Co-Evolving Expertise in Environmental Policy Debates: Rethinking Values and Participants through an Ecological Model of Rhetoric

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ABSTRACT: Environmental policy controversies reflect a struggle between "subjective" (human) and "objective" (scientific) knowledge, which a more rhetorical science could reconcile. I draw from actor network theory and rhetorical identification to suggest a model of ecological rhetoric, which I apply to two science policy projects: ecosystem service markets and adaptive management.

KEYWORDS: Latour, Haraway, ecology, adaptation, rhetoric, ecosystem services, identification, community, objectivity.

1. INTRODUCTION

On Earth Day in 2001, UN Secretary-General Kofi Annan launched the Millennium Ecosystem Assessment in response to the expressed need for international coordination of ecological knowledge and research.

The project synthesized the contributions of more than 1,360 "experts"—primarily but not exclusively scientists—to report on the state of the world's ecosystems. The basic diagnosis should sound familiar to those following the climate debate: there is resounding agreement among the international scientific community that human activities are harming the environment, and if we don't modify our behavior quickly and significantly, we could face unavoidable, irreversible, and in some cases devastating repercussions. But in spite of the urgency and cultural authority that such diagnoses ostensibly carry, the people and lawmakers of the United States rarely give them priority. Why?

The partial explanation with which this essay begins involves two related tensions that appear quite regularly in environmental policy debates: one between expert and non-expert knowledge, the other between environmental and human needs. Drawing from Latour, I will argue that both distinctions are caught up in the problematic binary of objective and subjective accounts of reality—understood as scientific expertise and embodied experience, respectively. Considering how we might reintegrate these two realms will be the primary focus of this essay.

Of course, *why* is a deceptively simple question, and the subject-object binary should not be seen as a complete answer. Indeed, one of the central assumptions in this essay is that *there are no complete answers* to decontextualized questions of causation. To suggest a cause or set of causes for a particular event, one must first define the context and the objects involved.

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For example, if I rear-end someone at a stoplight, I accept the blame, but the person I've bumped could easily think, "If I had just waited for rush hour to end, I would have never gotten hit." Both attributions of cause are partial but not inaccurate, yet they may lead to very different actions. The other driver may decide to travel at different times, while I may decide to pay better attention, and my insurance provider may decide to increase my premium. Partial causes help us predict and influence the future, but they do so only in a particular context.

Demarcating context is a kind of rhetorical selection integral to scientific inquiry. If, as Sarewitz (2000) puts it, "experiment serves to hold nature's complexity at abeyance," rhetoric is the means by which one decides what to study and what to fix. Sarewitz describes the political implications of such decisions in the climate change debate:

> To the climate modeller, a small, anthropogenic contribution to global temperature does not amount to climate "disruption," because the climate system is not fundamentally destabilized. To an ecologist, however, small temperature variations could stimulate significant changes in ecosystem function. The latter view might suggest the need for rapid policy action to control greenhouse gas emissions, even at high economic cost; the former might support a more cautious, less economically disruptive approach. (Sarewitz, 2000)

The question therefore shifts from why climate change happens to why climate change matters in the first place. If we are concerned about the stability of the climate system, we will take one approach; if we are concerned about sustaining the services provided by particular ecosystems, we will likely take another. And if there are additional, competing concerns involving economics, politics, and so forth, our chosen approach may shift dramatically as a result. In all cases, science is tremendously valuable in identifying a mechanism for change (e.g. reducing industrial emissions at a particular rate). But the mechanism(s) it identifies will always speak to particular investments and concerns.

In the section that follows, I discuss how the political function of "objective" science creates a rift between expert and non-expert knowledges, as well as natural and human needs. Noting the visible but muted role of science in current policy debates, I suggest that an explicitly rhetorical science, by bringing the objective and subjective realms into conversation, could *increase* the credibility and usability of scientific findings in political matters. Indeed, the rhetoricity of scientific facts, far from diminishing the contributions of science in policy, suggests an opportunity to more explicitly and thoroughly incorporate human values and experience into scientific knowledge production. The exigencies of our current moment suggest a constructive, *ecological* model of rhetoric that reflects the contingency and relationality of an era characterized by, among other things, globalization, environmental crises, and an emerging network culture.

