a year after his death gave up her estate to marry his cousin – young enough to have been his son'. Abstracted in this way, Dorothea risks being dismissed as a two-dimensional creature of little morality and no depth who could not have been 'a nice woman'. To see her whole, with the moral force of a latter-day Antigone or St Theresa, Eliot gives us recourse to the fine-grained detail of Dorothea's personal trials and tragedies. Only through her hesitant, self-denying accommodations with less noble characters in her life – the cold and jealous Casaubon, the impecunious enthusiast Ladislaw, the disappointed idealist Lydgate, and the unbearably light Celia Brooke and Rosamond Vincy – does Dorothea come into her own as a fully formed human being, a quiet yet heroic everywoman whose effect 'on those around her was incalculably diffusive' (Eliot, 1956: 612–13).

Abstraction, by contrast, is the method by which modern science achieves its universality and heft. Science wrenches phenomena out of their specific contexts, makes parts meaningful independently of wholes, and recombines segments in ways that transgress boundaries fixed by law, custom, tradition or institutional practice. Science creates entities – the periodic table of chemical elements, the nitrogen cycle, blood pressure, the metric system, biodiversity, the ozone hole – that reflect no one's unmediated observations of the world and yet are recognized and accepted as real. It is this very capacity to make ideas and objects that travel, spilling over the limits of lived experience, that students of the scientific enterprise have taken as the foundation of science's special cognitive authority.

Science, on the conventional account, faithfully mirrored nature and thereby underwrote shared human understandings of how the world works. In the newer version, historically excavated and ethnographically observed by a generation of scholars, science *represents* rather than mirrors reality (Hackett et al., 2007; Jasanoff et al., 1995). It may do so with utmost honesty and care, but science's products are at best images of real things, and much work has to be done to make the representations look as if they are the right ways of characterizing the world. That work tends to erase specificity and remove traces of the human mind and hand: all the moorings that tie scientific claims to local, subjective and contingent circumstances are cut loose so that claims may float freely and persuade people as objective facts (Daston and Galison, 2007; Latour, 1990). Inevitably, the process of making things impersonal eliminates not only subjectivity but also meaning;

scientific facts arise out of detached observation whereas meaning emerges from embedded experience. Science's erasures of local specificity, similar in many respects to the knowledge dynamics that accompanied the emergence of 'state' and 'society' as analytic categories in the 19th century (Skocpol and Rueschemeyer, 1996),[1] are an important source of the conflicts that have arisen around climate change – which many see as *the* pressing problem for humanity in our era.

This article reflects on the nature and implications of the pull between abstraction and specificity, objectivity and subjectivity, in representations of climate change. It shows how those polarities come into play at four levels of conceptual organization: community, polity, space and time. It explores what is at stake when an impersonal, apolitical, and universal imaginary of climate change, projected and endorsed by science, takes over from the subjective, situated and normative imaginations of human actors engaging directly with nature. It points to current environmental debates in which a reintegration between global scientific representations of and local social responses to the climate are taking place; and it suggests how the interpretive social sciences can lead to a fuller understanding, if not a resolution, of humanity's climate predicament.

Scales of Knowing, Scales of Meaning

Science is not the only, nor even the primary, medium through which people experience climate. We need no warrant other than our senses and memories, supplemented by familiar recording devices such as the calendar or the gardeners' almanac, to register the vagaries of the weather, the changing of the seasons, the fertility of the soil, the migration of birds, or the predation of insects. Increasingly, however, the politics of nature occurs under the rubric of 'environment' – a domain of ideas and entities accessible only with the aid of science and technology. A scientifically untrained eye, for example, might learn to recognize the terrible wasting symptoms of cancer, but inspection alone could not show us a disease called 'environmental cancer' or an allergic condition known as 'multiple chemical sensitivity'. The environment today is replete with invisible, elusive, fearful, yet wholly 'real' entities revealed to us by science: acid rain, ozone depletion, pesticide tolerance, carrying capacity, overpopulation, species loss and, most recently, climate change. Curiously, despite the universality of science, these constructions are among the most frequent focal points of environmental controversy, a class of conflicts that barely had a name a generation ago. Why these most 'scientific' aspects of nature (things known and knowable only with the aid of science) should also be the most contested is a large part of the problem I consider in this article.

It is not a trivial problem. Most analysts of science over the past few decades have assumed science's supreme cognitive authority as a given and sought chiefly to explain its causes. For example, the eminent American sociologist Robert Merton attributed to science a constellation of virtues, or norms, that underwrite its power to persuade others. Among these was

'universalism'. Science, according to Merton (1973), is entitled to special deference precisely because it liberates the truths of nature from particular social and cultural settings. While rejecting such claims of specialness (Bimber and Guston, 1995), more recent work in the social studies of science has also stressed the exceptional carrying power of scientific knowledge. This theme is paramount in the work of the French sociologist and philosopher Bruno Latour, who emphasizes the complex 'translations' effected by knowledge-making practices. In an influential essay, Latour (1990: 25–6) argued that a key to the success of science is its capacity to produce 'immutable mobiles', representations that are simultaneously '*immutable*, *presentable*, *readable* and *combinable* with one another.' Scientific facts accordingly look the same, he said, whether the users and consumers of those objects happen to exist peripherally on the remote Pacific island of Sakhalin or centrally in the resplendent court of Louis XVI at Versailles. Indeed, Latour would have us see the objects and categories that constitute our political and social life, such as capital or interests or class or law, as products of writing and craftsmanship similar to those with which science creates its boundary-spanning images of nature (see also Latour, 1987; Latour and Woolgar, 1986; and, questioning the idea of strict immutability, Mol and Law, 1994).

