Human beings and the natural world are on a collision course. Human activities inflict harsh and often irreversible damage on the environment. . . . If not checked, many of our current practices . . . may so alter the living world that it will be unable to sustain life in the manner that we know.

—“World Scientists’ Warning to Humanity” (1992)

The scientific debate is closing [against us] but not yet closed. There is still a window of opportunity to challenge the science.

—Frank Luntz, memo to Republican Party leaders (2001)

On March 7, 2001, Ian Thomas, a 33-year-old government scientist, posted a map of caribou calving areas in the Arctic National Wildlife Refuge on a U.S. Geological Survey website. At the time, Thomas was working as a cartographer for the agency’s Patuxent Wildlife Research Center in Maryland. Using satellite imagery and other data, his website displayed more than 20,000 maps showing bird, mammal, and amphibian habitats.
and vegetation land covers. Thomas also had been working on maps for all of the national wildlife refuges and national parks, using the new National Landcover Datasets (Thomas, 2001). Nevertheless, his timing in posting the new map of caribou calving areas landed Thomas in the center of a national controversy. The U.S. Congress had begun to debate a proposal from President George W. Bush's administration to open parts of the Arctic National Wildlife Refuge (ANWR) to oil and gas drilling, and the calving grounds appeared to be directly in the path.

On his first day at work after posting his map, Thomas was fired and his website removed. In an official statement, a public affairs officer for the U.S. Geological Survey stated that Thomas had been "operating outside the scope of [his] contract" and had not had his maps "scientifically reviewed or approved" before posting them on the website (Harlow, 2001). Thomas himself believed that his dismissal was "a high-level political decision to set an example to other federal scientists" who might not support the Bush administration's campaign to open the refuge for oil and gas exploration. "I thought that I was helping further public and scientific understanding and debate of the issues at ANWR by making some clearer maps," Thomas wrote in an e-mail to colleagues (2001). Asked about the USGS's removal of his maps, Thomas told the London Guardian newspaper, "You don't have to burn books now. You just press the delete key" (Borger, 2001).

News of Thomas's dismissal spread quickly around the globe via Internet chat rooms and listservs; his case became a cause célèbre and was taken up by environmental groups, debated in science and professional societies, and championed by the Public Employees for Environmental Responsibility (an advocacy group for scientists and other federal employees of environmental agencies). The furor over Thomas's map and his dismissal also raised a number of questions about the discourse of science in public debate over environmental policies:

- What is the proper role for science (and scientists) in deciding policy in a democratic society?
- Who should control the agenda of science and the uses of scientific research?
- How should the public interpret the significance of scientific claims when the research is uncertain (e.g., global warming, exposure to toxic substances, or the effects of logging on forest wildlife)?

In this chapter, I'll explore these questions as a source of knowledge and as a site of conflict over symbolic legitimacy. Symbolic legitimacy refers to the perceived correctness, authority, or common sense of a policy or an approach to a problem relative to other competing responses. (For a discussion of symbolic legitimacy boundaries, see Chapter 2.) As a site of conflict, the symbolic legitimacy of science is questioned as environmental groups, industry, and the media seek to influence the public by contesting the boundaries of consensus on the meaning and uses of science in environmental problems.

This chapter is organized into four sections. In the first, I'll trace how science became an important source of symbolic legitimacy in a society beset with complexity and specialized technical knowledge. The second section examines one way in which some propose to manage the problem of uncertainty about environmental dangers: by invoking the precautionary principle, an appeal to caution or prudence before taking a step that could prove harmful later. Because some in industry fear that too much caution may delay or restrict new products or increase the costs to industry, the third section, therefore, looks at attempts by industry to challenge the claims of environmental science through what some have called symbolic legitimacy conflict, or a challenge to the credibility of science itself. The chapter ends with an examination of recent debates about the role of scientists: Should scientists enter the public sphere or serve as advocates for positions?

Science and Symbolic Legitimacy Boundaries

As I write, the EPA and the U.S. Department of Energy disagree about whether the president's Clear Skies proposal can reduce mercury emissions
from coal-fired power plants by almost half by the year 2007. (Mercury pollution has been linked to birth defects and neurological damage in fetuses and young children.) Research on the effects of installing new pollution equipment to reduce sulfur dioxide and nitrogen oxide is divided over whether this same equipment would also reduce mercury emissions as a co-benefit (Piantin & Gugliotta, 2003). Similar problems of complexity in scientific research appear in other, major environmental and public health issues at the start of the 21st century: climate change, genetically modified organisms, the amount of critical habitat needed for endangered species, and the effect on human fertility of synthetic chemicals that mimic natural hormones.

Problems involving human health and industrial products are not new. Therefore, it may be useful to look at an earlier era that faced similar concerns, as well as at the emerging role of science in guiding important decisions about human health and the environment.

John Dewey Redux: Complexity and the Problem of the Public

In the early 20th century, the philosopher John Dewey confronted a similar problem as the American public experienced problems with urban sanitation and industrial safety as well as revolutionary changes in communication technologies. In his book *The Public and Its Problems* (1927), Dewey warned of an “eclipse of the public” that he felt would occur as citizens lacked the expertise to evaluate the increasingly complex issues before them. He wrote that the consequences of the decisions before the public are so large, “the technical matters involved are so specialized . . . that the public cannot for any length of time identify and hold itself [together]” (p. 137). With the growing need for technical expertise in making decisions, Dewey feared the United States was moving from democracy to a form of government that he called technocracy, or rule by experts.

The solution favored by the Progressive movement of the 1920s and 1930s was grounded in the reformers’ faith in science and technology as a source of legitimacy for state and federal regulation of the new industries. Williams and Matheny (1995) explain that, in regulatory policy, the Progressives wanted to rely on trained experts working within government organizations to discover an objective public interest (p. 12). Legitimacy for political decisions would come from these experts’ use of “neutral, scientific criteria for judging public policy” (p. 12).

Although the Progressive ideal of neutral, science-based policy would run into difficulty, the legitimacy accorded to science by the public grew steadily stronger. Willis Harman observed that, over the past century, popular culture has given “tremendous prestige and power to our official, publicly validated knowledge system, namely science” (1998, p. 116). For example, when the EPA announced in 2001 that the new Bush administration was abandoning a Clinton-era rule requiring lower levels of arsenic in water, EPA administrator Christine Whitman pledged that a new rule would be based on “sound science and solid analysis” (Jehl, 2001, p. A1). (The EPA later reinstated the strict arsenic rule after a review of scientific studies by the National Academy of Sciences.) President Clinton had used the same phrase earlier when he issued an executive order directing that the EPA’s environmental policies “be based on sound science” (Chitnis, 2001).

The appeal to “sound science” in environmental policy reflected a keen awareness of the cultural norm that policy should be as free as possible of political bias and grounded in reliable and valid knowledge. To some extent, this awareness evolved during the 20th century and continues to do so, as government agencies have sought to incorporate the counsel and findings of scientists in the EPA, the Department of the Interior, and in agencies such as the U.S. Fish and Wildlife Service. Additionally, scientists from the National Research Council, universities, and independent research centers routinely advise policymakers on the scientific implications of environmental proposals.

