The Honest Broker

MAKING SENSE OF SCIENCE IN POLICY AND POLITICS

Roger A. Pielke, Jr.

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ONE

Four idealized roles of science in policy and politics

Imagine that a visitor has come to town to see you, and wants to find some place in town to eat dinner. Being a local, you have expertise that may be useful in helping the visitor make a decision about where to dine. How might you provide information relevant to the decision on where to eat?

This chapter uses this story, with you as the central character, to illustrate four different ways in which you might interact with your guest. These four modes of interaction are very much ideal types; the real world rarely conforms to such distinctions. But the four different roles in fact do reflect practical differences in how scientists (and other experts) relate to policy and politics. Behavior by scientists providing counsel to decision-makers does necessarily approximate one ideal type more or less than another. Thus, these four different roles, while idealized, do reflect that scientists face practically meaningful choices in how they act in the context of policy and politics.

One choice that you might make in providing advice to your visitor is to serve as a *Pure Scientist*. You may decide that you really have no interest in the visitor's decision-making process and simply want to share some fundamental information about factors involved with nutrition. So you might provide your guest with a copy of the

US government's official report, *Dietary Guidelines for Americans*, which describes the characteristics of a healthy diet. What the visitor does with that information you feel is his or her responsibility.

A second role that you might decide to play is that of the *Science Arbiter* who serves as a resource for the visitor, much like a hotel concierge. The visitor could ask you a question, such as "How far is it to the closest Thai restaurants?" or "Where can I find a steakhouse with the lowest prices?" The Science Arbiter serves as a resource for the decision-maker, standing ready to answer factual questions that the decision-maker thinks are relevant. The Science Arbiter does not tell the decision-maker what he or she ought to prefer.

A third role is that of the *Issue Advocate*. That is, you might try to convince the visitor to eat at a particular restaurant. There are many reasons why you might try to limit the visitor's scope of choice, e.g., perhaps you think that the restaurant is really good, or perhaps you think that you understand the visitor's interests well enough to act in his or her stead, or perhaps your cousin works at the restaurant. Such issue advocacy could be very strong if you are focused on advocating a single restaurant, or more relaxed, if you were directing the visitor to some limited set of restaurants, say those with Italian food. The Issue Advocate does venture into telling the visitor what he or she ought to prefer by making the case for one alternative over others.

A fourth and final role is the *Honest Broker of Policy Alternatives* who provides the visitor with information on all restaurants in the city, basic information on each (cost, menu, location, etc.) and then lets the visitor face the challenge of reducing the scope of choice (i.e., making a decision). Such "honest brokering" could also be comprehensive (e.g., a comprehensive guide to all restaurants in the city) or more limited (e.g., a guide to all those within a five-minute walk). The defining characteristic of the honest broker of policy alternatives is an effort to expand (or at least clarify) the scope of choice for decision-making in a way that allows for the decision-maker to reduce

choice based on his or her own preferences and values. Because honest brokering of policy alternatives is often best achieved through a collection of experts working together with a range of views, experiences, and knowledge, a good example for restaurants might be a travel guide, such as those published by Fodors or Lonely Planet.

A characteristic fundamental to both Honest Brokers of Policy Alternatives and Issue Advocates is an explicit engagement of decision alternatives (i.e., choices, policy options, forks in the road, etc.). In contrast, the Pure Scientist and Science Arbiter are not concerned with a specific decision, but instead serve as information resources. Ostensibly, the Pure Scientist and Science Arbiter do not seek to compel a particular decision outcome, but in practice often slip into "stealth issue advocacy." The Issue Advocate seeks to compel a particular decision, while an Honest Broker of Policy Alternatives seeks to enable the freedom of choice by a decision-maker. It should also be obvious that as an expert one cannot simultaneously act as an Issue Advocate and an Honest Broker of Policy Alternatives at exactly the same time.[1] That is to say, one cannot work to both reduce and expand choice at the same time. As ideal types these categories are obviously not black and white, but a continuum from strictly reducing choice to expansively presenting options.

Let's follow the analogy a bit further to illustrate some of the complexities involved in trying to serve as a Pure Scientist or Science Arbiter in the context of decision-making. Let's say that you wish to serve as a Pure Scientist in your interactions with the visitor looking for a restaurant, and so you decide to hand the visitor the US government's report on nutrition. In the United States the federal government has come up with something called the "food guide pyramid" which seeks to provide guidelines on what constitutes a healthy diet. The pyramid does not purport to tell you what restaurant to eat at, only the scientific basis for what constitutes a healthy diet (USDA National Agricultural Library 2006). At first consideration, the food guide pyramid might seem to offer the prospects of

providing objective science to inform decision-making that is separate from the process of actually making a decision about where to eat. But things are just not so simple, for two reasons.

First, it turns out that the food guide pyramid is reflective of political debates that manifest themselves within the food science community. In other words, rather than representing pure science, the food pyramid actually serves to support issue advocacy. Marion Nestle (2002), who is Professor and Chair of the Department of Nutrition and Food Studies at New York University, has written a book called *Food Politics* that documents the battle of interests that takes place through the guise of food science (e.g., the interests of different food companies, the interests of the food industry as a whole). Professor Nestle served on the federal committee that developed the food guide pyramid and commented in the *Los Angeles Times* that, "Creating the [food pyramid] guidelines is still political – from start to finish. It's science politics. It's politics politics. It's corporate politics" (Mestel 2004). The food guide pyramid does not tell you exactly where to eat, but for those who look to the pyramid to inform their decisions, the food guide pyramid suggests that some choices are more desirable and others less so. Because the guidelines reflect a political process, the pyramid has great potential to serve as a front for "stealth issue advocacy."[2] This is why battles over science take on such importance across a wide range of areas. People can debate policy options through science without ever making their value commitments explicit. They can hide them behind science.

No one should be surprised by this, as scholars have demonstrated in great depth the degree to which considerations of politics and values shape the work of experts seeking to provide guidance to decision-makers. As Sheila Jasanoff, a leading scholar of science and society, has written:

> Although pleas for maintaining a strict separation between science and politics continue to run like a leitmotif through the policy literature, the artificiality of this position can no longer be doubted. Studies

> of scientific advising leave in tatters the notion that it is possible, in practice, to restrict the advisory practice to technical issues or that the subjective values of scientists are irrelevant to decision-making . . .
>
> The notion that scientific advisors can or do limit themselves to addressing purely scientific issues, in particular, seems fundamentally misconceived . . . the advisory process seems increasingly important as a locus for negotiating scientific differences that have political weight. (Jasanoff 1990: 249)

But in spite of such findings, a powerful current runs through the scientific enterprise that suggests that science somehow should be kept separate from considerations of policy and politics, even as science is asked to be relevant to decision-making. Policy makers looking to use science to advance their own agendas often reinforce the possibility of a separation between science and politics. The notion of science being at once apart from but a part of politics and policy presents a paradox that will be taken up in some detail later in the book.