My argument here rests on a more modest and grounded view of environmental knowledge. Representations of the natural world attain stability and persuasive power, in my view, not through forcible detachment from context, but through constant, mutually sustaining interactions between our senses of the *is* and the *ought*: of how things are and how they should be. The epistemic claims of environmental science are most trusted when they engage with practices that confer normative authority – not only scientific practices such as peer review (Merton's 'organized skepticism') but also the cultural practices of democratic politics and the law. Climate change, on this account, is problematic because it tends to separate the epistemic from the normative, divorcing is from ought. Crudely put, it detaches global fact from local value, projecting a new, totalizing image of the world as it is, without regard for the layered investments that societies have made in worlds as they wish them to be. It therefore destabilizes knowledge at the same time as it seeks to stabilize it. To know climate change as science wishes it to be known, societies must let go of their familiar, comfortable modes of living with nature.

This argument is consistent with the framework of co-production – the simultaneous making of the natural and social worlds – that has gained currency in science and technology studies in recent years (Jasanoff, 2004). Close readings of science and technology in-the-making have brought to light complex ways in which the construction of stable knowledge interpenetrates with the formation of core elements that stabilize society: identities, institutions, discourses and representations, among others. The historians Steven Shapin and Simon Schaffer put the point this way in their pathbreaking study of the disputes between Thomas Hobbes and Robert

Boyle about the experimental method in Restoration England: 'solutions to the problem of knowledge are embedded within practical solutions to the problem of social order', whereas 'different practical solutions to the problem of social order encapsulate contrasting practical solutions to the problem of knowledge' (Shapin and Schaffer, 1985: 15). In the framework of co-production, virtue in science cannot be constituted any differently from virtue in society; the two are inseparable, cut from the same cultural cloth, and seamed with the same ethical and political understandings.

The facts produced by the early English experimental scientists, as Shapin and Schaffer relate, could be democratized in a sense because they were *represented* as facts – through new material, literary and social practices – to 'virtual witnesses' who had never entered Boyle's laboratory or handled his air pump, but who came to believe in the truth of what he had demonstrated. For contemporary builders of climate reality, the corresponding work of making robust and credible representations for a global polity has only just begun. If climate change is to have a compelling global meaning, then the planetary community that needs to buy into that meaning system is still a-borning (Miller and Edwards, 2001; Jasanoff and Martello, 2004). That the climate changes is not news to communities with long histories of living with nature, but 'climate change' – the scientific phenomenon – employs techniques of aggregation and deletion, calculation and comparison that exhaust the capacities of even the most meticulously recorded communal memories. Indeed, climate change arguably displaces the very notion of community by displacing human beings, both as a species and as a source of norms, in favor of an impersonal, but naturalized, object of concern.

Climate science cuts against the grain of ordinary human experience, the basis for our social arrangements and ethical instincts, at four interrelated levels: communal, political, spatial and temporal. As the boundaries of states dissolve in the post-bipolar, globalizing world, and new civil society groups compete to represent nature on their own terms, climate change too risks dissolving and losing solidity. Politically, climate change cannot be subsumed within the knowledge-making routines of even the most scientifically advanced nation-states or validated in accordance with any single nation's sovereign administrative practices. Climate, moreover, is spatially unbounded. It is everywhere and nowhere, hence not easily accessible to imaginations rooted in specific places. And, unlike the weather, climate change occurs over spans of time that are not easily assimilated to circadian or seasonal rhythms: it is not perceptible nor provable as a day or year of human life shades into the next. By empowering new, esoteric centers of knowledge and stretching out the normal horizons of time, climate change virtually reverses the trend toward direct horizontal access and secular time that Charles Taylor (2004) takes as determinants of the modern social imaginary. These are radical shifts, and we should not be surprised if it takes decades, even centuries, to accommodate to such a revolutionary reframing of human-nature relationships.

Living creatively with climate change will require re-linking larger scales of scientific representation with smaller scales of social meaning. How, at the levels of community, polity, space and time, will scientists' impersonal knowledge of the climate be synchronized with the mundane rhythms of lived lives and the specificities of human experience? A global consensus on the meaning and urgency of climate change cannot arise on the basis of expert consensus alone – not even with the aid of impassioned proselytizers such as former US Vice President Al Gore. For all its influence in the lead-up to the 1992 Rio Earth Summit and beyond, the World Commission on Environment and Development (Brundtland Commission) missed this point when it optimistically proclaimed that a systemic, translocal and transhistorical way of knowing nature was replacing human-centered experiences of the environment (WCED, 1987: 308): '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.'