To appreciate how such a model might contribute to current environmental policy discussions, I conclude by comparing two nascent efforts to integrate human and natural systems: ecosystem services markets and adaptive management programs. The former aims to put price tags on elements of the natural world that our economic system does not currently address—things like clean air and water, pollination and cultural significance. The goal is to fit "nature" into the abstract economic system that currently governs our affairs. Adaptive management, meanwhile, aims not to stabilize or change the "natural" world, but to change *with* it, as constituents of the ecosystem.

2. "OBJECTIVE" AND RHETORICAL SCIENCE IN POLICYMAKING

In science policy debates, we typically expect scientists to supply the facts and politicians to supply the values.

But if science tells us inconvenient or even ideologically impossible truths, the only "rational" choice is to accept them. Scientists can make their facts more interesting or accessible but they cannot make them otherwise. It is not surprising, then, that we are witnessing what science journalist Chris Mooney (2005) calls a "war on science": a backlash against scientific findings that appear to conflict with the beliefs and experiences of certain communities. Still, the *idea* of science has retained much of its legitimizing power (Weingart, 1999), as we see even in Mooney's example of the intelligent design debate. The Discovery Institute (a major proponent of intelligent design) provides an annotated bibliography of "Scientific Publications Supportive of Intelligent Design Published in Peer-Reviewed Scientific Journals, Conference Proceedings, or Academic Anthologies." The Institute is not rejecting science in principle; it is performing and evoking scientific authority to legitimate its own perspective. In a response to Mooney (Luskin, 2006), they quote Thomas Kuhn, accusing evolutionists of wearing the blinders of normal science—of lacking true scientific skepticism. Mooney's "war," it seems, is less between religion and science than between competing definitions of "objective" science.

Ironically, the studies that people deem objective are typically those consistent with their existing beliefs and values. Attempting to understand why the apparent scientific consensus has not convinced people that climate change is a serious threat, Kahan et al. (2011, p. 148) found that people rarely attack science itself, but instead reassign credibility to "experts" whose findings support their worldview.

Here, "expert" is a pragmatically valid designation for one who knows what works in a certain system. If literal readings of the Bible provide an epistemic base against which all other claims are tested, evolution is a no-go—as unfathomable as a neutrino outracing light. But whether we find knowledge in scripture, physics, or both, we maintain it through reference to *some* source of common ground. Objects, then, are phenomena of interest, fixed by some knowledge system, whether religious, empirical, or otherwise. Goodwin (1994) illustrates this point in his study of archeologists, where expertise comes from "socialization through language" (p. 13). The well-trained archeologist can identify with considerable nuance those elements in the landscape that other practitioners will also value. The basis for expertise is not universality or "objectivity," but the opposite: embededness and sociality. It is one's acceptance of a particular mode of selection that is, I would argue, rhetorical.

Appreciating the role of rhetoric here is critical, given the persistent technocratic tendencies at the science-policy interface, tendencies rooted in the belief that there are scientific solutions for political problems, given enough information (Weingart, 1999, p. 154). Technocratic discourse gives validity to calls for more research in policy debates (whether out of genuine concern or what Paroske (2009, p. 149) calls "epistemological filibustering"), and it sustains the fantasy that perfect knowledge will yield perfect solutions. But if such discourse appears to promote the full scientization of politics, it in fact does the opposite. Weingart (2009, p. 158) argues that since science became a source of legitimacy for policy decisions, politicians have raced to get "the latest, and therefore supposedly most compelling, scientific knowledge, driv[ing] the recruitment of expertise far beyond the realm of consensual knowledge right up to the research frontier where knowledge claims are uncertain, contested, and open to challenge." The paradox, as Weingart sees it, is that this tendency effectively de-

legitimizes scientific findings. When one can find (or hire) "expert" testimony to support virtually any position, science seems to give us very little.