A second complexity arises when we realize that there are alternative food pyramids available, such as the "vegetarian food pyramid" (VegSource 2006a), the "vegan food pyramid" (VegSource 2006b), and the "Atkins food pyramid" (Everything Atkins 2002), among many others. The degree to which one of these is "better" than another depends upon the criteria one employs to evaluate them. If one values not eating meat, then the vegetarian food pyramid may be favored over the US government food pyramid. Alternatively, one's food pyramid preference will be influenced if one values the advertised waist-slimming effects of the Atkins diet over concerns about its health effects. The point here is that the expertise relevant to a particular decision – where to eat dinner – will necessarily be a function of what the decision-maker actually values. Absent knowing such values, any food pyramid will reflect either the values of those putting the pyramid together, or the experts' interpretation/expectation of what decision-makers ought to value. Consequently, it is very easy for the food science expert to act as an

Issue Advocate (e.g., should meat be part of the pyramid?) rather than as a Pure Scientist, favoring one set of choices over others based on trans-scientific considerations. In the end, no food pyramid alone can tell the hungry traveler where to eat.

So are there any circumstances in which experts can provide "objective" guidance that is independent of the choices to be made? The answer is yes and no. Perhaps ironically, objectivity is more possible in cases where the decision context is highly specified or constrained. If you have narrowed down your restaurant choices to, say, three restaurants, then you could ask your Science Arbiter to comment on the cost or healthiness of each, according to criteria that you would like to see applied. In circumstances where the scope of choice is fixed and the decision-maker has a clearly defined technical question, then the expert has a very important role to play in serving as an arbiter of science, focused on specific *positive* questions. But in situations where the scope of choice is open, decision-makers do not have a consensus on the values to be served by the decision, much less a fix on the technical questions derived from value commitments. There is very little room for arbitrating science in the process of decision-making and even good faith efforts to provide such a perspective can easily turn into a political battleground where political debate is couched in the guise of a debate over science (and the expert may not even be aware of his/her arguing politics through science).[3]

Daniel Sarewitz, one of the most thoughtful observers of science in society, characterizes the resulting circumstances:

> In areas as diverse as climate change, nuclear waste disposal, endangered species and biodiversity, forest management, air and water pollution, and agricultural biotechnology, the growth of considerable bodies of scientific knowledge, created especially to resolve political dispute and enable effective decision-making, has often been accompanied instead by growing political controversy and gridlock. Science typically lies at the center of the debate, where those who advocate some line of action are likely to claim a scientific justification for their position, while those opposing the action will either

> invoke scientific uncertainty or competing scientific results to support their opposition . . . nature itself – the reality out there – is sufficiently rich and complex to support a science enterprise of enormous methodological, disciplinary, and institutional diversity. I will argue that science, in doing its job well, presents this richness, through a proliferation of facts assembled via a variety of disciplinary lenses, in ways that can legitimately support, and are causally indistinguishable from, a range of competing, value-based political positions. (Sarewitz 2004: 386)

So when a scientist claims to focus "only on the science," in many cases the scientist risks serving instead as a Stealth Issue Advocate. For some scientists stealth issue advocacy is politically desirable because it allows for a simultaneous claim of being above the fray, invoking the historical authority of science, while working to restrict the scope of choice. The Stealth Issue Advocate seeks to "swim without getting wet."[4] Other scientists may be wholly unaware of how their attempts to focus only on science contribute to a conflation of scientific and political debates. One way for scientists to avoid such conflation, argued throughout this book, is to openly associate science with possible courses of action – that is, to serve as Honest Brokers of Policy Alternatives.[5]

For scientists seeking to play a positive role in policy and politics and contribute to the sustainability of the scientific enterprise there is good news – scientists have choices in what roles they play. *Pure Scientist*, *Science Arbiter*, *Issue Advocate*, or *Honest Broker of Policy Alternatives?* All four roles are critically important and necessary in a functioning democracy. But scientists do have to choose. Whether a scientist admits, accepts, or is aware of it, a choice must be made on how he or she relates to the decision-making process. This book is about understanding this choice, what considerations may be important to think about when deciding, and the consequences of such choices for the individual scientist and the broader scientific enterprise.

TWO

The big picture, science, and democracy

Our time is characterized by new demands upon scientists in policy and politics. But experience and research show us that science is well suited to contribute directly to the resolution of political conflicts only in the most simple of decision contexts. In more complicated contexts, looking to science to enable a political consensus may in fact compromise both the odds for consensus and the valuable role that science can provide to policy-making. In the light of these findings, which some scientists may admittedly find uncomfortable, this book considers options available for scientists in policy and politics.

The arguments presented in this book have benefited from, and indeed are derived from, a large literature on Science, Technology, and Society (STS) and Science and Technology Policy (STP).[1] For many scholars of STS or STP the arguments presented in this book may be quite familiar, even old news. But my experiences over the past decade and a half working on a day-to-day basis with many scientists suggest that, with some notable exceptions, most scientists, including social scientists, are simply unaware of the understandings of the scholarly community who study science in society. Hence, it is appropriate to view this work as an attempt to connect scholarly understandings of science in society with the practical world of

scientists who increasingly face everyday decisions about how to position their careers and research in the context of policy and politics. Rather than prescribing what course of action each individual scientist ought to take, the aim here is to identify a range of options for individual scientists to consider in making their own judgments on how they would like to position themselves in relation to policy and politics.

Even with a commitment to present a perspective on the scope of choice available to scientists in policy and politics, a central argument throughout this book is that as science has become used increasingly as a tool of *politics*, its role in *policy* has arguably been overshadowed. To use the concepts introduced in Chapter 1, the scientific enterprise has a notable shortage of Honest Brokers of Policy Alternatives, with many scientists instead choosing to engage policy and politics as Issue Advocates, or more troubling for the sustainability of the scientific enterprise, as Stealth Issue Advocates. Honest Brokers of Policy Alternatives matter because a powerful role for science in society is to facilitate the creation of new and innovative policy alternatives. Such alternatives have the potential to reshape political dynamics and, in some cases, enable action. By understanding the different roles that science plays in both policy and politics we may enhance the benefits to society related to the public's substantial investments in generating new knowledge.

Without a doubt science has demonstrated its enormous value to society and continues to have great potential to contribute significantly to further improving societal and environmental conditions. However, for that potential to be more fully realized, we must adopt a perspective on science that allows room for a close engagement with policy. If scientists ever had the choice to remain above the fray, they no longer have this luxury. It has become widely accepted by the public and policy-makers (and most scientists as well) that science shows relevance to a wide range of societal problems. Consequently, we should not view science as an activity to be kept

separate from policy and politics but, instead, as a key resource for facilitating complicated decisions that involve competing interests in society. We want science to be connected to society. But how we make this connection is not always easy or obvious. This book seeks to provide some conceptual clarity about the choices scientists face in connecting their work to policy and politics. The choices matter, not just for science and science in policy, but more broadly for how we think about the role of expertise in democracy.

Chapter 1 argued that scientists, and other experts have choices in how they relate their work to policy and politics. Understanding such choices is important if science is to contribute to common interests. Science in the service of common interests is threatened as scientists and policy-makers have come to see science mainly as a servant of interest group politics. That is to say, increasingly, science has come to be viewed as simply a resource for enhancing the ability of groups in society to bargain, negotiate, and compromise in pursuit of their special interests. As a consequence, groups with otherwise conflicting interests each look to science to enhance their political standing. The result is that political battles are played out in the language of science, often resulting in policy gridlock and the diminishment of science as a resource for policy-making.