From decades of international foot-dragging on climate, we have learned that the Commission's 'not-but' logic was inadequate, if not fatally flawed. The question today is how to replace the 'not-but' dichotomy of systemic versus specific framings with the integrative logic of 'both-and': how can climate be seen both as a matter of situated 'human activity and edifice' *and* as a function of greenhouse gases mingling with the 'clouds, oceans, greenery, and soils' that pattern the Earth's inanimate face? To find our way there, we must probe more deeply the four scalar shifts that have accompanied scientific constructions of the climate. We need to see more clearly why taking climate change on board is at once a moral and an epistemic undertaking, and how this particular re-representation of nature intersects with the meaning as well as the materiality of modern existence.

Community

While preparing its report, *Our Common Future*, the Brundtland Commission held a number of hearings worldwide to elicit and incorporate global public views into its assessment. Quotations from those hearings are interspersed throughout the published text, where (without interpretation or discussion) they make tantalizing reading. A poignant intervention by a Brazilian witness reads as follows: 'You talk very little about life, you talk too much about survival. It is very important to remember that when the possibilities for life are over, the possibilities for survival start. And there are peoples here in Brazil, especially in the Amazon region, who still *live*, and these people that still live don't want to reach down to the level of survival' (WCED, 1987: 40).

What was this speaker saying to the global experts who coined the term 'sustainability' and who helped cement the view of environmental degradation as a planetary problem? Decades later, the report's readers can only guess at the meaning of a brief passage detached from context, but the

passion in the words is unmistakable, and moving. The crux is in the contrast between 'living' and 'survival': the former rich, grounded, particular to the experiences of specific peoples in identifiable places, such as the Amazon region; the latter impersonal, detached from community, indifferent to life itself. It is not hard to see here an eloquent critique of modern biopolitics, with its dispassionate statistical gaze and its tendency to simplify in order to aggregate, to a point where the essential meanings and purposes of human existence are deleted (Foucault, 1998; Scott, 1998). Policy-makers concerned with survival, this speaker from Brazil seems to say, will not be bothered by the fates of living individuals in real communities. This is why, from the standpoint of those 'who still *live*', it is a sort of demotion, a 'reaching down', to become a cipher in a calculus concerned only with the nameless, faceless challenge of planetary survival.

Polity

The co-production framework directs our attention to the political work that must be done in order to bring about an actionable consensus on scientific facts. Benedict Anderson's (1991) fruitful concept of the nation-state as an imagined community offers a useful starting point for thinking about the nature of that work. Nationhood, Anderson argued, makes no sense as a spatial construct pure and simple. It is not simply a matter of living within defined territorial boundaries: one has to factor in what makes a nation's people, its subjects and its citizens, feel themselves to be part of a single community. That self-identification, according to Anderson, is promoted and nurtured through self-conscious deployment of words and symbols by those in power, propelled by the convergent interests of capital, the media and those who rule. We, however, cannot assume that powerful images of nationhood (maps, museums, censuses) or of nature win the assent of viewing populations without their active concurrence. With postcolonial imaginations set free, and technologies of mass communication readily accessible, people can exercise far more choice in deciding whose claims to believe and which loyalties to adopt.

In the industrial West, science and politics have long collaborated to produce dominant understandings of nature. Behind the public face of environmental science, the norm-building capacities of nation-states are continually at work, setting baseline conditions for whose knowledge counts and when knowledge is sufficient for action. How does climate change resonate with or disrupt that work of politically mediated co-production?

The methods by which governmental bodies assess the validity and weight of environmental knowledge, define and manage uncertainty, or resolve disputes about data and evidence show much consistency within nation-states, though they vary between states. A nation's citizens are acculturated into relatively settled ways of public knowledge-making and argumentation, or what I call 'civic epistemologies' (Jasanoff, 2005a). It follows that scientific studies deemed reliable and persuasive in one country may be dismissed as inadequate for policy guidance in another, although

regulators in both are attuned to the same social, political and economic demands. The embrace of nuclear power in France or South Korea and its rejection in the United States and Germany, and the European refusal to accept American-backed guarantees of the safety of genetically modified crops, exemplify the fact that informed citizens in one democratic society may reject as insupportable risks that are deemed entirely acceptable in another (Jasanoff, 1986, 2005a; Harrison and Hoberg, 1991).

Documented cultural preferences in evidence and reasoning include Britain's reluctance in the 20th century to rely on animal data as a surrogate for assessing human health risks (Germany and the United States offer marked contrasts), and the pervasive reliance of US decision-makers on mathematical modeling as a basis for environmental standards. One can speculate about the historical origins of such systematic variations. Is it plausible, for instance, to see in the modern British predilection for common-sense, empirical proofs the continuing influence of a gentlemanly culture whose members learned to trust each other's claims of experimental demonstration (Shapin, 1994; Shapin and Schaffer, 1985)? Does mathematical modeling in America respond to a skeptical, demographically diverse culture's need for impersonal validation of the state's knowledge and reasons (Porter, 1995)? The important point here is not to resolve these questions but to note that scientific facts bearing on the global environment never take root in a neutral interpretive field; they are dropped into contexts that have already been conditioned to produce distinctive cultural responses to scientific claims.