Still, the Progressive ideal of neutral, science-based policy falls short of its promise in other ways. Agency budgets, pressures from political constituents, ideology, and other factors limit the extent to which policy decisions flow directly from scientific findings. In some cases, the science itself may result in ambiguous conclusions. A recent dispute over the use of science in implementing the Endangered Species Act illustrates some of the ways in which the Progressive ideal falls short. The dispute results from a memo written by the southwestern regional director of the U.S. Fish and Wildlife Service on January 27, 2005, to his staff about recovery plans for certain species.

In the memo, Dale Hale, the director, “instructed members of his staff to limit their use of the latest scientific studies on the genetics of endangered plants and animals when deciding how best to preserve and recover them” (Barringer, 2005, p. A14). He stated that, in planning for recovery of a species such as the endangered Apache trout, staff must “use only the genetic science in place at the time it was placed on the endangered species list—in some cases the 1970s or earlier—even if there have been scientific advances in understanding the genetic makeup of the species and its subgroups in the ensuing years” (p. A14). A factor in this decision was the cost of recovery efforts, particularly if each genetic subgroup is to survive. For example, U.S. Fish and Wildlife Service officials in Arizona have argued that the $2 million to $3 million spent for the recovery of each subgroup of the Apache trout in
the last five years "was misdirected, since the species as a whole was on its way to recovery" (Barringer, 2005, p. A14). An official with the Arizona Game and Fish Department agreed with Hall, saying, "By not having to worry about small genetic pools, we can do these things [recovery efforts] faster and better" (quoted in Barringer, 2005, p. A14). As a result, a species could be removed from the endangered list, making it "easier for officials to approve actions, like... logging or commercial fishing—that could reduce a species' number" (p. A14).

Yet, other U.S. Fish and Wildlife Service officials and biologists disagreed with the new directive to limit use of the latest science. Ralph Morgenweck, a regional director for the mountain-prairie office, sharply rebuked his colleague. He explained that knowing whether populations of an endangered species are genetically isolated or exist in separate habitats "can assist us in identifying recovery units that will ensure that a species will persist over time. . . . It can also ensure that unique survival adaptations that may be essential for future survival continue to be maintained in the species" (quoted in Barringer, 2005, p. A14). Morgenweck went on to object that Hall's memo limiting the use of the latest science "could run counter to the purpose of the Endangered Species Act" and contradict the act's directive to use the best available science (p. A14). Whatever the outcome, this case illustrates the ongoing tension in federal agencies over whether science will guide policy or whether other factors will prevail, such as cost, political pressure, or differences in management philosophy.

Questioning Symbolic Legitimacy Boundaries

Even as science has become an important source of symbolic legitimacy in society, science itself is increasingly a site of conflict among disputing parties—industry, public health officials, and environmentalists—as they attempt to influence public perceptions of the scope or severity of problems. For example, environmental historian Samuel Hays (2000) reports that, as the new environmental sciences began to document risks from industrial products in the 1960s and 1970s, affected businesses challenged the science "at every step, questioning both the methods and research designs that were used and the conclusions that were drawn" (p. 222). Regulated industries, such as electric utility companies, oil and gas refineries, chemical manufacturing, and older extractive industries (mining, logging, and ranching), placed tremendous pressure on government agencies to justify the science behind new regulations. Some critics have charged that, in response, agency officials have sometimes ignored or misrepresented scientific findings to placate the criticism from regulated industries (Wilkinson, 1998).

In debates about environmental policies, one source of controversy often is the question of whether there is conclusive proof, something that is often beyond the reach of science (Hays, 2000, p. 149). John Fitzpatrick, director of the Cornell Laboratory of Ornithology, recently observed, "A paradox for conservation is that knowledge is always incomplete, yet the scale of human influence on ecosystems demands action without delay" (quoted in Scully, 2005, p. B13). This paradox poses a serious challenge for the public's willingness to support steps to protect the environment. At the same time, it provides the opponents of stronger regulations with an opportunity to contest the scientific claims:

To the public, the question is usually one of "is there enough proof," an issue that the media takes up in order to bring simplicity out of complexity. . . . This complexity of debate, arising out of the complexity of arguments over proof, generates opportunities for those who wish to slow up application of scientific knowledge and establishes . . . caution on the part of decision makers in public agencies. Their watchword is "insufficient proof." (Hays, 2000, p.151)

The challenge for government agencies becomes even more acute when the science fails to tell officials how to choose between technical and political questions (for example, What is acceptable risk?) or how to decide among competing values, such as the health benefits to be gained versus the costs to comply with a regulation (for example, the requirement that power plants reduce mercury pollution by 46% by 2007).

Two important questions, therefore, arise for the study of environmental communication: What counts as scientific knowledge? Who controls its production, dissemination, and use? To ask (and answer) these questions is to ask about the symbolic legitimacy boundaries of science itself. It also asks about the types of communication that contending parties use as they challenge, reinforce, or reframe these symbolic boundaries. For example, in the remaining sections of this chapter, I'll discuss attempts by some opponents of environmental standards to forestall discussion and debate in the public sphere by removing questions about global warming or endangered species to the technical sphere of scientific journals and laboratories as a method of limiting action. (For discussion of the public, personal, and technical spheres, see Chapter 2.)

In the Ian Thomas case, government officials sought to control the type of information that reached the public about the Arctic National Wildlife Refuge. In fact, an earlier communications directive limited the list of people in the federal government who would be allowed to publish anything related to the ANWR (Thomas, 2001). Similar struggles by industry and environmental groups to mobilize the resources of science, control access to
information, or challenge a policy's legitimacy occur in almost every major new story about the environment—proposals to ban logging in the national forests, air pollution standards, and, recently, the EPA's deletion of scientific research on the causes of global warming from its first "report card" on the environment (U.S. Environmental Protection Agency, 2003).

In the latter case, White House officials heavily edited the EPA's Draft Report on the Environment, deleting a 1999 study showing that global temperatures had risen sharply in the previous decade. In its place, these officials suggested a study funded by the American Petroleum Institute that questioned the 1999 findings on global temperatures (Seelye & Lee, 2003). In the end, the EPA chose to delete the entire section on global warming, "to avoid criticism that they [were] selectively filtering science to suit administration policy" (p. 28A). (For more information on the controversy over the EPA's report card, see Revkin & Seelye, 2003).

The dispute over the EPA's report card also illustrates the importance of the symbolic legitimacy boundaries associated with government uses of science. Earlier, in Chapter 2, I noted that the outcome of arguments between parties over legitimacy depends only partly on the facts. Equally important are the symbolic associations that politicians, business, and the public attach to a proposal, policy, or person (Schulzke, 2000). Symbolic legitimacy boundaries define a particular policy, idea, or institution as reasonable, appropriate, or acceptable. What is often at stake in the disputes between critics of environmental regulations and their supporters is the public's perception of the validity of scientific claims. To understand conflicts over science and the environment, therefore, we need to examine the ways in which the contending parties in society attempt to deal with scientific uncertainty, as well as the communication used in seeking to move scientific knowledge into the public sphere for discussion and as the basis for actions to protect the environment.

Because the symbolic associations of legitimacy boundaries are discursively constituted, they are also open to question and challenge. As far as environmental conflicts go, the fault line for such symbolic legitimacy conflict in a democratic society occurs most explicitly between supporters of an ethic of caution or prudence and others whose economic interests are affected by such caution and who seek to contest the claims of science. We'll discuss each of these tensions in the following sections.