The technocratic celebration of science as objective and apolitical obscures the rhetoricity of facts. The irony of objectivity, one might say, is that all objects are socially constructed. The *danger* of objectivity is that it takes for granted the ideology of those who constructed it. This is the central concern in Haraway's "Situated Knowledges" (1988, p. 580): "Science has been about a search for translation, convertability, mobility of meanings, and universality—which I call reductionism only when one language (guess whose?) must be enforced as the standard for all the translations and conversions." Whenever we speak of an object, we are evoking a context in which it is salient. Haraway's project, which this essay embraces, is to make these perspectives known, thereby "construct[ing] a usable, but not an innocent, doctrine of objectivity" (p. 582).

Construction figures importantly into both Haraway and Latour's work. Latour (1998, p. 81) writes, "To discover...is not a matter of revealing at last the 'true agent' *under* all the other, now 'false' ones …To discover is not to lift the veil. It is to construct, to relate, and then to 'place under." To discover is to create a composite agent or entity—something that comprises a set of phenomena that act similarly in certain situations, like the microbe, greenhouse gas, or attention deficit disorder (ADD). But Kenneth Burke and many others remind us that such categories invariably run into trouble at their margins, always leaving something out or including something that doesn't belong. The designation of ADD, for example, likely encompasses a range of "disorders," which may have different causes and treatments. In some cases, ADD is an important designation (for example, it allows universities to identify students who need more time on exams); in other cases it may obscure disparate causes or lead to ineffective treatments. We could try to resolve the matter by parsing out the differences, but no two cases will ever be exactly the same. To study and treat any disease or disorder, we must be able to define an agent on the basis of relevant commonalities. But we must also be able to revise these definitions to address the needs of the situation. An explicitly rhetorical approach to science considers what different definitions do and revises them to reflect the exigence and community in question.

Here is the crucial distinction between rhetorical science and "objective" science: the former, as *techne*, constructs; the latter, as *episteme*, ostensibly uncovers. A rhetorical approach builds knowledge on the ground; an objective approach imposes it from above. Since modern science achieves its predictive power by controlling all variables but those being studied, Latour (1988, p. 89) argues that scientific theories hold only to the extent that practitioners are able to make the world mimic the lab so that the experimental results can be replicated outside. When being treated for a disease, medication is shorthand for the cure only if we take it as instructed. Recovery depends not upon the pill itself, but upon a range of physiological interactions, which may not occur if we ignore the directions attached to our prescription—directions that tell us how to behave like test subjects so we can expect a similar response.

We cannot effectively apply objective science to society without policies to control the world around us—a task that appears increasingly absurd. Sarewitz (2000) calls this understanding of science the "physics view". He proposes instead a "geological view" that "recognizes that nature, as experienced by humans and as recorded in the lithosphere and cryosphere, is the evolving product of innumerable complex and contingent processes and

phenomena…" Whereas the physics view emphasizes "control and rigidity," this geological view, like rhetoric, privileges "adaptation and resilience."

Below I sketch out a framework for environmental decision-making that builds upon, but also complicates, Sarewitz's approach. The geological view does much to move science toward a more local, contingent, and dynamic understandings of the human-nature relationship. But if we take seriously the call to disrupt the divide between subjects and objects, and to make use of the contingency and radical relationality that Latour and Haraway espouse, it seems we must avoid even metaphorical evocations of bedrock. Co-evolution requires a transformation of both humans and nature. A rhetorically facilitated process of *critical* co-evolution—an ecological model of rhetoric—would help us take a more active role in this transformation, drawing from the predictive capacities of science and the context-building capacities of rhetoric to agree on and cooperatively pursue a common, if imperfect and impermanent, goal.

3. AN ECOLOGICAL MODEL OF RHETORIC

Millions of acres of the southeastern U.S. are draped in kudzu—an incredibly dense and fast-growing vine that smothers the trees and other vegetation beneath it.