Historically, faith in scientific institutions and their expertise was constructed in the crucible of national imagined communities, in accordance with prior commitments to reason, due process and social justice. That process entailed its own frictions (Skocpol and Rueschemeyer, 1996). Our era of globalization, like earlier revolutionary periods, is in the process of upsetting those earlier settlements between natural knowledge and political order. In the realm of knowledge, efforts to understand natural and social processes at increasingly complex levels of aggregation are producing new, boundary-crossing scientific representations. In the realm of politics, the sovereignty of state-centered methods of validating knowledge is under challenge from new social organizations, both civic and corporate, that cut across the operational spheres of nation-states and national markets. Global institutions such as the Intergovernmental Panel on Climate Change (IPCC) have arisen to produce expert knowledge for global policy. Though 'intergovernmental' in name, the IPCC is not answerable to particular national traditions of policy legitimation. Claims about the environment and its sustainability produced by such novel bodies inevitably function as sites of contestation among competing models of knowledge-making and governance.

Space

Across the world, the origins of the environmental movement were once firmly tied to places and particulars. In the United States, place initially meant the home, as the NIMBY ('not in my backyard') movement fought to keep hazardous technologies such as nuclear power from invading the precincts of one's private property. Throughout the 1970s, people all over the world struggled to protect various bounded spaces that they regarded as safe or held dear: the backyard, the local stream or lake, the wetland or stretch of coast, the national park, the sacred hill, and even individual stands of trees. India's famed Chipko movement produced indelible images of women risking their bodies to keep precious trees from being felled. Woods were places of deep-rooted meaning that people wished to guard against invasion or permanent loss.[2] Any science that showed such treasured environments to be at risk was taken seriously, indeed according to some even over-trusted because of cognitive biases that heighten human perceptions of danger in defiance of statistically defensible probabilities (Sunstein, 2005). Whatever the explanation, people view threats with greatest alarm, and are readiest to act defensively, when the place under siege is personally valued. That is an important normative lesson of the research on managing common pool resources by Elinor Ostrom (1990) and her colleagues.

Climate change, too, can be linked to a place, but that place is the whole Earth. To be sure, shifting the scale of an environmental problem up to the global level does not necessarily entail losses of meaning or caring. Ideas of belonging and stewardship can develop on a planetary scale: the slogan 'think globally, act locally' affirms both the possibility and the promise of connecting global issues back to more personal scales of meaning. Yet, as I have discussed elsewhere, the idea of the Earth as a single place is itself contingent on particular histories of exploration and dominance. The Apollo Mission photographs of earthrise and the Earth in space, for example, were quickly taken up by the US environmental community as normative signs, both demonstrating the Earth's vulnerability, and calling on us to be responsible for it. But those evocative images were products of Cold War rivalries between the United States and the Soviet Union, and their circulation and impact were more intense in the United States than elsewhere (Jasanoff, 2001). Historical differences such as these inevitably color perceptions of climate change, raising disputed questions: who caused it, how severe is it, who will be hurt by it, who is responsible for controlling it?

Time

Climate change invites humanity to play god with time. Human eras were once thought to be momentary blips in the light of eternity: 'A thousand ages in thy sight are like an evening gone.' Now science has put within reach the capacity (or the illusion of it) to grasp in moments what would take eons to experience in real time. Computer capability unimaginable a generation ago

makes it possible to simulate in a matter of seconds what will happen, for example, to land-use and land-cover change across an entire hemisphere in a hundred years. Climate change itself is routinely plotted in graphs spanning from decades to millennia, depending on the message being communicated. Futures that can barely be grasped with the mind are given visual reality. The famous 'hockey stick' graph of global warming provided by the IPCC in its 2001 assessment report displayed changes in the Earth's mean surface temperatures over a thousand years, from 1000 CE to 2000 CE (IPCC Working Group I, 2003, Fig. 2.20).

These shifts in the representation of time have been accompanied by new modes of accounting and analysis, as well as prescriptions for behavioral change. The best known is the Brundtland Commission's injunction, implicit in the definition of sustainable development, that we should leave the Earth no worse off for future generations than the form in which we inherited it. 'Future' is an open-ended concept, stretching to infinity, whereas the scope of moral thinking is ordinarily confined to the immediate past and near-term future. The common law, for example, was reluctant to prohibit any human activity unless dangers were imminent and foreseeable, on the basis of present-day proofs; even in the era of risk societies, regulatory law tends to demand evidence of actual harm (to test animals for example) before condoning restrictions on private enterprise. Not surprisingly, Europe's insistence on the precautionary principle, rooted in the civil law tradition of precisely defining the state's responsibilities toward citizens, has clashed with US common law perspectives that focus on the remediation of empirically documented harm.