The Precautionary Principle

Earlier, I noted that knowledge about the effects of human behavior on the environment is always incomplete, yet the scale of our influence on the earth demands that we take action. Stanford University biologists Paul Ehrlich and Anne H. Ehrlich (1996) comment that one of the great ironies in the environmental sciences is that science itself can never provide "absolute certainty or the 'proof' that many who misunderstand science say [that] society needs" (p. 27). Although certainty evokes a powerful pull for social reformers, religious adherents, and popular radio commentators, "it is forever denied to scientists" (p. 27). This is particularly the case in areas like chemical pollution and such large-scale problems as global warming and the loss of biodiversity. The Ehrlichs note with some concern that, in the absence of more precise knowledge of complex environmental systems, "Humanity is running a vast experiment on the biosphere and on itself" (p. 29).

Environmental Science and Uncertainty

The absence of scientific certainty also provides openings for some to call for delays before government takes action. For decades, the opponents of the environmental regulation of industry have used the indeterminacy of environmental sciences as a rationale for objecting to new standards to regulate hazardous chemicals such as lead, DDT, dioxin, and polychlorinated biphenyls (PCBs). A classic case, in 1922, involved the introduction of tetraethyl lead in gasoline for cars. Although public health officials thought lead posed a health risk and should be studied more carefully first, the industry argued that there was no scientific agreement on the danger and pushed ahead to market leaded gasoline for the next 50 years. Peter Montague (1999) of the Environmental Research Foundation writes, "The consequences of that... decision [to delay standards for leaded gasoline] are now a matter of record—tens of millions of Americans suffered brain damage, their IQs permanently diminished by exposure to lead dust" (para. 3).

Historically, the procedures for assessing risk have given the benefit of the doubt to new products and chemicals, even though these may prove harmful later. (For a description of methods used in risk assessment, see Chapter 6.) For example, existing government standards require only a tiny fraction of the 70,000 or more chemicals in commercial use in the United States today to be "fully tested for their ability to cause harm to health and the environment" (Shabecoff, 2000, p. 149). By the 1990s, however, a number of scientists, environmentalists, and public health advocates had begun to argue that the burden of proof should be shifted to require use of the precautionary principle.

As early as the 1960s, scientists such as René Dubos, Rachel Carson, Barry Commoner, George Wald, and others had begun to warn of possible ecological disaster and danger to human health from new chemicals
appearing in water, air, and soil and in the food chain and mothers’ breast milk. Rachel Carson’s best-selling book *Silent Spring* (1962) became the most visible public warning about the use of chemical agents such as DDT (dichlorodiphenyltrichloroethane) in agricultural spraying and pesticides. (*Silent Spring’s* publication prompted congressional hearings and scientific study of the health effects of massive spraying of chemicals on food crops.) Media stories of nuclear fallout from atmospheric tests and chemical residues on foods also fueled growing public anxieties. And, as I pointed out in Chapters 2 and 8, by the early 1980s, the upstate New York community of Love Canal had awakened the nation’s consciousness to the hazards of its chemical culture. The angry response of residents to the discovery that an elementary school had been built on top of toxic chemicals fueled demands for cleanup of other contaminated sites throughout the country. Others warned of specific dangers from the new organochlorines (such as PCBs) that can “reduce sperm counts, disrupt female reproductive cycles . . . cause birth defects, [and] impair the development and function of the brain” (Thornton, 2000, p. 6, in Markowitz & Rosner, 2002, p. 296).

The Precautionary Principle and Its Critics

Eventually, scientists and public health officials began to urge that a new approach to regulation of potential environmental risks be adopted, “one that takes science’s uncertainty not as a sign that there is no danger but as a sign that serious danger might well exist” (Markowitz & Rosner, 2002, p. 298). This view emphasized an ethic of caution or prudence in evaluating products that, even with low levels of toxicity, could harm populations in the future. In 1991, the National Research Council offered a compelling rationale for the new precautionary approach: “Until better evidence is developed, prudent public policy demands that a margin of safety be provided regarding potential health risks. . . . We do no less in designing bridges and buildings. . . . We must surely do no less when the health and quality of life of Americans are at stake” (p. 270).

An important step toward defining this principle of precaution was taken in January, 1998, at a historic gathering at the Wingspread Conference Center in Racine, Wisconsin. The Wingspread Conference on the Precautionary Principle was convened by the Science and Environmental Health Network and several foundations that funded scientific research. The 32 participants—scientists, researchers, philosophers, treaty negotiators, environmentalists, and labor leaders from the United States, Europe, and Canada—shared the belief that “compelling evidence that damage to humans and the worldwide environment is of such magnitude and seriousness that new principles for conducting human activities are necessary” (Science and Environmental Health Network, 1998, para. 3).

At the end of the three-day meeting, the participants issued the “Wingspread Statement on the Precautionary Principle,” which called for government, corporations, communities, and scientists to implement the precautionary principle in making decisions about environmental and human health (Raffensperger, 1998). The statement provided this expanded definition of the precautionary principle: “When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically. In this context the proponent of an activity, rather than the public, should bear the burden of proof” (SEHN, 1998, para. 5).

The new principle is to be applied when an activity poses a combination of potential harm and scientific uncertainty. It therefore requires (1) an ethic of prudence (avoidance of risk) and (2) an affirmative obligation to act to prevent harm. Importantly, Montague (1999) explains that the principle shifts the burden of proof to the proponents of an activity to show that “their activity will not cause undue harm to human health or the ecosystem.” Further, he explains that it requires agencies and corporations to take proactive measures to reduce or eliminate hazards, including “a duty to monitor, understand, investigate, inform, and act” when anything goes wrong (para. 13). (See “FYI: The “Wingspread Statement on the Precautionary Principle.”

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**FYI: The “Wingspread Statement on the Precautionary Principle”**

The release and use of toxic substances, the exploitation of resources, and physical alterations of the environment have had substantial unintended consequences affecting human health and the environment. Some of these concerns are high rates of learning deficiencies, asthma, cancer, birth defects and species extinctions; along with global climate change, stratospheric ozone depletion, and worldwide contamination with toxic substances and nuclear materials.

We believe existing environmental regulations and other decisions, particularly those based on risk assessment, have failed to protect adequately human health and the environment—the larger system of which humans are but a part.
We believe there is compelling evidence that damage to humans and the worldwide environment is of such magnitude and seriousness that new principles for conducting human activities are necessary.

While we realize that human activities may involve hazards, people must proceed more carefully than has been the case in recent history. Corporations, government entities, organizations, communities, scientists and other individuals must adopt a precautionary approach to all human endeavors.

Therefore, it is necessary to implement the Precautionary Principle: When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically.

In this context the proponent of an activity, rather than the public, should bear the burden of proof.

The process of applying the Precautionary Principle must be open, informed and democratic and must include potentially affected parties. It must also involve an examination of the full range of alternatives, including no action.


Not all parties rushed to embrace the precautionary principle, however. Some businesses, conservative policy centers, and politicians are concerned that the consequences of using the principle are at odds with assumptions in the Dominant Social Paradigm (Chapter 2) and object that the principle sometimes errs on the side of too much caution. That is, its use poses unnecessary barriers to economic activity and the operation of the free market. Writing for the libertarian policy center, the Cato Institute, Ronald Bailey (2002) argued that, “the precautionary principle is an anti-science regulatory concept that allows regulators to ban new products on the barest suspicion that they might pose some unknown threat” (p. 5). Bailey cites the case of the European Union’s ban on imports of genetically enhanced crops from the United States, or what have been called genetically modified organisms (GMOs). He argues that scientific panels have concluded that genetically modified foods are safe to eat and that “the EU ban is not a safety precaution, but a barrier to trade” (p. 4). In arguing this, Bailey and others therefore have demanded that higher standards of scientific certainty be required before entities like the EU or regulatory agencies can order businesses to take precautionary measures. In other words, judgments about environmental risk are best left to the technical sphere rather than to the added considerations and voices that enter into play in the public sphere of debate over environmental and health policy.