Native to Japan, kudzu was introduced in the U.S. to control erosion, and for decades conservation groups and the federal government *encouraged* farmers to plant it. Unchecked by its new ecosystem, the vine flourished, rapidly crowding out the native vegetation. Government agencies have since put a great deal of time and money into developing an effective means of control, but kudzu remains unstoppable.

Hardin's First Law of Ecology states that "you cannot do only one thing." An ecological perspective recognizes that everything is interconnected—small changes may reverberate through the system, making it impossible to isolate and manipulate single parts without fundamentally changing the whole. Having in most cases co-evolved with the rest of the system, organisms cannot be meaningfully defined without reference to the others with which they interact. Antlers, camouflage, and mimicry are among the more obvious examples of how organisms embody their relationships. But while mechanistic attempts to "tweak" parts of the environment can and do have major and unexpected repercussions, we continue to try. Hence the growing interest in addressing climate change through "geoengineering"—that is, by initiating large-scale, technological transformations of the environment. Options include injecting aerosols into the atmosphere to block solar radiation and dumping iron into the ocean to boost plankton populations and therefore photosynthesis.

As these strategies suggest, we see ourselves as acting *on* rather than *in* ecosystems, making it difficult for us to grasp the degree to which our daily lives both impact and depend upon them. Latour connects this perceived divide with what he argues is the central dilemma in science policy debates—a false distinction between all things human (subjectivity, values, contingency, society) and all things nonhuman (objectivity, facts, rigidity, nature):

> If we concede too much to facts, the human element in its entirety tilts into objectivity, becomes a countable and calculable thing, a bottom line in terms of energy, one species among others. If we concede too much to values, all of nature tilts into the uncertainty of myth, into poetry or romanticism; everything becomes soul and spirit. If we mix facts and values, we come from bad to worse, for we are depriving ourselves of both autonomous knowledge and independent morality. (2004, p. 4)

A more useful mode of differentiation, Latour says, groups humans and nonhumans according to what they *do*, not what they "are" in some metaphysical sense—that is, according to habits rather than essences (2004, p. 86). After all, much human activity is functionally interchangeable with nonhuman activity (difficult to deny after Marx), just as nonhumans can often be said to argue just as loudly as humans (an accepted notion among many sub-fields in rhetoric—visual rhetoric, for example, or the rhetoric of technology). Human and "natural" phenomena are equally capable of action. Networked together, they are simultaneously objects *and* subjects, always influencing and being influenced. By removing these traditional distinctions, we can form communities or networks based on shared needs and associations, giving voice to both human and nonhuman participants.

To be clear, Latour is not engaged in a kind of nonhuman suffrage; nonhumans already speak all the time, whether we listen or not. If we ignore ecological needs, we will still have to face the consequences of our actions later on. Nonhuman voices, we could say, express what Burke calls recalcitrance. When materialists pound on tables to make their point, the tables talk back with equal and opposite force. Still, what we hear in their response is not a single voice, but a chorus that contains human voices as well—table makers and designers, lumber mill operators, and so forth. The story of any action can be thought of as a conversation between humans and nonhuman agents.

An ecological approach to environmental policy doesn't force us to face the facts, but it does ask us to listen. Environmental decision-making is a process of community formation. When we invite nonhumans to the table, everything, not just the supposedly human realm, is open to negotiation. And through these negotiations we can build a more sustainable world.

This was the vision that McKeon championed at the Wingspread Conference: rhetoric *as technology*—an architectonic art of world production (1971, p. 53). In an age where technology, not ideology, provided the foundation for collective action, McKeon argued for a blend of social constructivism and technological determinism that could allow us to participate in creating the structures that give order to our lives.

