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Law, Environment, and the “Nondismal” Social Sciences

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Abstract

Over the past 30 years, the influence of economics over the study of environmental law and policy has expanded considerably, becoming in the process the predominant framework for analyzing regulations that address pollution, natural resource use, and other environmental issues. This review seeks to complement the expansion of economic reasoning and methodology within the field of environmental law and policy by identifying insights to be gleaned from various “nondismal” social sciences. In particular, three areas of inquiry are highlighted as illustrative of interdisciplinary work that might help to complement law and economics and, in some cases, compensate for it: the study of how human individuals perceive, judge, and decide; the observation and interpretation of how knowledge schemes are created, used, and regulated; and the analysis of how states and other actors coordinate through international and global regulatory regimes. The hope is to provide some examples of how environmental law and policy research can be improved by deeper and more diverse engagement with social science.

INTRODUCTION

Human beings seek meaning in the world around them (Frankl 1946). They look for purpose in their personal lives, in their work, and in the broader society in which they live. In a democratic society, law thus reflects not only material needs and interests but also a collective quest for meaning and purpose (Rubin 2002). Regulation of environmental quality is no exception, having arisen primarily from the environmental movement of the late 1960s and early 1970s, which itself was associated with larger societal value shifts (Lazarus 2004). During the ensuing decades, efforts to understand and regulate environmental quality ultimately—and perhaps inevitably—matured into a technocratic blend of science, economics, and politics. Issues ranging from the preservation of endangered species to the management of freshwater resources to the stabilization of the planetary climate system are now routinely analyzed through the technical lenses of risk assessment and welfare economic policy analysis (for reviews, see Brooks et al. 2009, Revesz & Stavins 2004). Nevertheless, at its core, the extant system of environmental law still reflects a collective expression about what kind of society the public wants; as such, it is not merely a technical apparatus for promoting preexisting wants, as the welfare economic approach to policy analysis typically presumes.

In this review, we argue that the study of environmental law and policy should be broadly inclusive of social scientific insights. Fields such as cognitive and social psychology, science and technology studies, history and philosophy of science, international relations theory, and global governance studies all offer valuable approaches to understanding and shaping environmental law. In important respects, these “nondismal” social sciences serve to compensate for aspects of the welfare economic framework that critics have found to be descriptively or normatively lacking. Although the welfare economic framework offers valuable systematic information regarding the expected consequences of policy proposals, it neverthe-

less misses a great deal about how problems get defined and framed in the first place, how people understand those problems given their predispositions and underlying cultural commitments, and how attempted policy solutions to those problems must emerge from and interact with multiple sources of governance. Experts, citizens, and governments operate within a context of social meaning that helps to shape thought and motivate behavior. Close attention to that context and its consequences should be a central feature of the interdisciplinary study of environmental law and policy.

For instance, over the past several decades, research in cognitive and social psychology has elaborated a model of human perception, choice, and behavior that is more richly contoured and more realistic than the economic paradigm’s rational actor model. For environmental law, this thicker and more accurate account of the human actor helps to better predict behavioral responses to policies; to illuminate how individuals conceive of and value the environment and risks to their well-being; and to identify psychological and cultural features among citizens and government officials that complicate the adoption, implementation, or even identification of economically “optimal” policy solutions.

Similarly, fields such as science and technology studies and the history and philosophy of science provide powerful lenses through which to examine how scientific and technical knowledge practices shape and inform particular legal and regulatory approaches. Whereas the welfare economic paradigm typically takes the empirical basis for policymaking as given (or only awkwardly addresses it through the economics of information), fields such as science and technology studies focus keenly on the manner in which actors go about promoting, organizing, regulating, and reacting to the generation of knowledge. Such epistemological self-reflection is essential for managing twenty-first century environmental, health, and safety threats by providing a more realistic and reflexive appreciation for what we know and how we know it.

Finally, work in political science and other fields helps to remedy the absence in the conventional policy paradigm of a detailed account of how governments go about coordinating policy responses to global environmental problems. Both through traditional international relations theory and through the burgeoning literature on new governance approaches to global regulation, political science offers valuable insight into the processes and institutions by which transboundary and global environmental problems become subjects of political activity and management efforts. Because so many environmental problems now are recognized as having significant supranational drivers and repercussions—and because soon nearly all environmental problems will be seen as deeply intertwined with the ultimate global problem of climate change—any account of environmental law that lacks traction in the international and transnational contexts is inadequate.

These three areas of social scientific inquiry—human cognition and decision making, knowledge production and management, and global governance—are merely illustrative of the kinds of intellectual and empirical gains to be had from expanding interdisciplinary work beyond law and economics. Other areas could easily have been chosen, such as the application of organizational behavior theory, new institutional economics, and related approaches to corporate actors in an effort to understand when and why regulatory compliance occurs (Gunningham et al. 2003, Macey 2010), or the use of sociological and cultural anthropological methods to understand communal dimensions of environmental issues, such as why some communities organize to resist environmental nuisances, whereas others do not (Crowfoot & Wondollock 1990), or how social solidarity can unravel in the aftermath of environmental disasters (Bowler et al. 1994, Gunderson 2010), or the importance of the interpretive social sciences writ large in understanding how climate change disrupts prior conceptions of identity and community and in offering new frameworks for reintegrating global facts with local values (Jasanoff 2010,

p. 249). Although space limitations prevent us from casting this wider net here, we hope that the waters will appear worthy of further exploration based on the examples we provide.

HUMAN COGNITION AND DECISION MAKING

While the connection between environmental regulation and economics is apparent, a tight connection between environmental law and research on human cognition also exists. For decades, psychologists have shown that how people think affects how they assess risk (Slovic 2001b). Of particular consequence to environmental law is the observation that experts and lay people assess environmental risks differently and, consequently, they disagree as to what constitutes a significant environmental risk (Margolis 1994). Although the disparity between expert and lay judgment is widely recognized, its meaning is contentious. Some contend that expert judgment should dominate regulatory efforts (Sunstein 2000). Others assert that ordinary human judgment reflects an underlying wisdom or a deeper rationality that regulatory efforts should track (Gigerenzer 2008, Kenrick et al. 2009). In recent years, Kahan and his colleagues have developed a third line of research, suggesting that this disagreement arises from different cultural and political commitments (Kahan 2007). Under this view, people adopt cognitive strategies to assess environmental risks that reflect their views about what constitutes a just and meaningful society. These three positions can be thought of as embracing technocratic, populist, and cultural approaches to understanding the cognitive processes that underlie demand for environmental regulation. Together, they map various strategies for how to think about how people think about environmental risk, marking out a domain of research that is obviously fundamental to environmental law and policy.

The technocratic approach to risk perception stresses the primacy of expert judgment. For the technocrats, the key fact is not so much the mismatch between expert and lay judgment

as the mismatch between lay judgment and actuarial risks (Slovic et al. 2001a). In an early study of lay assessment of environmental risks, for example, Slovic and his colleagues asked adults to identify the number of people in the United States who died each year from several causes (Slovic et al. 2001b). Not surprisingly, people did not display a good working knowledge of likely causes of death. More importantly, their estimates revealed a clear pattern of errors. Survey participants overestimated uncommon but dramatic causes of death, such as death from venomous animal bites, but underestimated common causes of death, such as death from heart failure. These results suggest that salience and emotional impact, more so than actual risk, dominate lay risk assessments.

For the technocrats, the prime suspect causing this mismatch in judgment is a widespread reliance on a simple mental process known as availability (Slovic et al. 2001a). According to psychologists, people tend to approach complex problems such as risk regulation using simple ways of thinking, known as heuristics (Tversky & Kahneman 1974). When people estimate the prevalence of an occurrence, for example, they assess how easy it is to call to mind instances of the occurrence (Tversky & Kahneman 1974). Psychologists call this particular mental shortcut the availability heuristic. In an early demonstration of the phenomenon, Tversky & Kahneman (1974) asked subjects to read lists of male and female names, and then asked whether male or female names were more prevalent on the lists. In one version of the list, the male names were celebrities, and in another version, the female names were celebrities. Even though the lists contained equal numbers of male and female names, the subjects guessed that there were more male names when the male names were celebrities (and hence easier to recall) and more female names when the female names were celebrities (and hence easier to recall).