No discipline, perhaps, has grappled with the extended time scale of climate change more vigorously than economics, the field that claims to value all human transactions occurring in foreseeable time. The methodological dispute between Nicholas Stern (2005), leader of the UK government's influential review of the economics of climate change, and William Nordhaus, a leading US environmental economist, centered in part on disciplinary differences in accounting for the future costs of a changing climate. For economists, time injects uncertainty and upsets calculation to such a degree that the future must be discounted. In applying discount rates, economists allow for shifts in supply and demand, technology and governance, in short, for all of the unexpected social and material developments that impede accurate crystal ball-gazing into remote futures. As Nordhaus (2007: 201–2) says: 'In a world where capital is productive and damages are far in the future . . . the highest-return investments today are primarily in tangible, technological, and human capital.' Not knowing the costs of the future, economists prefer to invest money in known goods today. A high discount rate can be seen, from this standpoint, as freeing up current capital, as an antidote to excessive precaution, and as a riposte to the very notion of sustainability.

Discounting erases the distant future as a topic of calculable concern. Yet we see in technical debates between economists such as Stern and

Nordhaus a recognition acknowledged by sociologists of time (cf. Adam, 1998) that applying the right discount rate for climate change is itself a normative choice. When is it time to care; which times should we care about; whom should we care about in times to come? Nordhaus's (2007: 202) critique of the Stern report hovered around these points, while denying that economics should seek to prescribe how to think about them:

> Analyses are sometimes divided between the 'descriptive approach,' in which assumed discount rates should conform to actual political and economic decisions and prices, and the 'prescriptive approach,' where discount rates should conform to an ethical ideal, sometimes taken to be very low or even zero. Philosophers and economists have conducted vigorous debates about how to apply discount rates in areas as diverse as economic growth, climate change, energy, nuclear waste, major infrastructure programs, hurricane levees, and reparations for slavery.
>
> The Stern Review takes the prescriptive approach in the extreme . . .

This is classic boundary work, relegating Stern, a proponent of lower discount rates, to the company of philosophers who seek to conform to 'an ethical ideal'. Nordhaus's sympathies clearly lodge with the descriptive, empiricist, anti-futurologist imagination of low discount rates, and of economics as Nordhaus thinks it ought to be.

From Transparency to Conversation

If climate change drives sharp wedges between society's fact-making and meaning-making faculties, then the prospect of concerted action in the face of this epochal threat seems dismal indeed. But are there countervailing dynamics of reconciliation that offer hope for reconnecting what we know globally with how we wish to act locally? Can we usefully search for master keys in the lamplight of historical, sociological and cultural studies of environmental controversies? What purchase, if any, can be gained for convergences between knowledge and norms from the idea of co-production that has developed within science and technology studies?

There is a paradox in contemporary accounts of scientific fact-making that may profitably be explored further. That paradox centers on science's seeming ability to bridge distances in spite of the gap between the abstraction of scientific knowledge and the thickness of (culturally embedded) human experience (Geertz, 1973). We know that the truths uncovered by science and the useful technologies that science helps build must ultimately be received back into the humdrum rhythms of ordinary lives and experiences in order to 'work'. It is not enough to know how the hardware or the material processes of a technology came into being, nor how they operate in principle; the fit to social practices matters as much, inducing a sense of ownership and responsibility toward the smooth operation of the system in question.

When technoscientific systems radically fail to fit their contexts of use, the consequences may be disruptive, even tragic. Environmental disasters

offer poignant illustrations – for example, the 1984 chemical explosion in Bhopal, India (Jasanoff, 1997a), the 1986 Chernobyl fallout in Britain (Wynne, 1996), and the outbreak of 'mad cow disease' in Europe. In these real-world cases of post-disaster misrule, experts and the public talked past each other as pitiably, if not as artfully, as in *White Noise*, Don DeLillo's (1985) brilliant, manic story of a university community's disintegration during an 'airborne toxic event'. The British public, as I wrote at the time, experienced the news of mad cow disease jumping to humans as a form of 'civic dislocation':

> a mismatch between what governmental institutions were supposed to do for the public and what they did in reality. In the dislocated state, trust in government vanished and people looked to other institutions – the high street butcher, the restaurant, the media, the supermarket – for information and advice to restore their security. It was as if the gears of democracy had spun loose, causing citizens, at least temporarily, to disengage from the state. (Jasanoff, 1997b: 224)

It is not only in the wake of disasters that experts and society fail to find common ground. The theme of 'reflexive modernity' propounded by Ulrich Beck, Anthony Giddens, Scott Lash and others theorizes a more pervasive skepticism toward and alienation from science (Beck, 1992; Beck et al., 1994; Giddens, 1990). The very success of science – in effect, its mass uptake or popularization – has led in these analysts' view to a proliferation of the critical, self-questioning resources that were once sequestered in the laboratory, the clinic or the field test site. Possessed and deployed by many, the methods of science reflect back on themselves in late modernity, making science the unwilling target of its own methodological skepticism.[3]

Reflexive modernity, however, is a trend or tendency, localized especially in Western democracies, rather than a totalizing story about science, nature or political action. Human beings do not, after all, make a habit of questioning all the taken-for-granted assumptions that undergird their daily existence. Harold Garfinkel's (1967) social experiments showed that trust, not distrust, pervades society and that challenging trusting relations too directly may be risky for social cohesion (see also Shapin and Schaffer, 1985: 6). Unbounded skepticism about every proffered fact fractures one's security and sense of self just as surely as would, in George Eliot's universe of sympathetic perception, an excessively 'keen vision and feeling of all ordinary human life'; in either case, one would die 'of that roar which lies on the other side of silence' (Eliot, 1956: 144).