On the other hand, defenders of the precautionary principle have continued to refine the conditions under which it may be relevant and the criteria that are important in guiding environmental safety decisions that involve different levels of uncertainty. These criteria suggest the involvement of both the technical sphere and the public sphere in deliberation. For example, Carolyn Raffensperger and Katherine Barrett (2001) of the Science and Environmental Health Network defended the use of the precautionary principle in the dispute over the European Union’s ban on genetically enhanced crops. They argued that the ban is both necessary and justifiable because “our ability to predict, calculate, and control the impacts of technologies such as GM organisms is limited. The novelty and complexity associated with inserting isolated gene constructs into organisms, and releasing those organisms on a global scale demand that we acknowledge uncertainties, accept responsibility, and exercise due caution” (p. 4).

(The dispute over the safety of genetically enhanced food and agricultural products is a continuing debate, one that has placed the precautionary principle squarely at the center of the controversy. For a defense of its use, see Raffensperger & Barrett, 2001; for a skeptical study of the precautionary principle, see Goklany, 2001. A sophisticated attempt to balance the uses of the principle in cases of environmental risk in cases before the WTO and NAFTA may be seen in Crawford-Brown, Pauwelyn, & Smith, 2004).

The controversy over the precautionary principle mirrors a larger conflict between some opponents of the role of science generally in setting environmental policy. It is to this conflict, and the attempt to challenge the symbolic legitimacy of science itself, that we now turn.

Industry, Science, and the Symbolic Legitimacy Conflict

Although science and technology have produced “a cornucopia of material abundance for a substantial portion of the human race” (Shabecoff, 2000, p. 138), scientific knowledge about the environmental impacts of industrial actions has been the site of controversy. In their study of business campaigns to shape the public’s perceptions of science, Markowitz and Rosner (2002) observe that, during much of the 20th century, industry has argued that there must be “convincing proof of danger before policymakers had the right to intrude on the private reserve of industry in America” (p. 287). Yet, even as
new knowledge emerged, some industries challenged the scientific consensus “at almost every step” when that knowledge might lead to new regulations (Hays, 2000, p. 138). The reason for this is not hard to understand. The possibility that some products and industrial pollutants might be linked to cancers, endocrine disruptors, and other health problems, as well as to changes in the earth’s climate, raises not only issues of the financial liability of these companies but also prospects for further regulation of industry itself.

One result has been that the industries at risk of regulation by environmental science—particularly petrochemicals, energy, real estate development, and utilities—have “sought to turn science in their direction and [have] attracted scientists who could help with that objective” (Hays, 2000, p. 138). A look at several of these cases is instructive for understanding the communication used by industry to contest the legitimacy of scientific consensus.

Science and the Trope of Uncertainty

The range of communication used by industry to challenge the symbolic legitimacy of environmental science includes the funding of friendly science, the dissemination of research that counters scientific findings that might justify restrictions on industry, and, most importantly, the use of a rhetorical trope of uncertainty. (A trope is a “turn” or reframing of a claim that alters its meaning or changes our understanding of a statement.) Let me describe this trope briefly and then illustrate its use and the related modes of communication some industries and trade associations have used to challenge the claims of environmental science in recent years.

When skeptics call for further research into the causes of global climate change or the effect of dams in the Pacific Northwest on runs of salmon, they are drawing on a familiar tool in industry’s challenge to the legitimacy of science. This trope of uncertainty functions to nurture doubt in the public’s perception of scientific claims and thereby to delay calls for action. In rhetorical terms, the trope of uncertainty “turns,” or alters, the public’s understanding of what is at stake, suggesting there is a danger in acting prematurely, a risk of making the wrong decision. For this reason, Markowitz and Rosner (2002) have observed that “the call for more scientific evidence is often a stalling tactic” (p. 10).

In a sense, the trope of uncertainty is an attempt to reverse the assumptions associated with the precautionary principle. Whereas the precautionary principle stresses the need to err on the side of caution before human or corporate actions harm the environment or human health, an appeal to uncertainty or a call for further research turns this caution against scientific claims themselves. Since environmental science cannot guarantee certainty about many things, the trope urges caution before the government bases any regulatory actions on such science.

A standard reference for the basic strategy for nurturing doubt about the legitimacy boundaries of an issue is public relations expert Philip Lesly’s (1992) article, “Coping With Opposition Groups.” Lesly advises corporate clients to design their communication to create uncertainty in the minds of the public: “The weight of impressions on the public must be balanced so people will have doubts and lack motivation to take action. Accordingly, means are needed to get balancing information into the stream from sources that the public will find credible. There is no need for a clear-cut ‘victory.’ . . . Nurturing public doubts by demonstrating that this is not a clear-cut situation in support of the opponents usually is all that is necessary” (p. 331; emphasis added).

Feeling uncertain about an issue, the advice goes, the public will be less motivated to demand action, and the political will to solve a problem will lessen. For example, in their study of corporations’ uses of public relations strategies opposing government regulation, Sheldon Rampton and John Stauber (2002) observe, “Industry’s PR strategy is not aimed at reversing the tide of public opinion, which may in any case be impossible. Its goal is simply to stop people from mobilizing to do anything about the problem, to create sufficient doubt in their minds about the seriousness of global warming that they will remain locked in debate and indecision” (p. 271). They note that the group Friends of the Earth International called such attempts to introduce uncertainty in order to dampen the motive for action as “lobbying for lethargy” (p. 271).

A striking case of the introduction of uncertainty into debates over the environment occurred in the report of an important consultant to a political party over the politically sensitive matter of global warming.

Memo on Global Warming: "Challenge the Science"

Sometimes, the conflict over the legitimacy of scientific consensus in environmental matters may be fought on the terrain of language itself, by engaging in what one political consultant called the “environmental communications battle” (Luntz, 2001, p. 136). In a memo entitled “The Environment: A Cleaner, Safer Healthier America” addressed to leaders of a major political party, consultant Frank Luntz (2001) warned, “The scientific debate is closing [against us] but not yet closed.” Nevertheless, he advised, “There is still a window of opportunity to challenge the science” (p. 138; emphasis in original). The “window of opportunity” to which Luntz referred was the possibility that skeptics could raise enough doubts about the symbolic legitimacy of
scientific claims about climate change that the public's uncertainty would delay governmental action in this area.

Luntz's memo offers a rare look into a behind-the-scenes debate over rhetorical strategy in high-level political circles. It is noteworthy especially for its frank assessment of the public relations dilemma that faced many politicians on the eve of the U.S. congressional elections in 2002. For example, Luntz had found that voters particularly distrusted the Republican Party on the environment. Thus, his memo to the party is revealing for his advice on the rhetorical strategy that he believed Republicans needed in order to challenge the growing consensus—the legitimacy boundaries—for many environmental issues, such as safe drinking water, the protection of natural areas, and especially global warming.