Researchers have demonstrated that excessive reliance on the availability heuristic can induce people to draw conclusions that are inconsistent with logic. In one study, people estimated that the text in a passage they just read

contained more words ending with “ing” than with “n” in the penultimate position (Tversky & Kahneman 1983). Because the full gerund form “ing” provides a better mnemonic cue than having “n” in the penultimate position, people can think of instances of the gerund form more easily, and hence assume that there are more of these kinds of words. In effect, people rely on the availability heuristic and their intuitive sense of prevalence, rather than treating the problem as a question of logic. Similarly, most people guess that there are more words in the English language that begin with the letter “k” than have “k” in the third position—even though there are far more of the latter (Tversky & Kahneman 1974).

For the technocrats, the availability heuristic has important implications for risk regulation. As the survey by Slovic and colleagues (2001a) suggests, it arguably explains much of the discrepancies between experts and lay people. Events that are easily recalled because of their emotional content, visual appeal, or extensive media coverage do not necessarily pose the most serious risks to society from an actuarial perspective. Indeed, pallid, ordinary events that draw little attention, such as automobile driving, might do so. Widespread reliance on the availability heuristic also leaves lay judgment vulnerable to manipulation (Kuran & Sunstein 1999). Politicians or others with good access to media outlets might work to make some events highly salient in ways that serve their own ends, rather than the public interest. Portraying an environmental hazard in a particularly vivid or emotional fashion might induce an availability cascade in which regulation becomes inevitable, whether it is truly needed or not.

Thus, under the view that reliance on the availability heuristic explains the discrepancy between experts and lay persons, the experts would seem to have the better approach to risk assessment. Moreover, availability is not the public’s only difficulty with risk perception that worries technocrats. Research suggests that people ignore other important aspects of risk, such as the benefits associated with the underlying risky activity (Fischhoff

et al. 2001a), and can completely ignore the probability of occurrence in some instances (Reyna & Brainerd 2008). Laypersons also react far more strongly to potential increases in risk than they react favorably to identical potential decreases in risk (William & Viscusi 1991). Experts have access to actuarial evidence concerning risk, whereas lay people tend to rely on their intuition, guided by the potentially misleading availability heuristic. Lay people let their intuition and emotion guide their concerns about the environment, rather than statistics (Finucane et al. 2001). Targeting the lay public's environmental fears and ignoring experts could thus mean, at one extreme, neglecting real risks that could be addressed in a cost-effective fashion and, at the other extreme, adopting excessive regulations against risks that are not apt to cause much harm.

For the technocrats, the primary problem with lay judgment lies with an excessive reliance on the wrong heuristics. In identifying a widespread reliance on mental shortcuts, Tversky & Kahneman (1974) argued that heuristics are useful but prone to being used in the wrong settings, thereby producing judgment that is inconsistent with rationality. Using availability instead of deductive logic to answer the question as to whether a passage has more words ending in "ing" or with the letter "n" in the penultimate position is a key example in which people commonly use an inappropriate mental strategy. More recently, Kahneman (2011) has argued that people generally rely on two systems of reasoning in making decisions—an intuitive system that is dominated by heuristics and emotion and a rational system that produces judgments that are largely consistent with rational choice. For the technocrats, experts rely on the deliberative system, whereas lay judgment is too often the product of the intuitive system.

Populists reject the technocratic position. They attack the idea that widespread reliance on heuristics leads to errors, arguing instead that heuristics are precisely what make people smart (Gigerenzer et al. 1999). Populists assert that what seem like mental shortcuts are really

expressions of deeper levels of rationality (Kenrick et al. 2009). In effect, they contend that the actuarial approach that experts use to assess risk is too narrow and fails to capture important values that lay people express through their reaction to environmental risk.

While technocrats contend that the research on judgment and choice shows that people rely on heuristics excessively, populists interpret the results differently. Populists agree that these kinds of studies demonstrate reliance on heuristics, but they contend that the studies do not show that reliance on heuristics produces bad judgment. Populists complain that the questions commonly used in this research are deliberately designed to induce people to rely on inappropriate heuristics (Gigerenzer 1993). People normally do not encounter lists of words that are stacked in such a way as to mislead what would otherwise be a fairly reliable mechanism for assessing frequency. Furthermore, populists assert that people do not rely on the same heuristics in all settings and avoid relying on heuristics when the environment signals that they would be inappropriate to use (Gigerenzer 2000). The populists thus embrace what they term ecological rationality (Gigerenzer et al. 1999). That is, people embrace the right mental shortcut for the right setting.

For example, in a recent study, Marewski & Schooler (2011) showed that people select carefully from among competing heuristics. In their study, people rely on the recognition heuristic to answer questions concerning which of two cities are largest or which have international airports. But when both cities are well known (as measured by internet references), people abandon the heuristic in favor of alternative strategies that rely on other knowledge they hold about the cities. The result is a nuanced approach to decision making that takes advantage of properties of the decision-making environment. When the recognition heuristic would work well, people rely on it, but when the environment disfavors the heuristic, people change strategies.

But if people are thinking intelligently about risk perception in this fashion, then what

explains the results of surveys showing that lay people's risk assessments do not track actuarial risk assessments? The populists assert that the survey results are overstated and that lay people are actually thinking more deeply about risk than experts. As to the first response, populists identify what they see as methodological flaws in the research (Hertwig et al. 2005). They note that the subjects for surveys are often college students, who face far lower immediate risks of suffering from common ailments like heart failure, diabetes, and cancer than the general population. Because people's estimates of mortality statistics are heavily affected by deaths in their peer groups, college students are apt to overestimate risks that are more likely to occur in their age group, such as deaths from violence or automobile accidents. Estimates based on such events do not really respond to the researcher's question about the population; subjects are instead providing answers that are more meaningful to them. They are expressing their personal fears, whereas experts are actually addressing epidemiological issues. Hence, although the survey participants fail to assess the question of population mortality rates well, they might be doing a fair job of assessing their personal, short-term risks.

Furthermore, the skewed mortality estimates in these studies might reflect regression to the mean (Hertwig et al. 2005). That is, the subjects might know that they know little about the true mortality rates, and moderate their estimates away from numbers they perceive as extremely low or extremely high. Moderation of this sort is a sensible response to one's lack of knowledge, but it would produce an underestimate of common causes of death and overestimate of uncommon causes. This account is more than just a methodological difficulty for a psychological research paradigm; it suggests that the demand for regulation will be far more rational than the technocrats suggest because it indicates that people make appropriately modest assessments of environmental risk. Taken together, the two populist reinterpretations of the survey disparities suggest that risk assessment is both personal and cautious.

Whereas technocrats portray the lay public as a kind of unruly mob, clamoring for regulators to respond to the latest new story, populists see the lay public as concerned about risks in a personal and moderated fashion.

Populist interpretations also suggest that lay risk assessment is actually superior to expert assessment because the former incorporates values other than mere actuarial risk (Gigerenzer & Brighton 2009). In fact, even technocrats admit that a wide variety of factors other than cognitive availability influence public risk perception (Fischhoff et al. 2001b). As described above, some of these factors cannot be reconciled with a rational approach yet may still be normatively significant. For example, people are far less tolerant of risks that they perceive to arise from involuntary activities (such as exposure to air pollution or proximity to a hazardous waste disposal facility) than ones that arise from events they perceive to be within their control (such as from smoking, skiing, or scuba diving) (Fischhoff et al. 2001b). This discrepancy can seem irrational, but it likely reflects the high value people place on their autonomy. Factors such as perceived naturalness, novelty, the chronic nature of risk, whether the risk involves a dreaded illness, whether the risk is well-understood by science, and whether the risk imposes catastrophic consequences all affect the public's tolerance for risk (Fischhoff et al. 2001a). These factors reflect rational concerns and are highly understandable. People obviously care about how they live, how they might die, and who might be responsible for their quality of life. A myopic focus on lives saved would inappropriately ignore these issues.

Two factors that affect the public's sense of risk in particular demonstrate why ignoring the public would be undemocratic and inappropriate: betrayal aversion and risk equity. First, it is clear that people are averse to risks that involve a perceived betrayal (Koehler & Gershoff 2002). In one study, researchers tested whether subjects were averse to betrayal by a safety precaution (Koehler & Gershoff 2002). They asked subjects whether they would prefer to purchase an automobile in which they stood a 2% chance

of dying if they had a serious traffic accident or one (at the same price) in which the presence of an airbag reduced the fatality rate to 1%, but which also presented an additional 1 in 1000 (0.01%) risk of a fatality due to another cause. When researchers indicated that the other cause was unrelated to the airbag, most subjects expressed a preference for the safer car. But when the researchers indicated that the extra 1 in 1000 risk was a direct consequence of the safety precaution, the subjects mostly preferred the more dangerous vehicle. Expressing that choice would certainly make the subjects less safe, on an actuarial basis, but people find the potential to be harmed by a safety precaution to be strongly aversive. Although technocrats identify such aversion as an irrational response (Sunstein 2005), these researchers defend the subjects' choice as reasonable. The pain and regret one might feel from opting into a safety measure that then caused serious harm might be worth avoiding, even at some increased level of actuarial risk (Koehler & Gerhsoff 2005). At the very least, betrayal aversion is not sensibly ignored by regulators.