Two Congressional hearings in the summer of 2006 dramatically illustrated these dynamics. The hearings were putatively about studies of the global temperature record over the past several thousand years and efforts to clarify scientific understandings about this history. In reality the hearings were about something else altogether, as described by a member of Congress to a scientific witness who had chaired a report suggesting that earlier studies of the paleo-climate record had some flaws and limitations.[2]

> I want you to make sure you understand the reality of this situation. I've given you all the sincerity that I could give to you. But the reason you are here is not why you think you are here, OK? The reason you are here is to try to win a debate with some industries in this country

> who are afraid to look forward to a new energy future for this nation. And the reason you are here is to try to create doubt about whether this country should move forward with the new technological, clean-energy future, or whether we should remain addicted to fossil fuels. That's the reason you are here.

The member of Congress was telling the scientist that whether he knew it or not, the hearing was about energy policy actions related to climate change, irrespective of the scientific content being discussed. The scientist was being used as a Stealth Issue Advocate, either knowingly or unknowingly. Another member of Congress at the hearing suggested that given the reality of stealth issue advocacy scientists should consider self-censoring their views based on how they might be received in the political arena. Another scientist present criticized this perspective, suggesting that once scientists start tailoring their scientific results to suit the needs of politics that is when science ceases to be science and morphs completely into politics, threatening the sustainability of the scientific enterprise itself.

Must scientists be at the mercy of politics? The answer is "no," but empowerment depends on understanding the different options available for relating to policy and politics.

Our thinking about the role of experts in democracy is no doubt grounded in how we conceive of the notion of democracy itself. Consequently, how each of us thinks about the Pure Scientist, Science Arbiter, Issue Advocate, and Honest Broker of Policy Alternatives is likely related to our beliefs about two relationships: (a) the role of science in society, and (b) the role of the expert in a democracy.

One well-understood conception of how democracy serves common interests is that competing factions engage one another in political debate, and the resulting compromise reflects the best possible balancing of conflicting demands. Political scientists have called this notion of democracy "interest group pluralism" and it is well described in the writings of James Madison (1787), for example,

as is found in *Federalist 10*, which Madison wrote when arguing for adoption of the original US Constitution in the late eighteenth century. Under such a view of Madisonian democracy, experts would best serve society simply by aligning themselves with their favored faction or interest group, and offering their special expertise as an asset in political battle. From this perspective on the role of experts in a democracy, it is a virtue for scientists to take a more proactive role as advocates in political debates seeking to use their authority and expertise as resources in political battles.

An objection to such a conception of democracy, and the role of experts it implies, was offered by political scientist E. E. Schattschneider in his book *The Semi-Sovereign People* (1975). Schattschneider argued that democracy is a competitive system in which the public is allowed to participate by voicing its views on alternatives presented to it in the political process. Such alternatives do not come up from the grassroots any more than you or me telling an auto mechanic what the options are for fixing a broken car. Policy alternatives come from experts. It is the role of experts in such a system to clarify the implications of their knowledge for action and to provide such implications in the form of policy alternatives to decision-makers who can then decide among different possible courses of action.

These different perspectives on democracy are complemented by different views of the role of science in society. In the post-World War II era the United States adopted a perspective on science that scholars have called the "linear model." The linear model takes two forms, one as a general model for how to make decisions about science, emphasizing the importance of basic research. The linear model will be familiar to most in terms of a metaphor that represents a flow of knowledge from basic research to applied research to development and ultimately societal benefits. Since World War II, the linear model has been used to advocate policies for science that emphasize the importance of basic research and freedom for scientists from political accountability.

A second form of the linear model is as specific guidance for the role of science in the context of specific decisions. Specifically, the linear model is often used to suggest that achieving agreement on scientific knowledge is a prerequisite for a political consensus to be reached and then policy action to occur. For instance, this perspective is reflected on the website of the US Environmental Protection Agency in its description of the role of science in the agency: "Through research that is designed to reduce uncertainties, our understanding increases and, as a result, we change our assumptions about the impacts of environmental problems and how they should be addressed" (EPA 2006). In even stronger forms, some use the linear model to argue that specific knowledge or facts compel certain policy responses on topics as varied as the availability of genetically modified foods and over-the-counter emergency contraception.

Arguments that a particular fact or body of knowledge compels a particular decision have been generally critiqued in terms of what is called the "is–ought problem" first raised by philosopher David Hume, who argued simply that you can't get an "ought" (i.e., something which should be done, or an answer to a "normative" question) from an "is" (i.e., a statement of fact, or an answer to a "positive" question).[3] Even so, claims that facts compel certain actions are frequently found in political debates involving scientific issues.

The linear model in both of its forms has been challenged by a range of scholars who have characterized it as descriptively inaccurate and normatively undesirable. Science policy scholar Harvey Brooks offers an alternative view to the linear model in terms of a complex pattern of feedbacks between researchers and decision-makers:

> If the process of using science for social purposes is thought of as one of optimally matching scientific opportunity with social need, then the total evaluation process must embody both aspects in an appropriate mix. Experts are generally best qualified to assess the opportunity for scientific progress, while broadly representative laymen in

TABLE 2.1: *Four idealized roles for scientists in decision-making*

		View of science	
		Linear model	Stakeholder model
View of democracy	Madison	Pure Scientist	Issue Advocate
	Schattschneider	Science Arbiter	Honest Broker of Policy Alternative

> close consultation with experts may be best qualified to assess societal need. The optimal balance between opportunity and need can only be arrived at through a highly interactive, mutual education process involving both dimensions. (Brooks 1995: 33)

Similar alternatives to the linear model have been offered by Donald Stokes in the notion of "use-inspired basic research" and Philip Kitcher with "well-ordered science" (also, cf., Jasanoff 1990; Nowotny *et al.* 2001; Sarewitz 1996; Wynne *et al.* 2005). Each of these perspectives suggests some form of "stakeholder model" as an alternative to the linear model of the relationship of science and decision-making. A stakeholder model holds not only that the users of science should have some role in its production but that considerations of how science is used in decision-making are an important aspect of understanding the effectiveness of science in decision-making.

Combinations of these different conceptions of democracy and science provide a simple and straightforward theoretical basis for the four idealized roles for scientists (and experts more generally) in decision-making introduced in Chapter 1, as illustrated in Table 2.1.

Pure scientist (Madisonian democracy + linear model of science)

The Pure Scientist focuses on research with absolutely no consideration for its use or utility, and thus in its purest form has no direct connection with decision-makers. Research results in findings that are placed into a reservoir of knowledge where they will be available to all decision-makers. Those from various factions in society have access to the reservoir from which they can draw the knowledge that they need to clarify and argue their interests. In principle, from this perspective the scientist remains removed from the messiness of policy and politics.

Examples of the Pure Scientist can be found more frequently in myth rather than practice. A young Albert Einstein is often invoked as the canonical pure scientist, seeking only truth without consideration for the practical implications of the results of his research. In practice, of course, things are quite a bit more complicated. Research funding has to be justified, and increasingly this occurs on the basis of expected societal benefits or outcomes. And irrespective of the justifications used in securing support, research results do have implications for the broader society. Even Einstein became active in politics later in his career, warning the United States government of the implications of the development of an atomic bomb.