At the time McKeon was writing, the field of ecology was on the cusp of its own paradigm shift, articulated in Holling's (1973) seminal essay, "Resilience and Stability of Ecological Systems." Up to that point, ecosystems were treated as orderly machines; management practices sought to keep them stable and consistent. But as Holling (p. 17) made clear, if we approach ecosystems as engineers, tightly controlling them to minimize fluctuations, we may drastically reduce their *resilience* (their capacity to persist through major disturbances) by stifling the dynamic processes that would normally allow them to adapt. So if we, like McKeon, aim to create a space for cooperative action, perhaps we should build it as a resilient ecosystem rather than a stable technology. While the "physics" or "objective" approach to science policy pursues stability through universal knowledge and careful control, ecology and rhetoric offer tools for handling the complexities and uncertainties of our messy life on earth.

The remainder of this essay explores the potential value of an ecological perspective by applying it to two developing environmental policy strategies: ecosystem services markets and adaptive management programs.

4. ECOSYSTEM SERVICES AND ADAPTIVE MANAGEMENT

It's late winter, but strawberries are on sale: $1.99 for a twelve-ounce carton—a steal, considering the environmental toll of the pesticides, fertilizers and fuel needed to supply so many perfect (if tart) red berries out of season.

The abundance of the produce aisle is as miraculous as it is unsettling, offering strawberries when it's snowing while masking the profound, if untraceable, impacts of industrialized agriculture: toxic algae blooms, pollinator mortality, and nutrient leaching, to name a few.

Individuals troubled by these hidden costs can attempt to purchase more sustainably grown produce, though the price difference rules out this option for many. The relatively recent efforts by government agencies, nonprofit groups, and others to create ecosystem services markets (ESMs hereafter) aim to level the playing field between mass-produced foods and their more sustainable counterparts by factoring in the environmental costs of production.

ESMs, one might say, help nature speak in the universal language of (powerful) humans: money. Gretchen Daily and several other prominent ecological scientists argue that a large-scale turn to sustainability will only be possible only after institutions begin to "view…ecosystems as capital assets" (2009, p. 26). These assets would be revalued on the basis of scientific, economic, and political research, coupled with the contributions of various stakeholders (community groups, ecosystem managers, businesses and so forth). Ideally, ESMs would provide an incentive structure to promote more sustainable decision-making—companies would make the best choice for all parties involved simply by pursuing maximum profit.

Of course, efforts to create ESMs are often fraught with controversy, precisely because this ideal of a single best choice is unreachable. Moreover, translating ecosystems into "natural capital" necessarily foregrounds phenomena that lend themselves to quantification. For this reason, Robertson critiques concepts like "natural capital" and "social capital":

> Suggesting that cultural beliefs or ecosystems can be analyzed ... [as capital] amounts to a rhetorical dismissal of everything about culture and nature that cannot be reduced to an input to the production of a commodity fulfilling the utility function of the mythical *homo economicus*. And such rhetorical dismissals can be immensely powerful on the world stage, encouraging us all to assume that any value worth expressing can be expressed in price. (2009)

And as Robertson notes, rhetorical dismissals have material effects. A useful illustration of this relationship can be found in Klumpp's model of ecological argumentation, wherein "not only the speaker is at risk … so are the beliefs, principles, and values invoked in the exchange" (2009, p. 188). Klumpp is evoking his concept of pragmatic risk—the principle that *if it doesn't work, it isn't true*. In ecological argumentation, beliefs and values are sustained through their constant evocation and reconsideration as parts of the argumentative network, and this continuous reconsideration serves as a selection mechanism. The survival of a belief or perspective depends on its utility. Argument constitutes and dissolves ideological commitments and their symbolic articulations in the objective realm. And without symbolic coherence, objects may lose material coherence as well. If the "national forest" designation were to vanish, for example, forests previously defined as such could be fragmented by roads and dispersed by logging

ESMs threaten to push out of sight and, indeed, existence, phenomena that cannot be standardized or quantified—in other words, objectified. So while they appear to let nature

speak in human conversations, they do so through a process of objectification that codifies the subject-object divide. While an ecological rhetoric could provide opportunities for consubstantiality between humans and nonhumans through ongoing deliberation, the rationalizing and abstracting force of ESMs would force nonhumans into human systems, while foreclosing future discussion. Just as technocracy circumvents politics, such commodification circumvents rhetoric, making it impossible for humans and nature to transform and evolve together