In one section of the memo, Luntz asserts that voters currently believe there is no consensus about global warming in the scientific community. "Should the public come to believe that the scientific issues are settled," he writes, "their views about global warming will change accordingly." Advising party leaders, the memo states, "Therefore, you need to continue to make the lack of scientific certainty a primary issue in the debate" (p. 137; emphasis in original). Among the ways to challenge the science, according to the memo, is to "be even more active in recruiting experts who are sympathetic to your view, and much more active in making them part of your message" because "people are willing to trust scientists" more than politicians (p. 138).

**FYI: Luntz's Memo on the “Environmental Communications Battle” (2001)**

"While we may have lost the environmental communications battle in the past, the war is not over...." [p. 136].

"We have spent the last seven years examining how best to communicate complicated ideas and controversial subjects. The terminology in the upcoming environmental debate needs refinement, starting with 'global warming' and ending with 'environmentalism.' It's time for us to start talking about 'climate change' instead of global warming and 'conservation' instead of preservation" [p. 142].

"The three words Americans are looking for in an environmental policy; they are 'safer,' 'cleaner,' and 'healthier' [p. 131]."


**Industry-Sponsored Science and Questioning of Scientists**

Other evidence of industry-sponsored science and attacks on scientists have appeared in news accounts and academic studies in recent years. Philip Shabecoff (2000), the founder of the Internet news source Greenwire, reported that the largest study ever conducted on the effects of polychlorinated biphenyls (PCBs) on workers' health had been funded by an interested party, General Electric. As we noted in Chapter 4, the large corporation had been fighting for years to avoid cleaning up the PCBs it had discharged into New York's Hudson River. Published in the *Journal of Occupational and Environmental Medicine*, the industry-funded study "found no evidence of 'significant' links to cancer deaths among workers exposed to PCBs on the job" (p. 142). In this and other cases of industry-sponsored science that we'll examine below, the rhetorical effect is to question the legitimacy boundaries that accompany the public's perceptions of a scientific consensus. With consensus or agreement, the rationale for government action appears stronger. Let's take a further look at some examples of this "environmental communication battle" (Luntz, 2001, p. 136).

Perhaps the most dramatic and systematic communications attempt by corporations to influence public perceptions of environmental science was disclosed in a *New York Times* report in 1998. The *Times* reporter, John Cushman (1998), uncovered a proposal by the American Petroleum Institute and other corporations to spend millions of dollars to convince the public that the Kyoto accord on global warming was based on "shaky science" (p. A1). Cushman reported that the proposal included a "campaign to recruit a cadre of scientists who share the industry's views of climate science and to train them in public relations so they can help convince journalists, politicians and the public that the risk of global warming is too uncertain to justify controls on greenhouse gases like carbon dioxide that trap the sun's heat near Earth" (p. A1). Other sources noted that the American Petroleum Institute's proposal included a five-million dollar Global Climate Science Data Center that would provide information to the media, government officials, and the public, grant money for "advocacy on climate science," and a Science Education Task Group to put industry information into school classrooms (National Environmental Trust, 1998). Finally, Beder (1999) wrote that other groups also had formed in this period to oppose measures to regulate the emissions contributing to global warming. (I'll discuss the case of one of these groups, the Global Climate Change Coalition, in Chapter 10.)

The campaigns of industry to influence public perceptions of the science of climate change may not be isolated instances. Independent monitoring
groups and news accounts have documented a range of practices used by industry to question the consensus—or legitimacy boundaries—for many environmental topics. These have included

- Corporate-sponsored science symposiums (Rampton & Stauber, 2002)
- Letters to editors and paid message ads in newspapers, including payments to scientists to write letters to influential medical journals that dispute evidence of cigarette smoking as a cause of health problems (Hanners, 1998)
- Funding of “defensive science” or encouragement of research that refutes mainstream science (Hays, 2000)
- Corporate funding of scientists who had published in leading biomedical journals on subjects in which the funders had a financial interest (Krimsky, et al., 1998)
- Distribution of materials containing scientific claims sympathetic to industry to schools, journalists, and public officials (Cushman, 1998)

In other cases, companies have deliberately withheld or suppressed scientific findings that revealed harms to human health from products such as asbestos, leaded gasoline, and the toxic chemical in many plastics, such as vinyl chloride monomer (Markowitz & Rosner, 2002; Castelman, 1996).

A striking example of an attempt by industry to discredit or suppress scientific research occurred a little closer to home for me. In 1999, a respected scientist at the University of North Carolina at Chapel Hill (my university) received threats of a lawsuit and other harassment for his research on the health effects of factory hog farms, called confined animal feeding operations (CAFOs), on residents of rural North Carolina. (Most of these residents were from predominantly African American and low-income communities.) The research of Dr. Steve Wing (2002), an epidemiologist in the School of Public Health, found a correlation between complaints of headaches, excessive coughing, diarrhea, and burning eyes and the close location of residents' homes to the CAFOs.

Shortly after the state’s health department released a press statement about Dr. Wing’s research, attorneys for the North Carolina Pork Council—the industry’s trade association—demanded his research files as well as confidential information on residents who had participated in the study. They also informed Dr. Wing that they were reviewing his research report for defamation. Finally, the attorneys contacted state legislators, officials at the University of North Carolina, and the National Institute of Environmental Health Sciences (NIEHS), which had funded his research. Wing (2002) believed these actions to be “harassment and intimidation,” and, in the case of the NIEHS contacts, “an effort of the industry to challenge federal support for our research” (p. 441).

Environmental Science and Public Accountability

Recently, new initiatives have gained momentum to scrutinize corporate funding that might influence scientific claims about cancer, climate change, and other public health and environmental concerns. Such efforts to monitor published attacks on science have been fueled by disclosures such as Cushman’s New York Times story of the campaign by the American Petroleum Institute to discredit the science of global warming. In other cases, the impetus has been more personal, such as the attacks on a modern-day Rachel Carson.

In Living Downstream: An Ecologist Looks at Cancer (1997), biologist Sandra Steingraber chronicles her personal investigation into the possible environmental sources of cancer in the United States. (Steingraber herself had bladder cancer.) Writing as a cancer survivor and a scientist, the author traced correlations between cancer registry data in her native rural Illinois and other communities, and concentrations of agricultural pollutants and other sources of chemicals. Steingraber also surveyed related medical research on the effects of DDT, dioxins, and other endocrine-disrupting chemicals on human health. Although public health officials and cancer victims praised Living Downstream, the book quickly came under fire from no less credible a source than the prestigious New England Journal of Medicine.

Soon after Steingraber’s book appeared, the New England Journal of Medicine published a harshly negative review of Living Downstream by Jerry H. Berke (1997), challenging the motive of the author and her scientific credibility. (At the time, the Journal identified Berke at only as “MD, MPH.”) The review accused Steingraber of “oversights and simplifications,” “biased work,” and “notoriously poor scholarship.” Berke also assured readers that her “focus on environmental pollution and agricultural chemicals to explain human cancer has simply not been fruitful,” that Steingraber herself was “obsessed,” and “the objective of Living Downstream appears ultimately to be controversy” (1997, p. 1562). (The personal criticism of Steingraber is similar to some of the personal attacks on Rachel Carson, in which a federal official accused the Silent Spring author of being a spinner and therefore unconcerned about future generations [Budwig, 1992, para. 1].)