Issue Advocate (Madisonian democracy + stakeholder model of science)

The Issue Advocate focuses on the implications of research for a particular political agenda. Unlike the Pure Scientist, the Issue Advocate aligns him/herself with a group (a faction) seeking to advance its interests through policy and politics. The Issue Advocate accepts the notion that science must be engaged with decision-makers and seeks to participate in the decision-making process.

Issue Advocates are found everywhere, and science is no exception. Whether the issue is a presidential election, the Nuclear Test Ban Treaty, or the Kyoto Protocol, many scientists are willing to take sides in a contested political issue and use their status as scientists, or invoke their specialized expertise, to argue for their cause. For some scientists advocacy poses difficult questions. For instance, the 2006 meeting of the Society for Conservation Biology held a debate on whether conservation biologists should engage in overt advocacy or instead should strive to stay away from politics and focus only on science (Marris 2006).

Science Arbiter (Schattschneiderian democracy + linear model of science)

The Science Arbiter seeks to stay removed from explicit considerations of policy and politics like the Pure Scientist, but recognizes that decision-makers may have specific questions that require the judgment of experts, so unlike the Pure Scientist the Science Arbiter has direct interactions with decision-makers. The Science Arbiter seeks to focus on issues that can be resolved by science, which may originate in questions raised by decision-makers or debate among decision-makers. In practice, such questions are sent for adjudication to the scientist(s), who may be on an assessment panel or advisory committee, which renders a judgment and returns to the policy-makers scientific results, assessments or findings. A key characteristic of the Science Arbiter is a focus on *positive* questions that can in principle be resolved through scientific inquiry. In principle, the Science Arbiter avoids *normative* questions and thus seeks to remain above the political fray, preferring to inform decision-making through relevant research or assessments, but removed from a closer interaction with stakeholders.[4]

Science Arbiters can take the form of a formal, authoritative committee or organization, such as committees under the National

Research Council or a federal agency. Individual scientists also seek to be Science Arbiters when they seek to answer questions posed by policy-makers or the media. The defining characteristic of the Science Arbiter is a focus on positive scientific questions posed by decision-makers. As will be seen, successfully arbitrating positive scientific questions is replete with incentives to engage in issue advocacy, and thus in practice can be a difficult role to fill.

Honest Broker of Policy Alternatives (Schattschneiderian democracy + stakeholder model of science)

The Honest Broker of Policy Alternatives engages in decision-making by clarifying and, at times, seeking to expand the scope of choice available to decision-makers. Unlike the Science Arbiter, the Honest Broker of Policy Alternatives seeks explicitly to integrate scientific knowledge with stakeholder concerns in the form of alternative possible courses of action.

Like the Science Arbiter, the Honest Broker of Policy Alternatives is likely to take the form of a formal, authoritative committee or assessment. There are several reasons why this is so. First, it can be difficult, and in some cases impossible, for an individual scientist to represent all of the areas of expertise required to recommend a range of action alternatives. Further, a diversity of perspectives can help to militate against issue advocacy (stealth or otherwise). The defining difference between the Issue Advocate and the Honest Broker of Policy Alternatives is that the latter seeks to place scientific understandings in the context of a smorgasbord of policy options. Such options may appeal to a wide range of interests. For example, in the United States the congressional Office of Technology Assessment (which was terminated in the 1990s) often produced reports with a wide set of policy options contingent on ends to be achieved. A simple way to think about the key difference between the Honest Broker of Policy Alternatives and the Issue

Advocate is that the latter seeks to reduce the scope of available choice, while the former seeks to expand (or at least clarify) the scope of choice.

The remainder of this book is focused on developing and understanding several simple criteria that might be fruitfully applied to the question of what role scientists should play in what decision contexts under the goals of contributing productively to effective decision-making and sustaining the long-term viability of the scientific enterprise. I argue that there are two critical factors to consider when a scientist (or any other expert) or scientific organization faces a decision about how to engage with policy and politics. The first criterion is the degree of values consensus on a particular issue. Sharply contested issues raise the political stakes and introduce dynamics quite different from issues which are less controversial. The second criterion is the degree of uncertainty present in a particular decision context. The greater the uncertainty – both scientific and political – the more important it is for science to focus on policy options rather than simply scientific results. The application of the simple criteria developed in the book is illustrated in the flow chart (see Figure 2.1).

Chapter 3 explains why values and uncertainty are central to understanding how science plays different roles in different decision contexts. In short, in the pursuit of desired outcomes, decisions matter and information matters. But in a particular policy context information only very rarely provides a sufficient basis to determine which course of action ought to be taken.

Chapter 4 will discuss the role of values in how we think about the different roles of science in policy and politics. Making things even more complicated is that information will play a different role in decision-making when there is broad agreement on values versus a situation characterized by values conflict. This chapter explains why scholars of science in society have concluded that consideration of values is just as important as issues of science in policy and politics. It uses an extended thought experiment to suggest how scientists

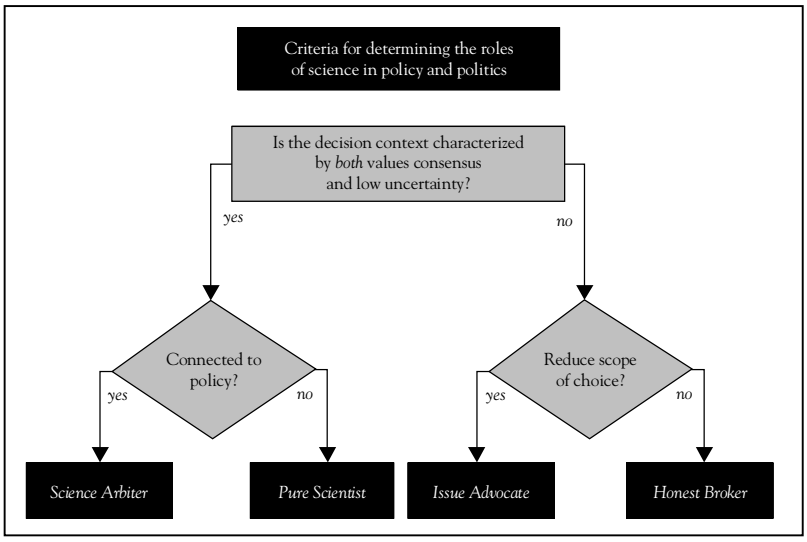

Figure 2.1 Flow chart illustrating the logic of roles for scientists in policy and politics

might determine whether a particular situation is characterized by a broad values consensus or fundamental conflict.

It is easy to conflate scientific uncertainty with political uncertainty, and then to suggest that a reduction in the former compels a reduction in the latter (Chapter 5). Understanding the relationship of different conceptions of uncertainty can help to make sense of different perspectives on the role of science in decision-making. Sometimes scientific research actually increases uncertainty, at least on the time scales of policy-making. This chapter explains different conceptions of uncertainty, how political uncertainty is related to scientific uncertainty, and how scientists might determine whether a particular situation is likely to have scientific or political uncertainty resolved through research.