Adaptive management programs, meanwhile, are based upon co-transformation. Regarding humans as part of the ecosystem, they use workshops, town meetings, and citizen science projects to engage a wide range of stakeholders, inviting input on how different people interact with and experience the environment in their daily lives. Still, these projects are typically dismissed as tokenistic or futile: time-intensive and politically complex, they frequently lose momentum and falter at impasses, ending in plans that are not discernibly different from the ones initially proposed (e.g. van Bommel et al., 2009).

Collins and Ison (2009a) argue that for adaptive management to succeed, we must rethink what we mean by "adaptation." The authors emphasize two key meanings: "adaptation as fitting into" and "adaptation as a good pair of shoes" (p. 354). In the first, adaptation is a matter of fitting together predetermined pieces to solve predetermined problems. In the second, it is a process of "co-evolution," wherein problems, participants, and the situation itself are deliberately (and deliberatively) constructed. This "social learning" model emphasizes, albeit not explicitly, rhetorical identification and construction, rather than the optimization of outcomes based on pre-established interests.

In contrast to the educational approach to public engagement, wherein experts share a non-technical version of their knowledge with stakeholders who then decide what to do, a social learning approach involves the on-site construction of both knowledge and "stakeholding" (2009b, p. 363). Rather than arrive with pre-assigned stakes in mind, participants develop a sense for what is important as they assess the situation and establish goals. This process arguably promotes the sort of situated self-awareness that Haraway pursues:

> As each stakeholder engages with situations from their different traditions of understanding [Russell and Ison, 2007], they begin to make sense of the issues from a partial perspective and different value judgments and so they construct their 'stakeholding.' (Collins & Ison, 2009b, p. 363)

The critical piece is not expert knowledge, taken to be universally applicable to all parties involved, but the ways in which different knowledges intersect and bump up against each other. Participants constitute new social identities and ways of knowing by reorienting themselves in relation to one another. While the role of scientists is somewhat vague in Collins and Ison's analysis, Latour's work makes it quite clear: scientists give voice to nonhumans.

But in spite of the improvements in this model, success remains elusive. Van Bommel et al. (2009) followed such a social learning initiative in the Netherlands, observing that because of unequal power relations, the knowledge produced reflected the perspective of those in power—social learning, they concluded, is "wishful thinking" (p. 410). They end on an optimistic note, however, reiterating Leeuwis's (2004) emphasis on 'instrumental/persuasive strategies to help create the pre-conditions for social learning and … enhance feelings of interdependence upon relevant stakeholders" (as cited in van Bommel et al., p. 410).

Still, the futility of current adaptation projects and the comparative success of certain market-based environmental protections suggest that some self-reflexivity may be in order. Having argued that knowledge is always situated and pragmatic, I should note that the position taken in this essay may not be viable outside of the sheltered epistemological environment of academia. Ecosystem services may, and probably should, appear untenable to many in our field, but that does not mean that they aren't among the best means available for sustaining human well-being—an aim that transcends most ideological divisions.

This is not to say that we should content ourselves to work within the status quo. In concluding their discussion of local knowledge systems, Watson-Verran and Turnbull write:

> The strength of social studies of science is its claim to show that what we accept as science and technology could be other than it is; its great weakness is the general failure to grasp the political nature of the enterprise and to work toward change. (2001, p. 138)

The need articulated here is for *re*constructive efforts to follow our deconstructive ones. Latour's work shows us how objects and relations are continually constructed and maintained; Haraway urges us to recognize our role in such constructions and to intervene with a critical, and self-consciously situated, eye. To the extent that rhetoric is concerned with making rather than uncovering and the contingent rather than the invariant, it seems that it has an important and unfilled role to play. An ecological rhetoric could operate in its constitutive, constructive, and persuasive capacities by facilitating identification and offering new models of deliberation that engage humans and nonhumans in a process of critical co-evolution.