Similarly, ordinary people pay close attention to the equities associated with risks. To see this, consider a hypothetical (described by Hornstein 1992) in which a community of one million people is considering one of three ways to provide electricity: (a) a conventional coal-fired power plant that pollutes the air in a way that poses a one-in-one-million risk of injury due to illness to each person in the community, (b) a novel biomass converter that poses a one-in-ten-thousand risk to the ten thousand people in the population who suffer from asthma, and (c) a nuclear power plant that poses a one-in-one-million risk of a catastrophic failure that would kill everyone in the community. Relying on actuarial risk provides no clear choice, because the expected harm in each scenario is identical. And yet people have preferences among these statistically equivalent options. Most people reject option *b* as unfair to a small number. Others dislike the idea that the first option will ultimately inflict all of the harm upon a small number of

people (or likely one person). Still others worry that preserving the community is important and so will avoid the nuclear option with its catastrophic potential. The important aspect of the problem lies not with the answer, of course, but with the reasoning process. Neglecting these reasoning processes leaves important concerns out of the risk calculation—a fact that is missed or only imperfectly glimpsed by the conventional risk assessment and welfare economic approach to environmental law.

Expertise does not help resolve some of the fundamental questions that underlie environmental risk. Catastrophic risk should, perhaps, be assessed differently than discrete risks. Risks that a society imposes on a small (perhaps historically underrepresented) minority group are not the same as risks shared by all. Some risks seem like betrayals and can undermine public trust. Risks that are imposed in an involuntary fashion, involve dreaded or stigmatized illnesses, or are novel can pose important questions for a society to answer as a society. Populists assert that the variations in lay risk perception reflect these concerns. Consequently, denigrating these concerns because they do not directly replicate actuarial measures of risk undermines democratic values.

Recent research on lay risk assessment from cultural cognition researchers deepens the problem of resolving tensions between expert and lay judgment. If the disparity between expert and lay judgment involved only a deeper rationality of lay judgment, the problem would be tractable. Experts could quantify the variety of factors that affect lay judgment and make adjustments to cost-benefit calculations. Regulatory authorities could also assess, in a public and careful way, whether any of the factors are ones that reflect deep rationality or instead arise from simplistic or misleading thought processes that individuals themselves would reject upon reflection. Although such a process could be messy and cumbersome, it is not unimaginable. In fact, current regulatory efforts attempt to reconcile some of these issues. For example, the US Environmental Protection Agency has made efforts to address what has been called

“environmental racism” in its licensing and regulatory decisions, so as to avoid imposing environmental risks disproportionately on disadvantaged communities (for a review, see Lazarus 2000).

Research on cultural cognition, however, suggests that lay risk perception reflects the cultural and political mindset of the decision maker to such an extent that reliance on neutral principles of environmental regulation may be fundamentally impossible (Kahan 2007). Cultural cognition researchers go beyond the divide between expert and lay perception to note that lay people do not agree among each other as to which issues constitute serious societal hazards. The very idea, in other words, that there is a lay perception of risk masks significant, deeply ingrained differences in cultural cognition. Thus, while some people worry that global climate change threatens to destroy our very civilization, others fail to see any appreciable risk associated with climate change (Kahan 2011). Individual differences, moreover, appear to follow a predictable pattern along political-cultural dimensions. People who generally believe that individual achievement is critical to societal flourishing and who also hold that governments cannot and should not disturb existing social and political hierarchies (so called individualist-hierarchs) assess environmental risks such as climate change radically differently from those who believe that governments exist principally to take care of the poor and disenfranchised (so-called communitarian-egalitarians) (Kahan 2011). These groups differ markedly as to what constitutes important societal risks (Kahan 2007). In effect, they do not merely incorporate some additional factors in assessing the degree of risk that various activities pose; they disagree fundamentally as to whether such risks even exist. Because these beliefs are so tightly bound up in cultural and political commitments, they resist scientific insights and economic calculations.

The individualist-hierarchs derive self-esteem from taking care of themselves and from any social status they hold (Kahan 2007). For them, expansive governmental programs

that supplant individual achievement or disrupt existing status arrangements are not only misguided, they are also threatening. This outlook is fundamentally inconsistent with the view that a massive, global externality is emerging that requires a major international initiative in response. Individualist-hierarchs believe in individual effort, not group achievement, and hence struggle to accept the perspective in which global climate change is a serious threat. Doing so would undermine their place in society and their understanding of how society should be organized to promote human well-being.

The communitarian-egalitarians harbor the mirror image set of concerns (Kahan 2007). They derive self-esteem from the belief that they live in a just society that can work together to solve problems that threaten their community and to take care of those that are less well off. Many environmental externalities resonate well with this group, as addressing pollution that comes from many sources generally requires collective action. They easily, even uncritically, accept climate change as a serious social problem because for them it is emblematic of all that is wrong with an individualistic, capitalist form of societal governance. For them, climate change is the product of promoting the mindset that all members of a society will be better off if they engage in self-serving pursuits. Communitarian-egalitarians see climate change as only symptomatic of a society that does not do enough to care for its weak and fails to embrace a collective mindset and sense of shared restraint. This mindset helps to explain why many environmental groups reject nuclear power as a response to climate change. Even though nuclear power has a vastly smaller carbon footprint than fossil fuels, it is still the product of large, hierarchically run business organizations that work for primarily private goals. For this group, esteem arises from working together to establish social norms of caring and trust, rather than from allowing unfettered individualism to reign.

These kinds of political attitudes affect risk assessment in ways that cannot be reconciled through neutral scientific or economic analysis.

The deep influence of cultural cognition can perhaps best be seen in research that Kahan and colleagues conducted on risk assessments associated with nanotechnology (Kahan et al. 2009). Nanotechnology is a little understood subject among lay persons; most people are unaware of what it is or what risks it might pose. In their survey of risk perceptions associated with nanotechnology, Kahan and colleagues found that those who knew absolutely nothing about nanotechnology expressed no meaningful opinions about its risks, but a little knowledge proved to be a dangerous thing. People who knew only a little about nanotechnology divided markedly along political-cultural dimensions. Individualist-hierarchs saw no danger from nanotechnology and expressed concern that government should be kept out of the business of regulating it so as not to quash an important nascent industry. Communitarian-egalitarians worried that big business was hiding the dangers of this novel technology, and that government should move quickly to develop regulations to address its risks. Knowledge feeds, rather than ameliorates, the political and cultural divides because people interpret what they know in light of their worldviews (Rachlinski 2000). Everything that the individualist-hierarchs feel they know about the world has taught them that governmental regulation stifles creativity, whereas everything that the communitarian-egalitarians feel they know teaches them that greedy corporations have to be reined in so as to avoid inflicting environmental harm on unsuspecting communities.

The research on cultural cognition adds a third understanding of the assessment of environmental risk to those provided by the technocrats and populists. The technocrats blame cognitive availability and widespread reliance on anecdotes for lay misunderstanding of risk. The cultural cognition research, however, demonstrates that different stories will resonate with different populations. Even the simplest stories of environmental risk are seen differently by different camps. For example, to communitarian-egalitarians, a news story in the late-1960s about debris that caught fire in the

Cuyahoga River near Cleveland was just the tip of the iceberg of the destruction of our nations' waterways by big business (Lazarus 2004). For individualist-hierarchs, the story was an oddity that environmentalists have overblown in support of an unjustifiable, cost-ineffective regulatory scheme that chokes individual initiative and economic growth (Adler 2002). Understanding that cognitive availability plays a role in risk assessment is thus only part of the story—we must also know what is available and to whom (Sunstein 2003).

Similarly, the cultural cognition story adds to populists' account of risk assessment. Populists would likely predict that nanotechnology would invoke a significant regulatory reaction, in that it is novel and suggests potentially catastrophic consequences. But the populist account fails to recognize that only some members of the community will be sensitive to these concerns. Concerns about catastrophe, in particular, are likely more closely associated with communitarian-egalitarians, who worry deeply about the potential destruction of communities, at least as much as they worry about threats to individuals.