Berke’s own review, however, would itself eventually come under critical scrutiny. In their study of corporate strategies to influence public perceptions of science, Rampton and Stauber (2002) pointed out that the New England Journal of Medicine had failed to disclose that Berke was director of toxicology for W. R. Grace, “one of the world’s largest chemical manufacturers and a notorious polluter” (pp. 202–203). (Grace is perhaps best known publicly for its role in the book and film, A Civil Action, in the town of Woburn,
Massachusetts, a working-class community in which cases of childhood leukemia led researchers to identify Grace and other nearby companies as a source of the polluted drinking water.) Rampton and Stauber reported that Grace had been a defendant in several thousand asbestos-related lawsuits and had been prosecuted for false reports to the U.S. Environmental Protection Agency. As controversy arose over the Journal for its failure to disclose this possible conflict of interest in one of its reviewers, a spokesperson admitted that it had known Berke’s identity but thought that Grace was a hospital or a research institute (Rampton & Stauber, p. 203).

As a result of cases such as these, groups such as the Society of Environmental Journalists and the Center for Science in the Public Interest now provide a database to research potential conflicts of interest when reporters read reports by scientists or interview them on controversial public policy topics. The site, linked to the Center for Science in the Public Interest (2005), offers the Integrity in Science Database of more than a thousand professors and scientists who may have affiliations with chemical, gas, oil, food, drug, and other corporations. The database aims to raise awareness among journalists and policymakers “about the role that corporate funding and other corporate interests play in scientific research, oversight, and publication” (para. 9). The database also lists nonprofit organizations and universities that receive industry funding for scientific research. (See www.cspinet.org/integrity.)

The Center for Science in the Public Interest has emerged as perhaps the leading resource in the United States for scientists, government officials, journalists, and public interest groups seeking to monitor and report corporate funding of scientists and university research projects. Among its goals are these:

- To investigate and publicize conflicts of interest and other potentially destructive influences of industry-sponsored science
- To advocate for full disclosure of funding sources by individuals, governmental and nongovernmental organizations that conduct, regulate, or provide oversight of scientific investigation or promote specific scientific findings
- To encourage journalists to routinely ask scientists and others about their possible conflicts of interests and to provide this information to the public

Although it acknowledges the benefits of corporate funding in areas such as genetics, bioengineering, and other cutting-edge research, the Center’s Integrity in Science Project seeks to highlight the dangers of commercialization of science and the growing problem of conflicts of interest. The project addresses an important aspect of the debate over the role of science in environmental affairs—the responsibility of journalists, policymakers, and others to scrutinize the possible conflicts of interests in corporate funding of science and other efforts to influence the public's perception of scientific research.

But what should be the role of scientists themselves? In the final section, I'll explore a growing debate within the ranks of environmental scientists: Should scientists, at any point, serve as advocates for environmental policy or enter debates in the public sphere as scientists?

Advocacy and Environmental Science

Biologist Paul Ehrlich (2002) expressed the dilemma felt by a number of environmental scientists: Although there is “little dispute within the knowledgeable scientific community today about the global ecological situation and the . . . well-documented environmental danger,” he observed that the majority of the public and public decision makers were still unaware of the seriousness of the problem (p. 31). Similarly, epidemiologist Steve Wing (2002) recognized the natural reluctance of many academic researchers to interact with the news media, particularly when their research may be misinterpreted. Nevertheless, he insisted that public health researchers and epidemiologists who work with at-risk communities have a special responsibility to make their findings public. By doing so, research can help community members
“protect themselves, can motivate participation in democratic processes, and can influence public opinion and policy makers” (p. 442).

Dilemmas of Neutrality and Scientists’ Credibility

The dilemma that Ehrlich and Wing outline springs from the fact that many environmental scientists find themselves asked to choose between two very different and competing identities. Are they laboratory scientists, whose duty is to remain neutral, disregarding the implications of their research? Or are they environmental physicians of a sort, guided by a medical ethic—the impulse to go beyond the diagnosis of problem to a prescription for its cure? This dilemma was heightened by the new discipline of conservation biology that emerged in the late 1980s and a series of provocative essays by one of its founders. Biologist Michael Soule (1983) insisted that conservation biology was a crisis discipline, that its emergence was necessitated by a rapid ecological perturbation with irreversible effects on species, communities, and ecosystems (p. 727). He believed that scientists cannot remain silent in the face of a “biodiversity crisis that will reach a crescendo in the first half of the twenty-first century” (Soule, 1987, p. 4); that, indeed, scientists had an ethical duty to offer recommendations to address this worsening situation, even with imperfect knowledge, because “the risks of non-action may be greater than the risks of inappropriate action” (Soule, 1986, p. 6).

Soule’s challenge and the rise of conservation biology have provoked considerable debate within the environmental sciences. Traditionally, scientists have been viewed as neutral parties who rely on objective procedures to investigate problems or questions, with the resulting, empirical evidence laying the basis for any policy implications (Mason, 1962). Shabecoff (2000) summarized this traditional view when he wrote, “The scientist, free of preconceived values, seeks the truth and follows it wherever it leads. It is assumed that whatever the outcome of the search, it will benefit human welfare” (p. 140). As a result, many scientists fear that to abandon this identity by entering public arenas to advocate responses to environmental problems would violate an ethic of objectivity and risk the credibility of scientists themselves (Wiens, 1997; Slobodkin, 2000).

Other scientists, especially ecologists, have begun to question the ethical appropriateness of scientists’ silence outside their laboratories in the face of worsening environmental problems. As early as the 1970s, some scientists believed that objective methodologies by themselves often were unable to take into account the important values in environmental controversies. For example, Robert Socolow (1976) observed that the failure of scientific and technical studies to assist in the resolution of these controversies

is part of a larger pattern of failures of discourse in problems that put major societal values at stake. Discussion of goals, of visions of the future, are enormously inhibited. Privately, goals will be talked about readily, as one discovers in even the most casual encounter with any of the participants. But the public debate is cloaked in a formality that excludes a large part of what people care most about...Disciplined analyses brought to bear on a current societal dispute hardly ever do justice to the values at stake. (p. 2)

The controversy over scientists’ identity and their ethical duty in the face of ecological and human challenges actually has its roots in earlier controversies, and it may be useful to briefly review this history.

Environmental Scientists as Advocates

The advent of nuclear weapons in 1945 and scientists’ pivotal role in their development prompted one of the first major debates over the ethical responsibilities of scientists. Along with nuclear scientists, molecular biologists also began to insist on a greater scientific voice in informing the public and policymakers of the consequences of the new research emerging after World War II (Berg et al, 1974; Morin, 1993). As a result, scientific associations such as the Federation of American Scientists, along with journals such as the Bulletin of the Atomic Scientists, arose to represent scientists in the public realm (Kendall, 2000).

By 1969, the Union of Concerned Scientists (UCS) had formed to address survival problems in the late 20th century, particularly the dangers of nuclear war. Having since expanded its scope to problems of global warming and the potential dangers of genetic manipulation, the UCS now includes almost 60,000 scientists and citizens. The organization defines its goals as education and advocacy, including a continuing critique of public policies as well as support for universities for educational programs at the frontiers of science and public affairs (Kendall, 2000, p. 11).