More broadly, expectations that consensus on science can lead to a consensus in politics have their roots in the "linear model" of the relationship of science and society (Chapter 6). The linear model has been found to be an accurate description of the role of science

and decision-making only in special circumstances, where values are shared and uncertainty is low. One of the most significant influences of the linear model on science in policy and politics has been to foster "stealth issue advocacy" among scientists.

Chapters 7 and 8 explore these themes in the context of two cases. Chapter 7 considers policy, politics, and uncertainty in the case of decision-making by the administration of George W. Bush leading to the war in Iraq. Chapter 8 examines the very public debate over the publication of the book *The Skeptical Environmentalist* by Lomborg. In both cases Issue Advocates sought to use science to advance a political agenda. Decision-making arguably suffered in each case because of the lack of Honest Brokers of Policy Alternatives who might have contributed to debate by focusing attention on policy options and their consequences. The concluding chapter (Chapter 9) offers practical recommendations for scientists seeking to better connect their work with decision-makers.

Figure 2.1 illustrates how the various arguments of the book come together to provide a general and simple guide for scientists to assess what roles they might adopt in specific policy and political contexts. For individual scientists or scientists working together, for example, on an advisory committee or assessment, the purpose of this flow chart is to help them make decisions about how to connect their work with decision-makers in ways that are likely to be more effective, that is, to have a better likelihood of helping decision-makers achieve their desired goals while contributing to the long-term sustainability of the scientific enterprise. To use this framework requires that the scientist is to gain some understanding of the broader social and political context of which his or her research is a part.

Beyond individual scientists, there is also a broader perspective. Effective, democratic decision-making depends upon a healthy diversity of roles played by scientists in society. If it is important for the scientific enterprise to advance knowledge and serve stakeholders, and

to both serve special interests as well as common interests, then it is important that the scientific community fulfill each of the four roles of scientists in policy and politics. Collective behavior that overlooks one or more of the idealized roles can lead to pathologies in the relationship of science with decision-making.

The flow chart begins by asking whether the context is characterized by a values consensus and low (scientific) uncertainty. Answering yes to both of these questions points toward the Pure Scientist or Science Arbiter as likely being the most effective roles for the scientist, with the final determination between the two assessed by whether or not the scientist has some explicit connection to policy-makers, e.g., such as through a scientific assessment process where explicit questions from decision-makers are used to shape the information reported from the scientific community. Answering no to either of the questions of values or uncertainty points toward the Issue Advocate and Honest Broker of Policy Alternatives, with the final determination between the two decided by whether the scientist seeks to expand (or clarify) or reduce the scope of choice available to decision-makers, with the former associated with the Honest Broker of Policy Alternatives and the latter with the Issue Advocate. This book and the two detailed case studies are focused on exploring this flow chart.

In the end the decision about what role to play by scientists in society will be made by individual scientists, their leaders, and patrons. In the spirit of the theme of this book, it is important to recognize that such decisions can be made in a number of different ways, with important consequences for science, policy, and politics.

THREE

Science and decision-making

This chapter introduces several of the main themes of the book by addressing the following two questions:

Can science compel action?

What are "policy," "politics," and "science"?

The answer to the first question is "sometimes," but only in very specific decision contexts characterized by general agreement on valued outcomes and little uncertainty between particular actions and the achievement of outcomes associated with those actions. Such situations are rarely controversial. The answers to the second question are that "policy" is a decision, a commitment to a particular course of action. "Politics" refers to bargaining, negotiation, and compromise in pursuit of desired ends. Understanding these concepts can provide a bit of analytical rigor in defining concepts such as the "politicization of science" and "scientization for policy." Understanding the complex interrelationship of science, policy, and politics is a first step toward making sense of the different roles of scientists who seek to contribute to effective decision-making and sustaining the scientific enterprise.

Can science compel action?

Late at night on July 1, 2002, high over southern Germany two planes streaked across the sky on a collision course. One was a DHL cargo jet and the other a Russian charter carrying students on their way to vacation in Spain. As the planes approached each other, the onboard computerized collision avoidance system on the Russian charter warned the pilot to climb higher. But at just about the same instant over the radio a ground controller told the Russian pilot to dive. The pilot found himself at what philosopher John Dewey called a "forked-road situation," one "which is ambiguous, which presents a dilemma, which proposes alternatives" (Dewey 1997: 11). Afterwards, a newspaper article characterized the situation succinctly, "What lay in the balance was a simple decision: up or down, 1 or 0. Believe the controller or believe the machine" (Johnson 2002).

For the Russian pilot the situation was *uncertain*, meaning that more than one possible outcome was consistent with his understanding of the choices available to him and their possible consequences. The state of uncertainty is a fundamentally human quality because it refers to how we associate our perceptions of the world with our expectations of how we find the world to be. In the absence of perception there is no uncertainty. When our perceptions suggest that only one outcome is possible, there is no uncertainty and we are sure. Of course, we are often very certain and very wrong. Our perceptions often mislead us into misjudgments about uncertainty. Misjudgments can lead to poor decisions, sometimes with tragic consequences.

The Russian pilot actually faced three possible choices: dive, climb, or take no action, with each choice leading to two possible outcomes: survive or crash. The pilot's *decision* – his commitment to a particular course of action among his available alternatives – clearly mattered as his choice would shape outcomes in a very

profound way. The entire point of making a decision is to reduce uncertainty in a particular, desired direction, or, in other words, to increase the certainty of realizing desired outcomes. From this perspective a *policy* is simply a decision – a commitment to a course of action.[1] In this case, the conflicting information provided by the air traffic controller and onboard computer meant that before making his decision the pilot was unable to use information to reduce uncertainty about the outcomes associated with his options. The information did not compel a certain decision.

The pilot chose to listen to the ground controller and sent the plane into a dive. With hindsight we know that he made the wrong decision, as the planes slammed into each other killing all seventy-one people aboard the two aircraft.

The Russian pilot faced a relatively simple decision situation. Simple decision situations share the following characteristics:

> The scope of choice of is unambiguous, discrete, and bounded.
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> No ambiguity exists about the desirability of the different outcomes.
>
> No ambiguity exists in the relationship between alternative actions and desired outcomes.
>
> And improving information on which decisions are based promises insight into understanding the relationship of alternative courses of action and desired outcomes.

The Russian pilot's decision-making process was confounded by conflicting information leading to ambiguity between his understanding of available choices and their outcomes. Improving decision-making, and thus outcomes, in such simple decision situations often requires improving the information on which decisions are based, or improving the use of information, often a significant but nonetheless tractable challenge.

Now consider a very different decision situation. For more than a decade, beginning in early 1980s, medical experts advocated mammograms for women age forty and over as a way to screen for early

signs of breast cancer (Kolata and Moss 2002). During this period most forty-something women typically did not need to make a conscious decision about being examined because experts routinely recommended mammograms as a way to reduce the risks of breast cancer. But beginning in the early 1990s, health experts began to raise questions about the effectiveness of mammograms. In other words, health experts began to question whether routine mammograms in fact led to desired health outcomes. This increase in uncertainty led the National Cancer Institute, an agency of the US National Institutes of Health (NIH), in 1993 to drop its recommendation of routine screening for forty-year-olds. In 1997 NIH reaffirmed its 1993 decision; however, the US Senate voted to encourage NIH to reverse this guidance, and the nongovernmental American Cancer Society recommended routine screening for all women over forty. In 2001 the debate intensified following the results of a Danish study that questioned the value of all routine mammogram screening, regardless of age. *The Wall Street Journal* reported, "A fierce scientific debate about the true value of mammography screening has left women confused and uncertain about the test" (Parker-Pope 2002).