This nuanced approach to understanding how people think about environmental risk accounts for how sophisticated environmental groups often try to convey their messages. Environmental groups commonly tout simple aphorisms about how to think about complex environmental issues. For example, Leopold's assertion that "a thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community [and] it is wrong when it tends otherwise" (Leopold 1949, p. 262) neatly converts the communitarian-egalitarian mindset that most environmental groups hold into a simple heuristic for how to think about any environmental issue. Similarly, the idea that one should worry about environmental impacts that will be felt seven generations hence does the same. Expressions such as "the polluter pays principle," or even "sustainable development" and the "precautionary principle," can also guide thinking in ways that are amenable to a particular mindset. Such thinking is commonly

denigrated by individualist-hierarchs precisely because it leads to policy prescriptions that undermine their way of thinking about the world. For their part, individualist-hierarchs are drawn to approaches, such as free-market environmentalism, that offer complementary cognitive reinforcement (Anderson & Leal 1991).

To be sure, recognition of the influence of cultural cognition does not wholly preclude democratic resolution of environmental problems. Kahan (2007) suggests that common ground can sometimes be obtained by reconstructing the social meaning that people attach to a public issue. For example, individualist-hierarchs might become more amenable to concerns about climate change when they are described as threats to international order or as potentially requiring military action. The concerns about social disturbance obviously resonate with the hierarchs, as would a military dimension to the problem. Furthermore, market-based programs to address climate change, such as cap-and-trade programs, can also be more amenable to people who harbor an individualist-hierarchic mindset.

Taken together, these three approaches to environmental risk suggest that understanding environmental law and regulation requires an awareness of how people think about environmental risks. The idea that the environment ought to be governed largely by unidimensional attention to efficiency lacks widespread support. Instead, people use simple but rich mental strategies for understanding environmental risks. These mental strategies are not uniform, as the technocrats might suppose. Nor does postulating an elaborate array of factors capture exactly how the public approaches risk. Rather, people embrace mental strategies for thinking about risk that suit who they are, what they believe, and how they see themselves and their society.

Conventional economic approaches thus mask important ways that the public thinks about the environment. Although people embrace simple ways of thinking about environmental problems, they do not choose their mental shortcuts arbitrarily. People embrace

ways of thinking about environmental risk that are meaningful to them and that reflect how they believe society ought to look. This reality does not mean that environmental issues are inherently intractable. It suggests that efforts to understand environmental regulation in a democratic society must address the meaning that people attach to threats and responses, rather than treat them exclusively in narrow risk-benefit terms.

KNOWLEDGE PRODUCTION

If the conventional economic understanding of environmental law misses important elements of a thicker, more nuanced account of human cognition and decision making, it also lacks an appreciation for the distinctive knowledge practices that dominant approaches to environmental law and policy making employ in defining, organizing, and managing environmental problems. Too often, the economic approach to environmental law tends to naturalize the problems targeted for regulation, assuming that the underlying facts “simply arrive” fully formed at the doorsteps of policy making and regulatory design (Kysar 2010, p. 72), prefitted for insertion into the familiar framework of externalities, commons problems, and other forms of market failure. Such an approach has saved environmental law from a great deal of epistemological difficulty, while underwriting a complex and expensive machinery for generating knowledge about the choices involved in protecting human health and the environment.

The results, whether measured in the sheer growth of the field, the complexity of its multi-layered perceptual and rule-making apparatus, or the sophistication of its analytical toolkit, are impressive. Notwithstanding diagnoses of the “graying” of US environmental law (Lazarus 2004, p. 251 ff.) or increasingly frequent calls for reinvention in the face of new challenges (e.g., Flournoy & Driesen 2010), there is little question that environmental law has achieved a great deal without having to seriously engage with its own epistemic virtues and vices. But at what cost? What has been lost or, more

precisely, never fully grasped as a result of this lack of epistemological self-reflection? Put another way, what would a more sustained engagement with environmental law's ways of knowing tell us about the field, about the conditions of possibility for remaking environmental law, and about ourselves and our relationships to each other and the earth?

Such questions, one might argue, are best left to philosophers or intellectual historians rather than environmental lawyers, disinclined as they are to engage in theoretical and methodological introspection and preoccupied, in any event, with the pressing need to get on with the hard work of environmental protection. Perhaps. This section argues, however, that any mature theory of environmental law and any adequate approach to environmental policy must engage directly with the theories, concepts, and tools—what we refer to as knowledge practices—that shape the subject matter of the field (Boyd 2010b, Kysar 2010). This is not simply a question of unmasking hidden ideological effects or political agendas. Rather, such a perspective seeks to go beyond (or beneath) politics to uncover some of the unrecognized assumptions and epistemological precommitments [similar in some ways to what Bourdieu (1977, p. 164 ff.) called the “doxa”] of dominant approaches to environmental regulation. By asking how specific knowledge practices shape and inform the field and by taking the process of knowledge generation itself as a subject of inquiry, new possibilities emerge for evaluating and expanding both positive and normative understandings of environmental law.

To be sure, the general critique of technocratic forms of decision making has been a recurring (if recessive) theme in environmental law scholarship for more than 30 years and, of course, draws upon much older philosophical and sociological critiques of instrumental reason (Horkheimer & Adorno 1969, Weber 1978). Writing in the early 1970s, Tribe pointed to the reductionist tendencies of the then emerging policy sciences and the resulting pathologies for fields such as environmental law (Tribe 1972, 1973, 1974). In seeking to uncover

the ways in which “particular modes of analysis in a number of different fields—particular approaches to formulating questions, organizing information, and developing answers—entail fundamental (if often unwitting) commitments to substantive conclusions shaped in characteristic and often unfortunate ways” (Tribe 1972, p. 76), Tribe showed how then-emerging welfarist approaches to environmental law and policy could be understood and engaged with only if situated within the larger framework of instrumental reason and an overarching value system of liberal individualism (Tribe 1974, pp. 1331–32).

Writing at the same time, Ackerman and colleagues used the case of water pollution control efforts on the Delaware River to explore “the uncertain intellectual foundations” of US environmental policy and the limits of “technocratic intelligence” (Ackerman et al. 1974, p. 5). Exploring how the “pollution problem” plaguing the river was reduced and made “susceptible to quantification,” the authors unmasked the selective rendering of “facts” that underlay specific policy choices and the concomitant inability to ask “more fundamental questions” regarding long-term environmental quality (Ackerman et al. 1974, p. 28). In doing so, Ackerman and colleagues provided the basis for a broader critique of the reductionist logic driving technocratic decision making and the seemingly inevitable policy failures that ensued as such intelligence came to be embedded within the bureaucratic routines of the administrative state.

Although these early efforts to engage with environmental law's distinctive ways of knowing largely gave way to debates over instrument choice and regulatory design, various scholars (inside and outside of law) have continued to investigate some of the knowledge practices that structure the field. Thus, the literature on epistemic communities has provided a basis for investigating how scientific experts and policy elites frame and legitimate approaches to complex problem areas such as stratospheric ozone depletion, highlighting the social basis of scientific knowledge and the importance of

particular forms and pedigrees of expertise in translating that knowledge into policy consensus (Haas 1992; see also Clark et al. 2001, Social Learning Group 2001). Legal scholars have also investigated the manner in which specific concepts from ecology, such as the balance of nature, have shaped environmental law (Scheiber 1997, Tarlock 1994, Wiener 1995), resonating with earlier work by environmental and other historians (Hays 1959, McEvoy 1986, Worster 1977) and with more recent efforts to distill broad patterns in American thinking about the environment—our collective “ideas of nature” (Williams 1980, pp. 67–85)—as part of a project aimed at reimagining the political history of US conservation and environmental protection (Purdy 2010).

Of course, there has also been a great deal of research over the past several decades on the general role of science in environmental law and policy. From Jasanoff’s pioneering work on the features of regulatory science (Jasanoff 1995) and the influence of scientific advisors in the policy process (Jasanoff 1990) to the extensive treatment of scientific uncertainty in particular environmental controversies—from alar to arsenic to benzene to global climate change—the use and abuse of science in various legal contexts has been a perennial topic of interest (Gelpe & Tarlock 1974, Latin 1988, Wagner 1995, Wagner & Steinzor 2006). And there is now a growing body of scholarship that seeks to evaluate the ways in which ideas and framings from neoclassical and welfare economics have shaped environmental law (Kysar 2003, 2010; Driesen 2010).