Trust, and its partner credibility, then, are part of the armor that modernity makes us put on against potentially limitless deconstructions of self and society (Shapin, 1994). But how do we drifters in the alien seas of climate change know which claims to trust, whose assessments to build on, and when to let doubt run rampant? How can we recognize the lifeboats and rescue parties of true knowledge and robust prediction when they arrive from beyond the horizons of known institutions and cultures? Above all, how

can human communities restore local, particular and actionable meaning to a phenomenon that repeatedly slips out of the conventional boundaries of sense-making?

One frequent answer is transparency. Though most social analysts see transparency as socially constituted, conforming to a given society's expectations of what it means to be visible, it is still regarded as an essential factor in securing belief and trust. Actors in experimental spaces, for example, project transparency to distant 'virtual witnesses' with the aid of literary, material, and social technologies.[4] In modern environmental science, however, the hegemony of laboratories over matters of fact is attenuated, and the relations between creators and users of knowledge have become complex and recursive. Experimentation itself is no longer restricted to spaces that scientists control; conversely, scientific experiments routinely spill into society, as when genetically modified crops with untested ecological properties are released into the environment. The boundaries among scientists, citizens, and even natural objects have become fluid and indeterminate (Haraway, 1991; Latour, 1993; Star and Griesemer, 1989). All of the heterogeneous components in a knowledge network participate in varying ways in the production and uptake of environmental knowledge, necessitating continual interchange between epistemic, social and ethical sense-making (Shapin, 1995). Not surprisingly, then, the points of disjuncture identified above – community, polity, space and time – have also become sites of renewed debate, turning matters of fact into topics of conversation.

But how can anyone speak meaningfully, let alone act with confidence, with respect to a nature that is hybrid, fluid, contingent and endlessly deconstructible? In a collection of essays devoted to rethinking nature in modernity, the environmental historian William Cronon (1995: 25) crisply captured the dilemma:

> The work of literary scholars, anthropologists, cultural historians, and critical theorists over the past several decades has yielded abundant evidence that 'nature' is not nearly so natural as it seems. Instead, it is a profoundly human construction. This is not to say that the nonhuman world is somehow unreal or a mere figment of our imaginations – far from it. But the way we describe and understand that world is so entangled with our own values and assumptions that the two can never be fully separated. What we mean when we use the word 'nature' says as much about ourselves as about the things we label with that word.

Unlike literary and artistic works of human creativity, however, nature does not manifest itself in infinitely varied forms across human societies. Its plasticity is limited. Instead of splintering indefinitely, interpretations fall into a few broadly defined camps. Epistemic communities, united by common perceptions of what counts as natural *and* what should be done to protect nature, do form across divisive social and political lines (Haas, 1990). I conclude with a few examples of conversations currently in progress

that may help reintegrate global knowing with local meaning around the contested, changing climate.

Bridging Scales

One strand of that conversation concerns membership in the moral community whose environmental fates we should care about. Transboundary movements of persons, non-human entities and commodities have rendered rigidly place-based justifications for caring about others increasingly difficult to sustain. Indicative of a new mood of expanded stewardship is the rising visibility of non-human actors as participants with us in the grand planetary journey. An early sign of this extension of caring, written just three years after the passage of the landmark US National Environmental Policy Act in 1969, was the legal scholar Christopher Stone's 1972 essay 'Should Trees Have Standing?' Here, Stone argued that entities such as forests, oceans, and rivers, along with 'the natural environment as a whole', should be granted legal rights similar to those of any human being. Such rights, he suggested, could be represented in court by legal guardians, much as lawyers represent the rights of other silent subjects such as corporations, municipalities or mental incompetents. To the objection that it might be difficult to determine the 'needs' of natural objects, Stone (1974: 24) responded:

> . . . natural objects *can* communicate their wants (needs) to us, and in ways that are not terribly ambiguous. I am sure I can judge with more certainty and meaningfulness whether and when my lawn wants (needs) water, than the Attorney General can judge whether and when the United States wants (needs) to take an appeal from an adverse judgment by a lower court. The lawn tells me by a certain dryness of the blades and soil – immediately obvious to the touch – the appearance of bald spots, yellowing, and a lack of springiness after being walked on; how does 'the United States' communicate to the Attorney General?

Widely admired for its moral clarity, Stone's essay failed in its instrumental purpose. Federal courts did liberalize the concept of standing for a time, so that public interest groups could assert aesthetic and recreational as well as economic interests in preserving nature. However, the notion of rights for natural objects proved too strange (unnatural?) for courts to take up. Instead, people debated whether and how natural objects might be *valued*, and so relegated questions of responsibility to the domain of environmental ethics.