So what should a woman in her forties do?[2] As with the situation faced by the pilot, her choices are clear. She can opt for routine screening or she can choose not to undergo routine screening. But she must make a decision. Ignoring the issue and going along as she always has done, still leads to a commitment to a particular course of action. Unlike the one-time decision faced by the pilot, a woman continuously faces a decision about mammograms. Deciding to opt out of routine screening today does not mean that a different decision cannot be made tomorrow. A continuous decision process is more complicated than a one-time, discrete choice.

Just like the aircraft on a collision course, a desired outcome related to the mammogram decision is clear and unambiguous: life is preferred over death; health is preferred to illness; efficacious medical

tests are preferred to the superfluous. But for at least two reasons in the case of mammograms, the scope of outcomes is not limited only to physical health.

First, mammograms are a tool not only for protecting physical health but also psychological health, and these two outcomes are not necessarily one and the same. One oncologist observed, "People cling to mammograms. They cling to the idea that there is something they can do to protect themselves. If we take away that as a security blanket, people turn to you and say, 'So, what am I supposed to do?' " (Kolata 2002). The psychological factors help to explain why in 1997 the US Senate involved itself in recommending mammograms, even as the science remained uncertain – the senators were seeking to meet the demands of their constituents for guidance on mammograms. For most people, peace of mind is more desirable than anxiety, even if the peace of mind is not backed up by sound data on the effectiveness of the medical procedure.

Second, there are consequences for society related to how millions of women make decisions about mammograms. Routine screening has costs, with implications for health insurance providers, medical practitioners, government budgeting, and electoral politics. When a group of people commit to a particular course of action with broad implications, we call this a *policy*. Often we think of policy as a governmental decision; however, policies are adopted by companies, interest groups, neighborhood associations, school boards, families, individuals and so on. Throughout this book the term *policy* is used to refer to a group's decision – a group's commitment to a particular course of action.

Insurers, doctors, and elected officials each have visions (and typically multiple visions within each community) of desirable outcomes associated with alternative mammogram policies. The visions of these different groups are typically not compatible. For instance, doctors may wish to emphasize health outcomes over costs, insurers may seek a different balance between the two, governments may

wish to expand or limit coverage of public heath benefits, and elected officials may want higher approval ratings. The different vested interests of these groups contribute to their provision of various and potentially conflicting advice. As a consequence, an individual woman's decision about whether or not to undergo routine mammograms is shaped by the broader expectations of various groups and institutions in the health care field about the consequences of recommending routine screening.

Like the pilot who received different advice from the computer and the air traffic controller, women receive conflicting guidance on mammograms. A key difference in the case of mammograms is that the outcome associated with an individual decision cannot be immediately known, or perhaps ever known. When a woman chooses to be screened (or not) for mammograms there is more than one possible outcome. According to the 2001 Danish study, women routinely screened for mammograms experienced a death rate no lower than those who went unscreened, yet the screened women experienced more surgical procedures, leading the researchers to ask "whether the test does more harm than good" (Kolata and Moss 2002). And given the context of this uncertainty, it seems unlikely that another study of breast cancer screening will provide clearer understandings of the relationship between alternative courses of action and desired outcomes, at least for women making decisions about mammograms in the near future. One doctor commented on the state of mammogram science, "Uncertainty is very painful. The idea that science is not going to give you certitude is very difficult for many people to accept" (Kolata 2002).

Given the conflicting scientific studies and the long time required for new clinical studies, efforts to improve the information which informs individual and societal decisions about routine screening is unlikely to reduce uncertainty about the relationship of mammogram decisions and health outcomes, at least in the short term. Of course, over the longer term such studies may well be able to clarify the benefits (and costs) of routine mammograms.

At first, uncertainty might appear to stymie effective decision-making, but uncertainty does not mean that women cannot make effective health decisions. By contrast, the uncertainty associated with the effectiveness of mammogram screening could provide an impetus for women in pursuit of physical and psychological health to seek out more choices beyond a "yes or no" decision over mammogram screening. For example, women might focus more upon risk factors for breast cancer and behaviors that might be adopted to reduce those risks. If the goal is health, then women have many options for action that make good sense with respect to their health benefits. Such actions can be considered robust to the presence of uncertainty. As Dwight D. Eisenhower once said, "If a problem cannot be solved, enlarge it" (*The Economist* 2006: 41). Doctors can serve a valuable role in this process as honest brokers of options that women may not be aware of.

The case of mammograms involves some complexities not present in the decision problem faced by the Russian pilot.

> The scope of choice is unambiguous, but it is also continuous.
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> For society, conflict exists about the desirability of different outcomes, because there are multiple possible outcomes and multiple conflicting interests.
>
> Considerable ambiguity exists in the relationship between alternative actions and desired outcomes.
>
> And improving information promises little insight into the course(s) of action likely to lead to a desired outcome, at least over the near term. But other options are available that might lead to desired outcomes.

With these additional complexities, the case of mammograms provides a hint of the complexities of decision-making in highly politicized contexts involving both science and politics. Such decision contexts are characterized by unbounded alternatives and many possible outcomes associated with those alternatives. The very existence of a problem compelling a decision is often in dispute.

Dewey's "forked-road situation" is itself subject to debate, with some arguing that a particular decision is needed, others arguing that no decision is needed, and still others trying to introduce new forks in the road, leading to various different destinations. These situations are characterized typically not only by lack of consensus on the relationship between alternative courses of action and their outcomes, but lack of consensus on the desirability of particular outcomes.

In all contexts the sole purpose of decision-making is to reduce uncertainty about the future in a preferred direction. That is, by committing to particular courses of action we seek to make some desired outcomes more certain than other, less desirable outcomes. Good decisions are thus those that more reliably lead to desired outcomes. Of course, because in society there are a multitude of interests and perspectives, there is thus rarely (if ever) consensus on desired outcomes and the means to achieve those outcomes. In situations where there is consensus on ends and means, we typically find little conflict. As a result, whenever there is conflict, we engage in political behavior. *Politics* is the process of bargaining, negotiation, and compromise that, in the words of the political scientist Harold Lasswell, determines "who gets what, when, and how" (Lasswell 1958: 96).[3]

When there is conflict over decision-making, politics is necessary to reach a consensus that allows action to occur. So while policy-making thus inevitably has politics, policy and politics are not one and the same. In some systems of governance, politics may involve threats, coercion, injury, and other forms of violence by the powerful upon the weak. In a democracy, or at least a well-functioning democracy, individuals and various interests generally expect to participate in the making of important decisions. The challenge of securing such participation helps to explain why many democratic systems are so complicated and allow for many opportunities to influence the decision-making process.

What are "policy," "politics," and "science"?