Although this admittedly cursory review has surely left out other important contributions, the intent is to emphasize the already existing diverse body of scholarship that touches in one way or another on the knowledge practices of environmental law. By bringing this work into more systematic engagement with the broad, multidisciplinary fields of science and technology studies (STS) and history and philosophy of science [fields that have already engaged in various ways with law (see, e.g., Burnett 2007, Caudill & LaRue 2006, Golan 2004, Jasanoff

2008, Mnookin 2007, Riles 2011) and with nature and the environment (for a review, see Yearley 2008)], this review seeks to further expand emerging areas of research that build upon existing scholarship in a manner that takes the knowledge practices of environmental law as a topic of inquiry worthy in its own right. Doing so, it is argued, provides not only a means for exploring how patterns of thought have structured environmental law but also a deeper understanding of what it is precisely that environmental law claims to know and how the field can better equip itself to deal with increasingly complex and unpredictable challenges.

Starting with the widely accepted proposition that scientific knowledge represents rather than mirrors the reality of nature—that it does not proceed as the cumulative march of progress as traditional histories of science suggest—shifts attention from the narrow question of what is to be done given the facts at hand to a consideration of the ways in which particular understandings of the world gain stability and authority, thereby highlighting the contingent, social basis of knowledge (Kuhn 1962, Rorty 1979, Shapin 1994). Contingency here refers not only to the Kuhnian sense of being always subject to redescription, revision, and occasional wholesale abandonment by expert communities but also to the more constructivist sense that the production of knowledge occurs within social, economic, and cultural contexts that can be subjected to self-conscious determination by the broader political community. At a more granular level, recognizing that the making of scientific and technical knowledge is messy and situated—that is, carried out by real people working in particular places under particular constraints—denaturalizes the production of expert knowledges and directs attention to the various actors and the larger networks of people, practices, technologies, and institutions that generate specific knowledge claims and endow them with authority (Latour & Woolgar 1986; Shapin 1994, p. xix). Likewise, approaching styles of reasoning and the concepts and facts that underwrite them as historically constituted opens up a whole set of

previously unexplored questions regarding how knowledge comes to be organized in particular ways at particular times and the effects that such knowledge practices have in shaping views of the world and concomitant modes of governing (Daston 1991, Hacking 2002, Poovey 1998). Finally, the insight that knowledge production and governance are coconstitutive emphasizes not only the manner in which regimes of truth come to be embedded within particular approaches to government (Foucault 1991, Rose et al. 2006) but also the conditions of possibility for more and deeper engagement by communities and individuals in the process of knowledge generation (Jasanoff 2003, 2004; Miller 2005).

Although such insights may seem out of place to mainstream welfarist understandings of environmental law, it is precisely their destabilizing effects that generate new lines of inquiry and expanded opportunities for reflection on the field. Taking the knowledge practices of environmental law as a distinct subject of inquiry, in other words, provides a fresh perspective on how particular problems and facts are fashioned into viable objects of governance; how new forms of calculability and quantification [new “technologies of visibility” to use Miller’s (2005, pp. 425–26) phrase] underwrite particular approaches to governance; how specific policy instruments depend on a whole range of technical and epistemic practices that are too often invisible; and how all of these knowledge practices have deep and unavoidable normative implications, valorizing certain views and approaches while marginalizing and erasing others.

Asking how the problems that environmental law targets for regulation are fashioned into objects of governance, for example, opens up an expansive set of questions regarding the manner in which various phenomena are made amenable to particular approaches to governance, the role of various communities in establishing and reproducing the knowledge forms that underwrite understandings of specific problems, and the forgettings and erasures entailed by certain ways of thinking (Boyd

2010b). The problem of global climate change, to take perhaps the most obvious example, emerged as a widely accepted scientific fact in the 1980s and as a corresponding object of international environmental concern on the basis of a particular kind of thinking about the earth as a single integrated system; a particular set of knowledge practices and infrastructures, including most prominently global circulation models and an extensive worldwide monitoring and data collection network; and a large and growing transnational community of experts gathered under the umbrella of the Intergovernmental Panel on Climate Change (IPCC) and other bodies (Edwards 2010). Together, these knowledge practices have provided a very robust set of capabilities for generating “facts on a planetary scale,” allowing the climate system to be approached as a single ontological whole (Edwards 2010; Jasanoff 2004, p. 45). Far from undermining the claims of climate science, unpacking knowledge practices in this manner allows us to see just how powerful the scientific and technical infrastructure is that generates our knowledge of global climate change, while providing a fuller appreciation for the difficulties confronting environmental decision making in the face of uncertainty. From this perspective, climate change is not reducible to the standard law and economics framing of commons problems and collective action; rather, it is a problem that disrupts prior senses of space, time, and community and calls forth, indeed demands, new thinking about governance and the conditions for integrating highly technical, globalized forms of knowledge with lived experience (Jasanoff 2010). Similar stories could be told for other environmental problems, from stratospheric ozone depletion to biodiversity loss, tropical deforestation, or persistent organic pollutants, all of which have emerged as coherent objects of governance based on an elaborate set of knowledge practices that allowed the underlying phenomena to be understood and formatted in particular ways.

Likewise, the tools and techniques that environmental law uses to generate its working knowledges—from dose-response curves to

monitoring systems to simulation models to cost-benefit analyses—contain within them a set of assumptions about the world and, quite often, implicit politics that are too often ignored or taken for granted (Winner 1980). Opening up the black boxes of these tools and techniques elucidates the process of knowledge generation, providing insight into the possibilities, but also the limits, of employing particular tools as a basis for environmental decision making. Cost-benefit analysis, for example, emerged in the late nineteenth and early twentieth centuries as a tool for insulating the evaluation of public works projects such as roads and dams from political pressures (Porter 1995, pp. 148–89). By the second half of the twentieth century, under the influence of the new welfare economics, it had extended its reach into various areas of the administrative state, emerging along with other forms of quantification as a key “technology of distance” directed at solving problems of trust and accountability for government bureaucrats and becoming one of the most important decision-making frameworks for regulations aimed at protecting human health and the environment (Porter 1995, pp. ix, 186–89). In the process, a logic of optimization applied to public expenditures on infrastructure came to provide a seemingly objective way to determine how many deaths were justified or how much environmental destruction was acceptable for a given level of regulation, displacing in quite dramatic ways alternative approaches to environmental regulation premised on responsibility and precaution (Kysar 2010).

Other tools, such as modeling and simulation, although less overt in terms of direct impact on environmental decision making, have come to exercise similar levels of influence on environmental regulation—a fact that has not escaped environmental law scholars (Farber 2008, Fine & Owen 2005, Wagner et al. 2010), but one that has only recently begun to be investigated systematically to understand the distinctive kinds of knowledge claims made possible by these tools and their implications for law and policy. By providing ways of seeing “systems that are too large, too complex, or

too far away to study by other means” (Oreskes 2000, pp. 70–71), by “replicating the world in a machine” as Edwards puts it in reference to climate models (Edwards 2010, p. 139), modeling allows us to see new problems in new ways, opening up vast new frontiers of knowledge and new possibilities for governance. Like the challenges involved in making “inferences from the unseen” confronting Justice Holmes and his colleagues more than a century ago in *Missouri v. Illinois* (1906), the new anticipatory knowledges made possible by predictive models (and other related techniques such as forecasting, scenario building, and threat assessment) confront environmental decision making, both expert and lay, with a host of epistemic and political challenges (Nelson et al. 2008). Indeed, although predictive models operate as “a surrogate for access to the future,” it is often difficult to evaluate “how good a surrogate they are” (Oreskes 2000, p. 79). How, for example, should we evaluate the predictions of repository behavior at Yucca Mountain (or some other place) one million years in the future (Oreskes 2000, p. 79; cf. *Nuclear Energy Institute v. EPA* 2004)? Moreover, the technical sophistication associated with modeling “may propagate the illusion that things are better known than they really are” (Oreskes 2000, p. 79). Viewed as “tools and heuristics” by the modeling community, models are sometimes perceived and presented as truth machines by the policy community—a result that can work to disempower publics and the broader political community, while providing fodder to critics who are quick to point to overreaching by those in favor of taking action on complex problems marked by significant uncertainty (Jasanoff & Wynne 1998, p. 62; Wagner et al. 2010). Wrestling with the knowledge claims made possible by these modeling practices rather than taking them at face value provides a much firmer footing for efforts to enhance sustained and meaningful public engagement in the process of environmental decision making.