Today, a generation later, the moral relationship of human beings to other members of a shared environmental community is again a subject of intense, though fragmented, conversation. Bruno Latour's provocative call to admit things into the politics of nature can be taken as a recasting of Stone's legal language into the contemporary discourse of science studies, and as itself a sign of blurring ontological categories as nature morphs into environment (Latour, 2004). But ontological questioning is also taking place beyond the reflections of academics. In 2008, for example, the constitution

of Ecuador gave nature the 'right to exist, persist, maintain and regenerate its vital cycles, structure, functions and its processes in evolution'. Constitutional rights to life for animals have been recognized in several countries, including Spain and Germany. The Indian constitution, one of the few in the world to offer explicit recognition to environmental values, directs the state 'to protect and improve the environment and to safeguard the forests and wildlife of the country'; correspondingly, each citizen of India has a fundamental duty 'to protect and improve the natural environment including forests, lakes, rivers and wild life, and to have compassion for living creatures'. The interpretation and implementation of such principles, as well as their long-term harmonization, will follow trajectories we cannot yet foresee, but they represent self-conscious efforts to redefine the very meaning of the moral community in the face of paradigmatic environmental change.

At the political level, global environmental governance is generating new concepts of citizenship (Jasanoff, 2005b). Given the increases in cross-border political activity around the environment, this is not surprising. As of late 2009, the web-based Environmental Treaties and Resource Indicators recorded 464 international agreements dealing with the environment. Each entails its own political practices, addressing issues of voice and representation, expertise, and dispute resolution. Harder to pin down, but perhaps more significant in the long run, is the bottom-up role of citizens and non-governmental organizations in shaping the direction of transnational policies – introducing preferences and demands that may get washed out in formal, state-to-state negotiations, such as the disappointing Copenhagen climate conference of late 2009. In historical hindsight, the 1992 Rio Earth Summit may be remembered as a watershed moment when a global social movement began forming around climate change and other planetary environmental problems. But equally noteworthy are more localized attempts to repossess the global, as for example when, in 2005, the Inuk activist and chair of the Inuit Circumpolar Conference, Sheila Watt-Cloutier, filed a petition with the Inter-American Commission on Human Rights on behalf of herself and 62 other named plaintiffs, claiming relief for global warming caused by the United States. A similar impetus to assert bottom-up citizenship in planetary matters was at play when 12 states and several cities of the United States, led by Massachusetts, filed a successful lawsuit against the Environmental Protection Agency for failure to address greenhouse gases as a pollutant under the federal Clean Air Act.[5]

Similar attempts to restore local voices and experiences to the distanced discourse of climate change are apparent on the dimensions of space and time. Marybeth Long Martello and I (Jasanoff and Martello, 2004), for example, noted the dense interaction of global and local subjectivities, through the formation of new regional affiliations and identities superimposed on existing territorial divisions. Island nations at risk from rising sea levels sought unity and political strength by uniting as a single imagined community: the Association of Small Island States. And in April

2009, Inuit leaders from Alaska, Canada, Greenland, and Russia launched a Declaration on Arctic Sovereignty, basing their action on millennia of shared occupancy and knowledge of the circumpolar region, which they called 'our home'. As if taking a page from Anderson, the declaration stressed the Inuit people's imagined unity across existing state boundaries. The impetus toward unification, however, came not through state-controlled instruments of nation-building, such as newspapers or the census, but from a sense of cultural identity fostered by a shared vulnerability to climate change.

Time is more elusive than place as a locator of identity, but temporality, too, has entered the new discourses of meaning-making unleashed by the climate threat. Perhaps the clearest consequence is a problematizing of 'the present' in relation to both past and future – visible even in the economists' quarrel between Stern and Nordhaus. Of great interest from a normative and political standpoint is an unresolved debate that emerged around the morality of fixing the value of carbon in the present, through market-regulatory mechanisms such as capping and trading. In 1991, in a monograph entitled *Global Warming in an Unequal World*, two influential Indian environmentalists, Sunita Narain and the late Anil Agarwal, argued powerfully for a normatively inflected, historically aware valuation of carbon emissions. The attempt to create a trading scheme in greenhouse gases, they noted, made the sources of carbon irrelevant, in effect, erasing the historical origins of emissions. Carbon pricing, they proposed, should distinguish between subsistence and luxury emissions, the former reflecting the necessities of the poor, the latter the whims of the rich. Underlying this analysis was a sensitivity to the disparate historical trajectories, including colonialism, through which the world's consumption habits acquired their gravely unequal character. Agarwal and Narain advocated for a recalibration of value that would take account of history, with present-day economics reflecting past social injustice. Though their argument was not adopted in their terms, it has continued to resonate through the policy debate on climate change – from the 1997 Kyoto Protocol's failed attempt to distinguish between the obligations of developed and developing countries to China's efforts a decade later to recast a right to continue emitting carbon in terms of a right to develop. The emissions framing ineffectually bucked the tide of scientific opinion; the development framing, by contrast, asserts a nation's sovereign political right to imagine the future for its citizens.