The situation faced by the Russian pilot and the women deciding upon a mammogram are both examples of a common problem. We often need information to help guide the making of important decisions, but for various reasons information is rarely sufficient to determining how a decision should be made. And in some cases the wrong information or the misuse of information can actually lead to decisions with undesirable outcomes, and perhaps outcomes that are worse than if the information had not been considered in the first place. More than ever decision-makers depend upon scientific information in the making of important decisions. But at the same time the role of science in decision-making has never been more complicated. For those whose job it is to create, interpret, and provide information to decision-makers, a challenge exists in how to connect their activities with decision-makers in ways that foster good decisions that increase the likelihood of attaining desired outcomes.

In many different contexts, controversies abound about the roles of scientific information in decision-making. In the United States in 2004, Congressman Henry Waxman (D-CA) and the Union of Concerned Scientists, an advocacy group, each issued reports alleging that the administration of George W. Bush systematically misused science in pursuit of its political agenda. And coming from a very different political perspective, the Hoover Institution published a book in 2003 alleging that the political left misuses science to further its political agenda (Gough 2003). Every day when you pick up the paper, watch the news, or surf the internet, science infuses numerous issues of critical importance to health, the environment, the economy, and our security. Consequently, more than ever, making sense of science in policy and politics can help inform both scientists and the users of science about the various roles of science in decision-making.

But if we are to make sense of science in policy and politics we must first start with a shared understanding of what these terms mean in practice. As used in this book, *science* refers to the systematic pursuit of knowledge, and is a broad enough term to share considerable similarities across different areas of knowledge acquisition and expertise, such as, for example, the gathering, interpretation, and dissemination of military intelligence. As described above, *policy* refers to a commitment to a particular course of action, and *politics* refers to the process of bargaining, negotiation, and compromise that determines who gets what, when, and how. Thus, this book is about making sense of the roles played by the systematic pursuit of knowledge for (a) making commitments to particular courses of action and (b) bargaining, negotiation, and compromise, with a particular focus on the role of scientists in policy and politics.

One reason for this focus on scientists is that the role of science in society is changing. Scientists are being asked by policy-makers to contribute more directly to the needs of society. Part of this demand lies in the degree to which the problems that society faces have some close connection to issues of science and technology, for example in areas such as disease, development, terrorism, environmental impacts, adoption of new technologies, and so on. Another reason for such demands is that the resources available to support science and technology are limited, and thus choices must be made about priorities. Policy-makers thus expect that, to some degree, such choices should be made based on information about the relative benefits of different areas of science.

Scientists too justify their demands for public support by basing them on promises of benefits to society. For instance, in 1998 the US National Science Foundation adopted a second review criterion focused on societal impact in addition to its traditional criterion focused on scientific excellence. We see convergence between the conduct of scientific research and expectations for it to be useful or relevant. Some scientists have answered the call to be more useful or

relevant to society by adopting a much more aggressive stance in political advocacy. Scientists are of course citizens as well as scholars, and are as free as anyone to express their political preferences. However, for the individual scientist, issue advocacy in the political process is not the only means of connecting science with society. Such advocacy has become so pronounced that some see the scientific community as a *cause* of political conflict. Paul Starobin (2006) wrote in the *National Journal*:

> the modern professional research scientist is not, by any stretch, a blameless figure – in this tale, that scientist emerges as an increasingly partisan and self-interested figure . . . the science community, even if at times a reluctant warrior, is itself contributing to the polarization that afflicts America's political culture. Viewed by the Founders as part of the glue that binds American democracy, the scientist is in danger of becoming a force for its increasing fragmentation.

But scientists need not always choose to engage the broader society as political advocates. As Chapter 1 asserts, scientists have a range of choices for how they act in the context of decision-making. To understand the different roles that scientists might play in decision-making it is thus important to distinguish policy and politics.

Even if all policy-making necessarily involves politics, sometimes politics and policy come into conflict. That is, the process of bargaining, negotiation, and compromise can get in the way of making commitments to particular courses of action. This matters when decisions are needed to increase the certainty of valued outcomes. To make the distinction between policy and politics more concrete, consider a September 2002 op-ed in *The New York Times* by US Representative Dick Gephardt (D-MO) on the debate over the possibility of United States intervention in Iraq. Representative Gephardt wrote that the decision whether or not to go to war in Iraq "is a case that deserves to be made on the basis of policy, not politics" (Gephardt 2002).

What did he mean by distinguishing policy and politics? In his op–ed Representative Gephardt expressed concern that President George W. Bush and members of his administration were using the decision on the war in Iraq as a means of consolidating the Republican Party's hold on government. He provided several examples to justify his concern, including, "In a recent speech in Kansas, Vice President Dick Cheney also entered the act, saying that our nation's security efforts would be stronger if a Republican candidate for Congress were elected" (2002: A31). Representative Gephardt concludes:

> Military action, if required, may meet with quick success in Iraq, but a peaceful, democratic Iraq won't evolve overnight. It will take the active support of both parties in Congress over the long term if we are going to win the peace. That's only going to happen if we act, not as Democrats or as Republicans, but as Americans. (2002)

In other words, it is in the national interests to reconcile the competing perspectives of Republicans and Democrats through practical actions, and not simply via the consolidation of power by one group or the other.

Whether or not the Bush administration was in fact seeking political advantage through the debate over Iraq, it is clear that Representative Gephardt was concerned about the consequences associated with a debate that focused on the relative power positions of competing political parties but excluded consideration of alternative courses of action in Iraq. Political power is of little policy utility if there are no good options available for decision-making.

The reality is of course that the politicization of policy is unavoidable and in fact desirable. We want conflicts to be resolved through the political process, which is much better than any of the alternatives. But politicization, when taken to such an extreme that it overshadows considerations of policy, can also threaten effective decision-making when those engaged in conflict over alternative

courses of action evaluate those alternatives solely according to the gains or losses they provide to a group's ability to bargain, negotiate, or compromise relative to its opponents. Thus, the actual merits of alternative courses of action are at risk of being lost in a debate that becomes politicized to the extent of overshadowing policy. Ultimately, decisions matter because decisions shape real-world outcomes. Under some circumstances, politicization places at risk the connection between the policy and the outcomes that are supposedly being pursued through adoption of the policy.

Politics without policy threatens the democratic process for two reasons. First, it may lead to a limited participation in processes of decision-making, as some groups might be excluded. Second, political power can do little to serve common interests if there are no good alternatives for action available for decision-makers.

If politicization refers to situations where politics overshadows policy, then what about situations in which considerations of policy overshadow politics? Politicization has a counterpart which results when those engaged in conflict act as if all political debate can be resolved through evaluation of policy alternatives by some objective, scientific criteria. Such a perspective is consistent with the notion of the Science Arbiter introduced in Chapter 1 and reinforced by situations such as that faced by the Russian pilot in which information did in fact compel a particular course of action. Attempts to turn all policy-making into technical exercises that obviate the need for political debate have been called *technocracy* or *scientization* (see, e.g., Jasanoff 1990; Weingart 1999). Examples abound of contemporary political debates which invoke a technocratic vision of policy-making when the onus of decision-making is placed upon the shoulders of experts under an expectation that reliance on these experts will eliminate the need for politics. An example can be found in debates in the United States in 2005 and 2006 over the provision of emergency contraception in drug stores. Those wanting to see the drug made available cited a Food and Drug Administration's expert

panel recommendation on the drug's safety as necessarily compelling that the drug be made available. At the same time, opponents of making the drug available sought experts who would impeach the safety of the drug. Of course the reality is that the debate reflected the values that are at stake in abortion politics. In the end the US government decided to make the drug available to women over the age of eighteen, reflecting a political compromise similar to establishing legal drinking ages. Given the challenges of politics in a charged issue such as abortion, it is no surprise that the technocratic vision is most appealing in highly contested political issues that involve considerations of science.