Like the tools and techniques that underwrite environmental law’s ways of knowing, the concepts that animate particular approaches to

certain problem domains often carry with them a durable set of precommitments about what counts as knowledge about the world. The concept of ecosystem services, for example, rests on a simple stock-flow model of ecological systems (comprised of an identified stock of “natural capital” and the flows of environmental services that it produces) that translates almost seamlessly into market-based approaches (Gómez-Baggethun et al. 2010, Norgaard 2010). The improved policy fit that comes with such an approach thus needs to be considered against an impaired ability to see and understand the complexity and interconnectedness of ecological systems and, more ambitiously, to cultivate less anthropocentric approaches to the value of nature (Norgaard 2010, Tribe 1974). Similarly, the concept of risk, which has become so central to environmental law, is obviously made possible by and deeply committed to an actuarial view of the world oriented to populations, distributions, and averages—a world that has no place for lives in their uniqueness or for anything but the roughest sense of corrective justice (Hacking 1990, Gigerenzer et al. 1989, Simon 1988). None of which is intended to take away from the power and utility of such concepts for environmental law or for broader problems of social order in a complex, industrial society. Rather, the point is to recognize the limits entailed in the deployment of such concepts and to bring into focus what is lost in the process.

As with the problems, tools, and concepts of environmental law, the higher-level principles and norms that serve to organize approaches to the field and that so often provide the terrain on which normative debate occurs are ripe for more sustained interrogation in a manner that incorporates insights and approaches from STS and the history and philosophy of science. But instead of engaging in yet another round of deconstruction and critique—whether of efficiency, precaution, or corrective justice—focusing on the historically situated knowledge practices that give rise to, shape, and sustain these principles and norms provides a basis for investigating how they get traction in particular

circumstances and how they gather normative momentum as they mutate and migrate across the field and through various communities. Such a perspective also provides a way of thinking about other, less obvious background principles and norms that allow environmental law to do its work. The principle of objectivity, for example, which is fundamental to the technocratic approach to environmental decision making (Kysar 2010), has deep historical roots, with different meanings and different applications depending on context (Daston 1992, Daston & Galison 2007, Porter 1995). By recognizing this, we can begin to parse the uses and abuses of objectivity in the context of environmental regulation, but in a manner that need not write it off as antithetical to any particular normative grounding for environmental law. Instead, by viewing objectivity as an “epistemic virtue” for guiding inquiry and decision making in particular contexts rather than as a universal standard of rationality (Daston & Galison 2007, pp. 39–42), we can more easily recognize what is at stake in specific claims to objectivity and their deployment in particular approaches to environmental law.

Finally, the various policy instruments deployed by environmental law, premised as they are on particular ways of understanding problems and making use of specific concepts, tools, and techniques, would also benefit from more sustained engagement with STS. In addition to the more abstract arguments regarding market-based approaches to pollution control that have become a staple of the environmental law literature, for example, significant work on the technical and material aspects of market instruments reveals the importance of “taking on the technicalities” (Riles 2005, p. 973) to understand the technologies and infrastructures needed to build and sustain these markets (Boyd 2010b; Callon 2009; Levin & Espeland 2002; MacKenzie 2009a,b). Such an approach resonates with existing legal scholarship on the problems of fungibility in environmental trading markets and the challenges involved in developing currencies that facilitate trading, while serving as effective proxies for

environmental quality (Rose 2008, Salzman & Ruhl 2000). Bringing these two literatures into more sustained conversation promises to provide a richer understanding of the technical challenges involved in regulatory design and the limits involved in applying specific instruments to certain kinds of problems.

All of these examples point to new and, in some cases, renewed directions for the positive theory of environmental law, understood here as the theory of how environmental law does its work, while providing a way of situating the welfarist approach to environmental problems and investigating its undeniable performative role in structuring so much of contemporary environmental regulation. But these perspectives also open up and reinforce an important set of normative questions. As scholars from various fields have pointed out, the very act of rendering something technical—of making it legible (Scott 1998)—is a way of depoliticizing it, taking it out of the world of social institutions and normative communities and making it the domain of expertise (Ferguson 1994, Li 2007, Mitchell 2002, Rose 1999; see also Kennedy 2008, Koskenneimi 2007). In the environmental law context, to take one example, the logic of optimization embedded within cost-benefit analysis marginalizes and even erases crucial questions of ethics and responsibility that were once at the heart of environmental law (Kysar 2010, Tribe 1974). Recognizing the normative valences of particular knowledge practices thus provides another way into the project of reconstructing environmental law in a manner that seeks to open up the process of knowledge generation to more and deeper engagement by individuals and broader political communities (Jasanoff 2003, 2004; Kysar 2010; Miller 2005).

By historicizing and contextualizing the knowledge practices that inform environmental law, systematic attention to the field's distinctive ways of knowing works to denaturalize the facts and problems that environmental law so often takes as pregiven and to situate them within a larger set of positive and normative concerns. Such an approach, it bears emphasizing, should not be conflated with any sort of

call to relativism or endless critique (cf. Latour 2004). Efforts to historicize and contextualize knowledge production are hardly tantamount to a claim that any particular knowledge practice lacks epistemological validity—a point that is as true for environmental law as it is for special relativity theory (Daston 2009, pp. 812–13). Pragmatist theories of knowledge long ago abandoned the search for foundations in favor of a more workmanlike approach to knowledge—an approach that underscores the importance of understanding how particular knowledge practices come to be useful in particular contexts and, more importantly, how they get deployed by various political communities in making environmental futures.

GLOBAL GOVERNANCE

In light of the sheer scale and intensity of human activity on the planet, many scientists contend that we have entered a new geological epoch, the Anthropocene, with consequent inability to draw reliable predictions from past experience. As the previous sections made clear, this view is a product of psychological processes, political and cultural commitments, academic customs, technological developments, and other socially contextual factors. Both science and economics are sometimes depicted as resting on a set of neutral methodological principles that shield the disciplines from the influence of partisanship and ideology. This is, of course, only an ideal. Like all human individuals, scientists and economists harbor partisan beliefs that can determine what they study, how they study it, and what conclusions they draw from the evidence they gather. When addressing highly political issues at the edge of collective understanding, they are also influenced by their ideological beliefs and cultural commitments in ways that can affect the recommendations they make to regulators. This is not intended to suggest that experts, policy makers, and citizens do not face natural realities or that the social embeddedness of knowledge practices inevitably renders them unreliable or somehow dispensable. Rather, it suggests only that experts work within a

particular social structure that influences their work and methods. At least in some instances, that structure should itself be studied, understood, and subjected to policy influence.

At the same time, knowledges also must be attended to on their own terms, particularly when they indicate that the natural reality faced by humanity will pose grave challenges to well-being in the future. This section addresses one particular challenge to environmental law and policy suggested by the contemporary environmental sciences: the observation that environmental processes operate in ignorance of legal boundaries, even those lines of national jurisdiction that figure prominently in the formal allocation of world power and authority. This is true most obviously for so-called earth system processes (Rockström et al. 2009). Certain dynamics and resources—such as the ozone layer, ocean currents, the nitrogen and phosphorous cycles, biodiversity, deforestation, desertification, deep sea fisheries, and persistent toxic pollutants—appear to literally span the entire globe in reach and/or impact and thus seem to require significant multilateral engagement from nations of the world to be successfully managed (Dietz et al. 2003). Even those environmental and natural resource issues thought to be more local in scope increasingly are being recognized as deeply impacted by activities and decisions undertaken abroad (Kysar & Li 2008). Ambient air quality in the Western United States, for instance, appears to be significantly affected by pollutant emissions from Asia, such that the ability to achieve domestic air quality standards depends on choices made by other governments halfway around the world. Similarly, in the future hardly any environmental or natural resource issue may be amenable to adequate characterization without considering the effects of climate change, which is a global public goods problem par excellence. In short, to fully understand and evaluate environmental law, one must be prepared to incorporate the subject's inevitable supranational dimensions.

Economic approaches to environmental law face a conceptual challenge in this respect, as they are generally premised on a welfarist

framework in which an assumption has already been made regarding who counts for purposes of welfare calculation. Cost-benefit analyses of national environmental policies, for instance, typically only tabulate domestic impacts of regulation (Posner 2007, Zerbe 1991). In some instances, however, the most important question posed by an environmental issue will be whether and to what extent foreign impacts should be considered by a regulating body. Likewise, cost-benefit analyses typically model foreign contributions to environmental problems as fixed inputs, rather than as factors that might themselves become subjects of policy influence. Even a recent US Interagency Task Force Report on the Social Costs of Carbon—which offered a significant methodological advance by expressly incorporating the well-being of individuals living outside of the United States when calculating the welfare losses associated with greenhouse gas emissions—remained anchored to a rigid account of foreign state behavior. Specifically, all three of the integrated assessment models relied upon by the Task Force were built on assumptions about the growth of greenhouse gas emissions in other countries that remained independent of US policy. In other words, no action taken by the United States to arrest its own emissions could spark policy changes in other countries within the models, no matter how significant the US step taken. As a result, the benefit to changing US climate policy may be significantly understated: Almost without exception, knowledgeable observers report that the US position against serious greenhouse gas regulation has been a fundamental stumbling block for international climate negotiations during the past two decades. Because the positive international impact of removing that stumbling block cannot be recognized and credited by the US social cost of carbon measure, however, it becomes less likely that the stumbling block will actually be removed (Kysar 2011).