Conclusion

Durable representations of the environment, I have argued, do not arise from scientific activity alone, through scientists' representations of the world as it *is*, but are sustained by shared normative and cultural understandings of the world as it *ought* to be. When it comes to nature, human societies seem to demand not only objectively claimed matters of fact but also subjectively appreciated facts that matter. Environmental knowledge achieves robustness through continual interaction – or conversation – between fact-finding and meaning-making.

The rules by which those conversations are conducted have evolved, often over very long periods of time, within the envelope of well-established, bounded communities, such as nation-states; and they are backed in most cases by accredited processes of co-producing legitimate knowledge and legitimate power. Institutional norms influence such fundamental choices as defining the boundary between nature and culture, determining who has authority to represent natural objects, and selecting the rules for resolving controversies. Much that we claim to know of the environment accordingly comes bundled up with histories of specific cultures and places. It is this tight coupling between the presumed nature of nature and the desired nature of society that the narrative of climate change has disrupted.

Climate change confronts us with facts that matter crucially to the universal human destiny but that have not passed through complex processes of social accreditation on a global scale. The institutions through which climate knowledge is produced and validated (most notably, the IPCC) have operated in largely uncharted territory, in accordance with no shared, pre-articulated commitments about the right ways to interpret or act upon nature. The resulting representations of the climate have become decoupled from most modern systems of experience and understanding. Climate change introduces scalar dislocations, as described above, in widely held prior conceptions of community, polity, space and time. On all of these dimensions, however, we see today not only civic dislocation but new conversational opportunities being actively pursued by an immense variety of actors, both local and translocal. The promise of all these exchanges is that the disrupting, troubling, yet compelling reality of climate change may eventually be better integrated into the dynamics of the world's unimaginably diverse forms of life.

Until that time comes, where does all this turbulence leave the social sciences? I have suggested that climate change, through the discordances it produces in established ways of understanding the human condition, offers unique opportunities for disciplines that mainly concern themselves with the interpretive, sense-making capacities of human societies. For legal scholarship, for example, climate change offers a site not merely to consider how enforceable obligations may be constructed around trades in greenhouse gases, but also to reflect on deeper questions of rights and responsibilities, the criteria and correlates of citizenship, and the rebuilding of constitutional norms around a threat that cuts at the foundations of all civilized societies. Returning to the tension between the situated and the statistic, the uncushioned and (in George Eliot's words) the 'well wadded with stupidity', the interpretive social sciences have a very particular role to play in relation to climate change. It is to restore to public view, and offer a framework in which to think about, the human and the social in a climate that renders obsolete important prior categories of solidarity and experience. It is to make us more aware, less comfortable, and hence more reflective about how we intervene, in word or deed, in the changing order of things.

Notes

1. Skocpol and Rueschemeyer (1996: 302–3) note that the nation-state derived power from knowledge claims that contradicted prior local understandings:

> New knowledge claims associated with social reform initiatives, especially those emanating from above, thus had to bypass and contradict both local common sense and market signals. New forms of social knowledge sought to describe and to diagnose societywide structural problems. In this they could not rely on 'naturalized' forms of decentralized intelligence, but had to build on new, specially collected information and more abstract modes of analysis. 'Artificial' by comparison to market signals and common sense, and inherently more controversial, the new types of knowledge at the same time tackled formidable vested interests associated with the information patterns of communities and markets.

I am indebted to Stève Bernardin for calling my attention to this important analogy.

2. The first environmental cause I became aware of, at Harvard in the early 1960s, was the 'save the sycamores' movement that successfully preserved trees lining the parkway along the Charles River in Cambridge from the developers' axe. James Cameron's global blockbuster *Avatar*, released in 2009, locates the nature-loving Na'vi in a gigantic, courageously defended 'Hometree', and thereby elevates tree-hugging to an ethic for a new generation of sustainability-conscious cinema-goers.

3. A vivid illustration occurred in late 2009, when climate science was engulfed in an episode dubbed 'Climategate' in analogy to the Nixon-era Watergate scandal in the United States. Triggered by the hacked disclosure of emails at the University of East Anglia, a leading center for UK climate research, the emails illustrated the dynamics of scientific controversy and consensus that STS scholars have so frequently documented. Yet the public display of scientists showing 'interests' ran sufficiently counter to the still dominant Mertonian understanding of science as a detached, disinterested activity that many commentators and observers were appalled – or else found it in their interest to appear to be so. The episode was widely regarded as a blow to years of international consensus-building on climate science.

4. Experimental knowledge, according to Shapin and Schaffer in *Leviathan and the Air-Pump*, was constituted early on as useful knowledge, directed toward solving the problems of commerce and military security. Yaron Ezrahi (1990) has argued that modern liberal democracies borrowed from experimental science both its instrumentalism and its transparency, thereby turning citizens into virtual witnesses of the state's problem-solving capability.

5. *Massachusetts v. Environmental Protection Agency*, 549 U.S. 497(2007).

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