Other groups also began to participate in public debates about the environment. For example, Physicians for Social Responsibility seeks to bring the knowledge of medical science to environmental and health problems caused by new technologies and industrial practices. In 1992, more than 1,500 members of the scientific academies of 69 nations, including a majority of then-Nobel laureates, issued the “World Scientists’ Warning to Humanity” (1992): “Human beings and the natural world are on a collision course. Human activities inflict harsh and often irreversible damage on the environment. . . . If not checked, many of our current practices . . . may alter the living world so that it will be unable to sustain life in the manner that we know” (para. 1).
The Debate Within the Scientific Community

Beyond these groups and their occasional statements, in the last decade a more contentious debate has arisen in many journals of conservation, ecology, and biology about scientists' responsibilities in their own work. Along with Michael Soulé's earlier essays, James Karr's 1993 letter in the journal Conservation Biology ignited a new debate over the appropriateness of science advocacy. Stressing the responsibility of scientists to report clearly the ecological consequences of society's actions, Karr equated this duty with the responsibility faced by an engineer who discovers a fatal flaw in a design (p. 8).

Other letters to the journal soon followed. Lorna Salzman (1995), a former official of Friends of the Earth, urged scientists to leave their laboratories as necessary in order to reclaim their identity as citizens in debates about environmental policy. As policy rarely results simply from the outcomes of scientific research, she argued, scientists also have a role in the democratic life of their society by joining in debates that affect their lives and their environmental values. In 1996, the debate flowered into full bloom when Conservation Biology published a special section on "the role of advocacy in the science of conservation biology" (Noss, 1996, p. 904). The gauntlet was thrown down in the opening essay: "Conservation biology is inescapably normative. Advocacy for the preservation of biodiversity is part of the scientific practice of conservation biology. . . . To pretend that acquisition of 'positive knowledge' alone will avert mass extinctions is misguided" (Barry & Oelschlaeger, 1996, p. 905).

Other scientists took a differing view of the role of environmental science, reflecting the traditional belief that advocacy taints a scientist's credibility. In his review of a recent Ecological Society of America symposium on science, values, and policies, Edward Rykiel (2001) argued that scientists must separate their role as providers of impartial information to the public from the inherently opposite role of advocates, as value-driven campaigners. Other ecologists have agreed, insisting that, although scientists should report their results to the public, they should not recommend outcomes or decisions. Frederick Wagner (1999), for example, pointed to the image problems some ecologists have had with public officials when they advocate specific approaches; in these cases, he warns, the officials "not infrequently discount our scientific message" (para. 12).

More recently, the debate about the scientist as advocate has taken a sharper focus as new voices have spoken up. For example, William Schlesinger (2003), dean of the Nicholas School of the Environment and Earth Sciences at Duke University, has argued that scientists have a responsibility "to speak out against a toxic impact to our environment, just as we would expect a physician to speak against a carcinogenic substance that might contaminate our food" (p. 23A). Stanford's Paul Ehrlich similarly urged ecologists to look to biomedical scientists who "gain prestige by diagnosing public health problems and recommending ameliorative steps—and interestingly, they aren't accused of advocacy" (2002, p. 33). Ehrlich argued that, in the face of "unprecedented, escalating, and well-documented environmental danger," scientists not only can be advocates but ethically "they must be advocates. . . . The credibility of ecologists. . . . has been enhanced as many of them have tried to diagnose environmental ills and suggest cures" (pp. 31, 33).

An unprecedented move by scientists to debate the uses of science by government officials occurred in 2004. More than 60 prestigious scientists (including 20 Nobel Prize winners) released a report sharply criticizing the misuse and suppression of science by federal agencies in Washington, D.C. The report, released by the Union of Concerned Scientists (2004), charged that officials had engaged in "a well-established pattern of suppression and distortion of scientific findings" (p. 2). Among its findings, the report claimed that these officials had "misrepresented scientific consensus on global warming, censored at least one report on climate change, manipulated scientific findings on the emissions of mercury from power plants and suppressed information on condom use" (Glanz, 2004, p. A21). (For the report's principal conclusions, see "FYI: Scientific Integrity in Policymaking.")

FYI: Scientific Integrity in Policymaking

On February 18, 2004, the Union of Concerned Scientists made public its report, Scientific Integrity in Policymaking: An Investigation into the Bush Administration's Misuse of Science. The principal findings of the investigation into charges of misuse of science by government officials were stated in the report's executive summary:

- There is a well-established pattern of suppression and distortion of scientific findings by high-ranking Bush administration political appointees across numerous federal agencies . . .
- There is strong documentation of a wide-ranging effort to manipulate the government's scientific advisory system to prevent the appearance of advice that might run counter to the administration's political agenda . . .
- There is evidence that the administration often imposes restrictions on what government scientists can say or write about "sensitive" topics. . . . [And]
Continued

- There is significant evidence that the scope and scale of the manipulation, suppression, and misrepresentation of science ... is unprecedented. (p. 3)

The full report is available from the Union of Concerned Scientists, Two Brattle Square, Cambridge, MA 02238-9105, or from www.ucsusa.org.

Importantly, the Union of Concerned Scientists report also defended the importance of scientists' assuming a role in the public sphere. It called upon other scientists to “encourage their professional societies and colleagues to become engaged in this issue, discuss their concerns directly with elected representatives, and communicate the importance of this issue to the public, both directly and through the media” (p. 3). In response, the director of the Office of Science and Technology Policy at the White House stated, “I think there are incidents where people have got their feathers ruffled ... But I don’t think they add up to a big pattern of disrespect ... They are individual actions that are part of the normal processes within the agencies” (quoted in Glanz, 2004, p. A21).

Science and the Public

Although the report of the Union of Concerned Scientists explicitly engages in criticism of science policy at the highest levels, other approaches to the role of scientists are less controversial. One example is the proposal for civic science (Lee, 1993), a blend of science and democratic modes of public involvement. For example, Silvio Funtowicz and Jerry Ravetz (1991) suggested that when interested citizens, policymakers, and journalists work closely with environmental scientists to select priorities and, in some cases, participate in the design of research, it is possible to achieve a “democratization of knowledge”; this is so not merely in terms of public education but in “enhanced participation in decision making for common problems” (p. 14). Similarly, political scientist Frank Fischer (2000) has described a process for policymaking that incorporates many of the ideals of public participation that I described in Chapter 3. His approach elicits information from scientists and citizens alike, who in turn comment publicly about the technological, legal, and financial feasibility of proposals (p. 229).

One example of a successful effort by scientists to bridge the gap between the technical sphere and the public sphere of interested public and environmental groups was the recent decommissioning of the dam on the Kennebec River in Maine. In his new book Dam Politics: Restoring America’s Rivers, William Lowry (2003) describes the efforts of scientists to educate the public about the ecological importance of rivers, teaching values that go beyond the economic uses of rivers for transportation, irrigation, and hydroelectric power. In the Kennebec case, local and federal officials, scientists, and public interest groups not only cooperated in removing the dam but have begun restoration attempts to aid the return of spawning fish native to the area. However, Lowry is also quick to note that other attempts to decommission dams that impede the natural ecological functioning of river systems have met with more resistance, such as the controversy over the effects of dams on the Snake and Columbia Rivers in Idaho and Washington State. In the latter case, powerful economic and political interests have stalled efforts to discuss the removal of dams that may be impeding the successful run of salmon. (For recent court rulings that federal officials have “limited and skewed” the scientific analyses of the environmental impacts of dams on the Snake and Columbia Rivers, see Barringer, 2005.)