REFERENCES

Collins, K. & Ison, I. (2009a). Living with environmental change: Adaptation as social learning. *Environmental Policy and Governance*, *19*, 351–357.

Collins, K. & Ison, I. (2009b). Jumping off Arnstein's ladder: Social learning as a new policy paradigm for climate change adaptation. *Environmental Policy and Governance*, *19*, 358–373.

Daily, G.C., Polasky, S., Goldstein, J., Kareiva, P.M., Mooney, H.A., Pejchar, L., Rickets, T.A., Salzman, J., & Shallenberger, R. (2009.) Ecosystem services in decision making: Time to deliver. *Frontiers in Ecology and the Environment*, *7*(1), 21–28.

Goodwin, C. (1994). Professional vision. *American Anthropologist, 96*(3): 606–633.

Haraway, D. (1988). Situated knowledges: The science question in feminism and the privileged of partial perspective. *Feminist Studies, 14*(3), 575–599.

Holling, CS. (1973). Resilience and stability of ecological systems. *Annual Review of Ecology and Systematics, 4,* 1–23.

Kahan, D., Jenkins-Smith, H., & Braman, D. (2011). Cultural cognition of scientific consensus. *Journal of Risk Research, 14*(2), 147–174.

Klumpp, J. (2009). Argumentative ecology. *Argumentation and Advocacy*, *45*(2), 183–197.

Latour, B. (1988). *The pasteurization of France*. (A. Sheridan & J. Law, Trans.). Cambridge, MA: Harvard University Press.

Latour, B. (2004). *Politics of nature*. Cambridge, MA: Harvard University Press.

Luskin, C. (2006, Sep. 22). Whose "war" is it, anyway? Exposing Chris Mooney's attack on intelligent design. *The Discovery Institute*. Retrieved from http://www.discovery.org/a/3739

McKeon, R. (1971). The uses of rhetoric in a technological age: Architectonic productive arts. In L. Bitzer & E. Black (Eds.), *The prospect of rhetoric* (pp. 44–63). New Jersey: Prentice Hall.

Millennium Ecosystem Assessment. (2005). Overview of the Milliennium Ecosystem Assessment. Retrieved from http://www.maweb.org/en/About.aspx

Mooney, C. (2005). *The Republican war on science*. Basic Books.

Paroske, M. (2009). Deliberating international science policy controversies: Uncertainty and AIDS in South Africa. *Quarterly Journal of Speech. 95*(2), 148–170.

Remnick, D. (2006, April 24) Ozone man. *The New Yorker*. Retrieved from http://www.newyorker.com/archive/2006/04/24/060424ta_talk_remnick

Robertson, M. (2009, Jan. 4). Five hidden challenges to ecosystem markets. *The Katoomba Group's Ecosystem Marketplace*. Retrieved from http://www.ecosystemmarketplace.com/pages/dynamic/article.page.php?page_id=6415

Sarewitz, D. (1999). Science and environmental policy: An excess of objectivity. *Center for Science, Policy and Outcomes*. Retrieved from http://www.cspo.org/products/articles/excess.objectivity.html

van Bommel, S., Roling, N.,Aarts, & N. Turnhout, E. (2009). Social learning for solving complex problems: A promising solution or wishful thinking? A case study of multi-actor negotiation for the integrated management and sustainable use of the Drentsche Aa area in the Netherlands. *Environmental Policy and Governance*, *19*, 400–412.

Watson-Verran, H. & Turnbull, D. (2001). Science and other indigenous knowledge systems. In S. Jasanoff, G.E. Markle, J.C. Petersen & T. Pinch (Eds.), *Handbook on Science and Technology Studies* (pp. 115–139). Thousand Oaks: SAGE.

Weingart, P. (1999). Scientific expertise and political accountability: Paradoxes of science in politics. *Science and Public Policy, 26*(3), 151–161.