The implicit worldview of such models is an atomized one that borrows much from the realist tradition in international relations theory (Waltz 1979). States are presumed to care only

about maximizing their own interests, such that international law and international relations are seen merely as spaces within which rationally motivated competition and coordination occurs, rather than as forums for discussion and mutual social influence (Goldsmith & Posner 2005, Posner 2009). International law seen from this vantage point does not represent real law, in the sense of embodying a set of values and expectations that the law's subjects accept as legitimate reflections of, or even constitutive elements of, their community. Accordingly, as Goldsmith and Posner put it, "nations have no moral obligation to comply with international law" (Goldsmith & Posner 2006, p. 463). Instead, states simply have a duty to deploy international law in a manner strategically calculated to maximize state self-interest. Treaties and other international agreements, by "providing a focal point for coordination, and establishing what counts as cooperation in a prisoner's dilemma" (Goldsmith & Posner 2006, p. 466), do little more than temporarily and unstably suspend otherwise endemic rivalries between states. From this vantage point, even widely embraced international agreements may not solve collective action problems given that the likelihood of state shirking and consensus breakdown is thought to increase as the number of parties to a treaty expands (Goldsmith & Posner 2006, p. 469). Thus, the rationalist approach to international ordering reintroduces the collective action problem at the very moment that international law appears to be succeeding. The upshot of these theoretical claims is blunt: "Given the multiple conflicting interests of states on various issues, and the particular distribution of state power with respect to those issues, many global problems are unsolvable" (Goldsmith & Posner 2006, p. 468).

Two features of the rationalist approach merit particular scrutiny: the undertheorized role of state interest and the focus on the state as the dominant unit of analysis. First, the rationalist approach says very little about how states decide what is and is not in their interest, a gap that in the extreme threatens to render such approaches tautological (Chayes &

Chayes 1993). Generally, states are expected to maximize their citizens' well-being as defined in materialist terms and as shaped by the states' internal political economies, but these concepts seem malleable enough to account for most any outcome. Moreover, on the rationalist account, little possibility exists for the process of international lawmaking to influence what states and their citizens perceive to be in their interest. Important schools of thought reject this exogenous conception, including even some within the rationalist tradition (Abbott 1989, Slaughter et al. 1998). For instance, rather than a simple game theoretic exercise with limited and clearly defined payoffs, international negotiations might be seen as more open-ended interactions in which a wider range of interests can be balanced through side payments and other flexible mechanisms (Barrett 2010, Parson & Zeckhauser 1995, Susskind 1994). Introducing reputation as an important component of state interest might similarly expand the range of situations in which international cooperation appears attractive, even on a rational-maximization account (Guzman 2008). More dramatically, all parties to a treaty might subject themselves to shifting and unpredictable perceptions of state interest by committing to scientifically investigate the severity and potential impact of an environmental problem and to base policies substantially on the results of those investigations (Parson 1998). The widespread success of the international ozone treaty regime has been attributed to this kind of willingness by parties to precommit to scientifically influenced policy (Parson 2003; see also Canan & Reichman 2001), in addition to materialist explanations hinging on the market interest of US corporations.

Various liberal schools of international relations theory extend this approach through careful focus on international institutions and the possibilities they hold for influencing the preferences and behaviors of states (Downie 2010). For instance, international environmental institutions may help to elevate issues to a level of national concern, strengthen capacity within lesser-developed nations, and structure and enhance the space within which

negotiations take place (Haas et al. 1993). International environmental law is a particularly fruitful area for the liberal institutionalist approach given that environmental problems typically necessitate the creation of administrative bodies to implement and enforce treaty obligations and to monitor environmental quality over extended periods of time. One estimate places the number of international environmental institutions created in recent decades at more than 200 (Biermann & Pattberg 2008, p. 281). Whereas realists would see such institutions as merely epiphenomenal of state interest, liberals regard the number, complexity, and durability of such institutions to be implausibly explained by state interest alone (Raustiala & Slaughter 2002). At the least, the proliferation of agreements and regimes within the fragmented system of international law gives rise to the possibility of conflict among them, exemplified most starkly by the different approaches taken by the World Trade Organization and the Convention on Biodiversity toward the regulation of genetically modified organisms (Pollack & Shaffer 2009, Raustiala & Victor 2004). Such alternative regimes allowed for competing policies and, indeed, competing normative frameworks to persist despite seemingly compelling reasons for major players, such as the United States and the European Union, to achieve a harmonized result.

An important extension of the liberal school of international relations is Koh's theory of transnational legal process (Koh 1997; Koh 1998a,b), which focuses attention on the variety of actors and fora through which global norms are debated, interpreted, and ultimately adopted by states. Koh's approach, with its focus on the institutions through which state power is influenced and performed and on the discourses through which global norms are articulated and contested, can be seen as a bridge between liberal and constructivist schools of international relations theory. The latter school goes even further away from the materialist focus of realists than liberal institutionalists, positing "(1) that the structures of human association are determined primarily by shared

ideas rather than material forces, and (2) that the identities and interests of purposive actors are constructed by these shared ideas rather than given by nature" (Wendt 1999, p. 1; see also Ruggie 1998). Constructivist approaches aim to open the black box of state interest, analyzing the social and ideational processes by which norms and values come to be accepted and adhered to by an actor (Checkel 2008). In the extreme case, the very subjective identity of an actor is said to be a product—a construct—of the discourses and knowledge schemes that permeate the actor's social world. Even without going to that idealist extreme, processes of socialization and acculturation seem capable of leading states to positions and behaviors that they might reject through interest-based decision making (Goodman & Jinks 2004). A recent working paper, for instance, uses international socialization theory to explain China's unexpected decision to commit to significant reductions in the greenhouse gas intensity of its economy, a move that, at a minimum, raises questions about the adequacy of explanations based on purely instrumental grounds (Williams 2010). Constructivist insights also shed light on the choice of "hard" and "soft" versions of multilateral agreements (Shaffer & Pollack 2010), which is especially important in the environmental arena given extensive historical use of soft agreements as a supposed gateway to norm internalization and, eventually, more significant environmental commitments. If assumptions about the socialization process underlying this approach are ill-founded, then the constructivist school may be able to both diagnose and improve the situation.

These alternative theoretical approaches dovetail with a tradition in US environmental law of viewing states intersubjectively, as entities that are capable of reasoning with one another toward shared goals. The United Nations Environment Program Participation Act of 1973, for instance, declared that "[i]t is the policy of the United States to participate in coordinated international efforts to solve environmental problems of global and international concern" (Kysar 2010, pp. 124–25).

Amendments to the Foreign Assistance Act adopted in 1977 began with a congressional finding “that the world faces enormous, urgent, and complex problems, with respect to natural resources, which require new forms of cooperation between the United States and developing countries to prevent such problems from becoming unmanageable” (Kysar 2010, p. 125). In light of these problems, the amendments directed the President “to provide leadership both in thoroughly reassessing policies relating to natural resources and the environment, and in cooperating extensively with developing countries in order to achieve environmentally sound development” (Kysar 2010, p. 125). Other examples of US efforts to assert international environmental leadership included the Federal Water Pollution Control Act, which instructed the President to take those actions necessary to ensure that other countries reduce water pollution even within their own borders, and the Ocean Dumping Act, which directed the Secretary of State to promote effective international cooperation to protect the marine environment. This mode of national self-awareness regarding international environmental responsibility was also encouraged under some US federal court interpretations of the National Environmental Policy Act and under a 1979 Carter Administration executive order, all of which encouraged consideration of the extraterritorial environmental impact of major actions by US governmental actors.