There is some evidence that support is growing for proposals to bring together scientists and members of the public. For example, Lach, List, Steel, and Shindler (2003) surveyed the attitudes of scientists, resource managers, and members of the public about their preferred roles for research and the involvement of field ecologists in natural resource management in the Pacific Northwest. The study identified five levels of involvement in public communication and decision making that research scientists might have:

- Reporting scientific results that others use in making decisions on natural resource management issues
- Reporting and then interpreting scientific results for others who are involved in natural resource management decisions
- Working closely with managers and others in integrating scientific results into management decisions
- Actively advocating for specific and preferred natural resource management decisions
- Making decisions about natural resource management policy. (p. 174)

Lach et al. (2003) found that, with the exception of scientists, all the groups surveyed most preferred the role of integrating scientific results into management decisions; that is, they would support means to ensure that management decisions—such as deciding where logging could occur—reflected the findings of science more directly. Scientists preferred the slightly more cautious role of interpreting scientific results for others, though there was some support among scientists for the integrative role as well (p. 174).
In other words, most scientists preferred to limit their roles in the public sphere to reports and explanations of their findings, holding back from more direct involvement in managing natural resources.

**Act Locally!**

Arrange for a conservation biologist, a toxicologist, an ecologist, or other environmental scientist on your campus to visit your class to discuss the role of environmental science in policymaking or the debate about the role of public advocacy in the public sphere.

Discuss with your guest the five levels of involvement in public communication and decision making that scientists can play: reporting, interpreting, and integrating their research findings, advocating policy, and making decisions. What is their viewpoint? What do you believe is the proper role of scientists in the public sphere?

Finally, the ease of research on the Internet has now placed the results of environmental science more easily within reach of anyone with a computer and online access. In some cases, research in the technical sphere has been made available through sites that are easily engaged by the public. For example, in Chapter 3 I discussed the research that is clearly organized and made public by the EPA's Toxic Release Inventory, showing sources of air and water pollution in communities. (See www.scorecard.org.) In addition, the requirement under NEPA for environmental impact statements provides additional scientific information about the effects of proposed actions on the environment. With the increased availability of science, the quality of debate within the public sphere has grown immeasurably.

**Conclusion**

In this chapter, we have considered several provocative questions about the discourse of science in public controversies over environmental policy. What is the proper role of science (and scientists) in deciding policy in a democratic society? Who should control the uses of scientific research? How should society interpret the meaning of scientific claims when the research is characterized by uncertainty? In disputes over environmental policy especially, access to and command of technical knowledge is an important source of legitimacy. Equally important to the importance of scientific knowledge are the symbolic associations that public officials, industry, and the public attach to the claims of science, which constitute critical symbolic legitimacy boundaries in the public debate. Because such boundaries influence many decisions about business activity, scientific discourse often becomes a site for public debate and controversy.

In the second section, we looked at one way in which some have urged that we manage the uncertainty of scientific claims about environmental dangers. The precautionary principle states that, when an activity threatens human health or the environment, even if some cause-and-effect relationships are not fully established scientifically, caution should be taken. Thus, when deciding what action to take about unsafe products or business activities, it is industry, rather than the public, who should bear the burden of proving that it is safe.

Although it can safeguard against uncertainty, the appeal to caution or prudence also can restrict new products and increase costs to industry. In the third section, we examined the attempts by some industrial and political interests to challenge the claims of environmental science through a trope of uncertainty and other forms of symbolic legitimacy conflict. By funding a series of challenges to scientific claims of global warming and other environmental dangers, political and corporate groups have suggested that there is danger in taking action prematurely, a risk of making the wrong decision. The goal of such legitimacy challenges is to create doubt in the public's minds, thereby lessening the will to political action, particularly action that might harm business or industrial interests.

Finally, we explored recent and sometimes contentious debates about the appropriate roles of scientists themselves. With growing evidence of deterioration of the world's biodiversity and ecosystems, many ecologists and other scientists believe that they must assume a more public role to educate policymakers and, for some, to advocate specific actions. Other scientists fear that, by venturing outside their laboratories, scientists risk their credibility as objective sources of information. At stake is both the public's perception of the symbolic legitimacy of science and the growing sense of urgency among many that time is running out and that "the risks of non-action may be greater than the risks of inappropriate action" (Soule 1986, p. 6).

**KEY TERMS**

**Civic science:** A blend of science and democratic modes of public involvement.

**Crisis discipline:** Term used to characterize the new discipline of conservation biology; coined by biologist Michael Soule (1985) to refer to the duty of scientists, in the
face of a looming biodiversity crisis, to offer recommendations to address this worsening situation, even with imperfect knowledge.

**Paradox for conservation:** Awareness that “knowledge is always incomplete, yet the scale of human influence on ecosystems demands action without delay” (quoted in Scully, 2005, p. B13).

**Precautionary principle:** As defined by the 1998 Wingspread conference, “When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically. In this context the proponent of an activity, rather than the public, should bear the burden of proof” (SEHN, 1998, “Wingspread Consensus Statement,” para. 5).

**Progressive ideal:** Put forth by the 1920s and 1930s Progressive movement, the concept of a neutral, science-based policy as the best approach to government regulation of industry.

**Symbolic legitimacy:** The perceived correctness, authority, or common sense of a policy or approach to a problem relative to other competing responses. (For a definition of symbolic legitimacy boundaries, see Chapter 2.)

**Technocracy:** John Dewey’s term denoting a government ruled by experts.

**Trope of uncertainty:** An appeal that functions to nurture doubt in the public’s perception of scientific claims and thereby to delay calls for action; in rhetorical terms, the trope of uncertainty “turns” or alters the public’s understanding of what is at stake, suggesting there is a danger in acting prematurely, a risk of making the wrong decision.

**DISCUSSION QUESTIONS**

1. What does it mean to appeal to “common sense” or the “public interest” in urging support for environmental protection? How does one decide what is common sense in the disputes over the solution to seasonal wildfires in the national forests?

2. How can ordinary citizens evaluate media reports of apparent disagreement among scientists over whether carbon dioxide (CO₂) from cars and trucks is a source of global climate change? Should the public be cautious of scientific research funded by corporate sources? Why or why not?

3. Is the precautionary principle a clear guide to decision making, or does it leave too much discretion to agency staff or others to determine whether a product is unsafe or should be withdrawn from the market? Should industry carry the burden of demonstrating to the general public that its products or chemical substances are safe before releasing them to the marketplace?

4. Does corporate funding of scientific research taint the credibility or influence the conclusions of scientists’ reports?

5. What is the role of the media in disclosing the sources of funding or conflicts of interest for scientific reports when they report an environmental story?

6. Should ecologists and other environmental scientists ever serve as advocates in the public sphere? Where do you draw the line—if at all—in how far scientists should go in entering the public sphere or working with government agencies?

**REFERENCES**


**NOTE**

1. Carson “was belittled as an antihumanitarian crank, a priestess of nature, and a hysterical woman. The director of the New Jersey Department of Agriculture believed she inspired a “vociferous, misinformed group of nature-balancing, organic gardening, bird-loving, unreasonable citizenry.” An official of the Federal Pest Control Review Board, ridiculing her concern about genetic mutations caused by the use of pesticides, remarked, “I thought she was a spinster. What’s she so worried about genetics for?” (Budwig, 1992, para. 1).