More recently, however, the view of foreign environmental relations as an essentially hostile and noncommunicative game has tended to dominate within the United States. It was well encapsulated in the climate change context by President George W. Bush’s statement that “each country needs to recognize that we must reduce our greenhouse gases...to come up with an effective strategy that, hopefully, when added together...leads to a real reduction,” a conception that came to dominate international climate negotiations as the Copenhagen Climate Summit failed to produce a binding collective agreement (Kysar 2010, p. 143). Even from the perspective of unbridled state

self-interest, this atomistic conception seems unsatisfactory, for it presupposes a vision of state autonomy and self-sufficiency that can no longer be maintained: Under circumstances of deep environmental interconnectivity, the state risks much by choosing to go it alone and to simply “hope” that other states’ policies will lead to a sustainable planet “when added together.” The state instead might profit by perceiving itself as a subject that stands in relations of responsibility and dependency with other significant actors on the geopolitical stage. From that perspective, countries might pursue unilateral emissions abatement precisely because they hope to inspire and lead other states to a new shared perspective on climate change, believing that perceptions of state interest not only drive international relations but also can, at least in part, be determined by them.

As the preceding discussion already indicates, international ordering also can be usefully studied and understood by focusing on a wider array of actors and institutions than simply states, which are the usual focus of rationalist accounts. As Kennedy summarizes:

Any so-called “realism” that attends only to the overt acts of national sovereigns is no longer realistic. In our world, power lies in the capillaries of social and economic life. Myriad networks of citizens, commercial interests, civil organisations and government officials are more significant than interstate diplomacy. Statesmen and stateswomen act against a background fabric of expectations – the legitimating or delegitimizing gaze of world public opinion – and they act in the shadow of all manner of public and private norms (Kennedy 2005, p. 3).

In the environmental realm, important contributions have followed this advice by, *inter alia*, breaking down the state into its constituent departments through a focus on the domestic implementation process (Victor et al. 1998), evaluating how domestic regulations and institutions affect the ability of states and other actors to compete in

international standard-setting arenas (Mattli & Büthe 2003), examining the surprising influence of subnational governmental actors on the global policy stage (Kysar & Meyler 2008), formalizing the concept of epistemic communities as similarly important policy actors (Haas 1992), evaluating how the professional affiliation of representatives to international standard-setting bodies can influence decision making (Veggeland & Borgen 2005), and exploring the phenomenon of transnational networks of regulatory officials that arguably “have become fully formed alternatives to the new international tribunals that increasingly meant to give form and content to international legal regimes” (Zaring 2009, p. 212; see also Slaughter 2004). These various strands of inquiry resonate well with the emerging legal literature on “global environmental law” (Yang & Percival 2009), a field that “seeks to move beyond the traditional focus of international environmental law on the possibilities and limits of consent-based regimes among state actors and abstract arguments regarding instrument choice toward a more empirically grounded focus on institutional design and problem solving that crosses multiple jurisdictional scales and attends to multiple actors coordinating through a variety of organizational forms” (Boyd 2010a, p. 504).

Scholars working under the banner of global governance studies have fully embraced this decentering of the state for both positive and normative reasons: “The move to governance seems broadly to reflect the view that paradigms like ‘regulation’ or the ‘Westphalian’ system in international relations are no longer capacious enough to generate useful theory or guide the humane practice of social control” (Burriss et al. 2008, p. 1). From the governance perspective, problems such as climate change reveal the inability of conventional frameworks to adequately grasp twenty-first-century threats and the variety of actors, norms, and institutions that have arisen to address them. Targets of regulation must be seen as embedded within intricate social, economic, and ecological systems that span the globe and defy prediction

or control in a top-down, state-driven manner. Thus, governance can only emerge within such systems from the decentralized interventions of multifarious public and private actors, each operating at different levels and from different spheres of authority, utilizing a range of policy tools both hard and soft and representing diverse interests and stakeholder groups. Understanding how a governance system arises and stabilizes in this terrain is far more complicated than conventional study of international law (Boyd 2010a). In addition to mapping the ways in which various global initiatives are worked and reworked through the vernacular institutions of national and subnational formations (Sassen 2006), one must be prepared to examine the role of nongovernment organizations in what one scholar terms world civil politics, whereby such organizations not only lobby governments directly to influence state interest but also work through transnational networks to alter norms of appropriate conduct at the level of individuals and communities (Wapner 1996). Nongovernmental organizations might even exert a sort of virtual Westphalian power by allying with weak states and providing diplomatic services to them during multilateral negotiations (Spiro 2007). Similarly, the business community must be acknowledged as a force capable of asserting strong influence over the design and impact of governance systems, both through conventional means of shaping government positions and, increasingly, through direct engagement with international institutions and creation of new institutions and partnerships (Braithwaite & Drahos 2000, Levy & Newell 2005). Interactions between these two movements have yielded particularly interesting developments in the form of private global governance (O’Neill 2009), including those processes and norms associated with the corporate social responsibility movement (Auld et al. 2008), and with the use of market-based certification and labeling regimes to promote social and environmental goods (Bartley 2007, Cashore et al. 2004). The latter example of nonstate market driven governance has been an especially significant area of study, not only

because certification and labeling schemes exemplify so much that is of theoretical interest within governance studies but also because their practical impact could be quite significant: “Current systems alone operate in sectors that represent one-fifth of the products traded globally” (Bernstein & Cashore 2007, p. 348).

Perhaps because its subject matter is plural, fragmented, and messy, the global governance literature often feels rather unruly. Increasingly, scholars are finding ways to synthesize its findings and features into more manageable rubrics. The recursivity framework, for instance, encompasses a politics of global norm creation, a politics of domestic adoption and implementation, and a politics of interaction between the two driven by intermediary actors (Halliday 2009). A critical advantage of this integrated framework is that it focuses attention on possible gaps and mismatches between norms articulated at the global level and capacities of domestic actors expected to implement them. Burgeoning literatures on the question of legitimacy in global governance regimes (Bernstein & Cashore 2007, Bodansky 1999) and the possibility of global administrative law (Esty 2006, Kingsbury et al. 2005) also help as bridging devices by establishing and evaluating normative criteria for inclusion and participation in global policy-making processes. Not only are multiple actors and levels of governance being synthesized in this manner but also multiple modes of influence. Sophisticated writers in the global governance literature, for instance, increasingly adopt an integrated framework in which realist, liberal institutionalist, and constructivist insights are combined, recognizing the “importance of the interaction of social structure with the dynamics of choice” (Bernstein & Cashore 2007, p. 352). From this vantage point, a once-contested norm might over time become sufficiently embedded as to become part of the social structure within which interest-maximization occurs. Some form of attention to labor and environmental conditions upstream in a supply chain, for instance, appears to have become a relatively settled aspect of multinational corporate

citizenship, such that firm profit-maximization occurs now under a different, more socially inflected set of constraints.

This section has only hinted at the complexity and significance of questions raised by global governance studies. Continuing interactions within and across disciplines will enrich the standard set of conceptual tools—actors, interests, and institutions; discourses and norms; instrument choice, implementation, and enforcement; multiple, overlapping governance systems; etc.—with still new ways of understanding and assessing global social and ecological change. As discussed in the previous section, the role of knowledge practices in making such changes legible as global policy issues, for instance, is an important and underappreciated one that recently has been added to the legal literature. And social scientists and legal scholars of various persuasions have started to expand the literature on global governance by illustrating how legal technologies—such as the value form devised to incorporate avoided deforestation into emerging carbon markets—hold implications not only for standard questions about institutional design and regulatory effectiveness but also for the very nature of sovereignty, territoriality, and community (Boyd 2010a, Sassen 2006). To be sure, the emergence of a multilateral world environmental organization that successfully tackled climate change and other globe-spanning problems through top-down regulatory controls might well turn the tide back toward more traditional areas of inquiry. But environmental scholars are advised not to hold their breath and wait.

CONCLUSION

Rather than abstract or formal truth, the American pragmatist tradition emphasizes usefulness as the primary test of knowledge’s veracity. What is useful for environmental law in the twenty-first century is to understand human cognition and decision making as both thicker and less stable than rational choice theories presume, to recognize knowledge production as something that can itself be studied and

regulated, and to perceive international policy coordination as a complex social endeavor that involves more actors and more interests than a simple game theoretic contest among states. To meet these needs environmental lawyers must explore new knowledges, as the traditionally dominant field of economics seems less useful on these dimensions than available alternatives. Our review of “nondismal” social sciences has offered some fruitful possibilities, but it has been necessarily brief and selective. In addition to the fields discussed above, scholars and practitioners of environmental law have

much to gain from canvassing such disciplines as geography, ecological anthropology, environmental sociology, environmental history, and political ecology, all of which have been almost entirely neglected by environmental lawyers but have long been asking foundational questions about nature/society in ways quite different from environmental and natural resource economics. Through these alternative lenses, the environmental problems of the twenty-first century may appear less wicked and insoluble, even as they are rendered with more accuracy and complexity.

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