In such cases we often expect *science* – the systematic pursuit of knowledge – to provide insight into the nature of problems, decision alternatives, and their consequences with respect to desired outcomes. With respect to decisions, the technocratic impulse suggests that the reduction of scientific uncertainty necessarily leads to a reduction of political uncertainty. In other words, technocrats believe that by seeking a clearer conception of the relationship of alternative courses of action and their outcomes, there will necessarily be greater consensus on what action is preferable. We see such calls in most every area where science is contested, with notable recent examples including global climate change, genetically modified organisms, and nuclear waste disposal. For instance, in the case of emergency contraception, in 2005 the *New York Times* expressed a technocratic impulse when it wrote that the US government's decision at that time to keep the drug off the market meant that "politics or ideology was allowed to trump science" (*New York Times* 2005). In situations of political conflict about the means or ends that a policy is to achieve, politics will always and necessarily "trump" science simply because science does not compel action.

The politicization of science and the scientization of politics are mutually reinforcing. When politicians look to scientists to provide information that will help them to overcome or avoid politics, the

result is inevitably more funding for research and more science conducted. More science results in more papers and more reports that invariably provide more material for those who seek to use science as a resource for negotiating for desired outcomes. As is typical of complex issues, science is frequently uncertain and diverse enough to provide ample material to sustain the arguments of competing political perspectives (Sarewitz 2000). Peter Weingart has written that "the competition for the latest, and therefore supposedly most compelling, scientific knowledge drives 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" (Weingart 1999: 158). And the circle is completed when contested knowledge claims result in demands for more science to "reduce uncertainty."

Chapter recap

This chapter has sought to address two questions:

Can science compel action?

Yes, but only in particular circumstances characterized by shared values and low uncertainties about the relationship of alternative courses of action and those valued outcomes. By contrast, many issues in which scientists are asked to play a role in facilitating decision-making are complex, even more complex than the decision contexts faced by the Russian pilot or women resolving whether or not to get a mammogram. They share the following characteristics:

The scope of choice is ambiguous and continuous, and competing interests work to limit the scope of choice.

Considerable conflict exists about the desirability of different outcomes, because there are many outcomes and many interests.

> Considerable ambiguity exists not only about the relationship between alternative actions and desired outcomes, but about the conditions that motivate the need for decision-making in the first place.
>
> And more information promises little insight into the course(s) of action likely to lead to a desired outcome; in some circumstances more information may increase the ambiguity about the relationship between alternative actions and desired outcomes.

In these cases not only is there *uncertainty* about the nature of problems and the effects of actions in the face of problems, but uncertainty is also a resource for various interests in the process of bargaining, negotiation, and compromise in pursuit of desired ends. Of course, in some cases uncertainly may also facilitate democratic decision-making by allowing for ambiguity that enables competing interests to reach agreement on action. For instance, the effects of future climate change are not known with precision, so there is some risk that any particular decision-maker might suffer future harm. If the winners and losers associated with future climate change were to be known precisely, there might be less incentive for future winners to participate in a collective response. Consequently, there may be greater room for political compromise when winners and losers are unknown or at risk, that is, when uncertainty is present.

What are "policy," "politics," and "science"?

Simply put, a "policy" is a decision; "politics" is bargaining, negotiation, and compromise in pursuit of desired ends; and "science" is the systematic pursuit of knowledge.

Decisions that we make about science, i.e., *science policies*, matter a great deal. Such decisions include what we decide to research, how many resources to devote to that research, who conducts it, how it is governed, how we structure its institutions, the expectations that we have for its connections with the needs of decision-makers, criteria

for its success, and so on. Such decisions also will shape how science connects to policy-makers, and the degree to which scientific results have the potential to play a constructive role in policy-making.

Why should scientists seek to make better sense of science in policy and politics? Because, more than ever, science and scientists are being asked by society to play an important role in decision-making. Science matters for how we make decisions. And decisions matter for real-world outcomes – who benefits at whose expense, who (or what) lives or dies, how they live and how they die. Decisions cannot be avoided. And because outcomes – things we care about – are necessarily affected by decisions, it is only logical to explore the degree to which good decisions can be made more reliably more often and bad decisions avoided. Science, well used, holds great potential to improve life on earth. Science, poorly used, can lead to political gridlock, bad decisions, and threaten the sustainability of the scientific enterprise. The difference depends upon how we decide to use science in policy and politics. And that decision depends on being able to distinguish the different roles that scientists and other experts can play in policy and politics.

FOUR

Values

This chapter builds on the discussion in Chapter 3 of science in policy and politics by asking one question:

> What are the implications of different degrees of values consensus in decision contexts for the role of science in policy and politics?

The chapter answers this question through an extended "thought experiment" – an exercise in the imagination – that describes decision contexts that share some surface similarities, but suggest vastly different roles for science and expertise in the actual process of decision-making. Thought experiments allow the thinker to create carefully constructed, hypothetical scenarios in order to highlight aspects of the real world that are typically difficult to see or somehow obscured. Politics and policy are concepts that are often conflated and difficult to distinguish, making it difficult to understand the role of science in decision-making.[1] The thought experiment introduced below uses two scenarios to highlight the importance of the context of decision-making as a critical factor that shapes the interconnections of science, politics, and policy. This chapter builds upon the more general

discussion of science and decision-making in Chapter 3 to explore in some detail the importance of political context for how we think about the role of science in decision-making.

Abortion Politics and Tornado Politics

The significance of information in decision-making, and the types of information that are significant for decisions, are a function of political context – specifically, science plays a different role in situations of values consensus and low uncertainty than in the opposite circumstances.[2] Consequently, for scientists to contribute to effective decision-making requires understanding the political context of a particular decision situation.

Imagine that you are in an auditorium with about fifty other people. Perhaps you have gone to hear a lecture or you are at a neighborhood meeting. As you entered the auditorium you noticed a thunderstorm approaching, but you paid it little attention. All of a sudden someone bursts into the room and exclaims that a tornado is fast approaching and that we must quickly proceed to the basement. Whatever formal event was going on is quickly transformed into several dozen hurried conversations, some expressing doubt, and the excited packing of purses and briefcases. As the milling about continues, someone shouts loudly to all in the room, "We must decide what to do!"

How might such a decision be made? For the purposes of this thought experiment, it is not unreasonable to assume that the people threatened by the tornado have a shared common interest in preserving their own lives.[3] Thus, to reach a consensus to commit to a course of action – say, stay in the auditorium and continue the meeting or go down to the basement – they would need to know if the tornado is indeed quickly coming this way. To collect this knowledge they might log on to the internet to find a real-time radar image, or just look out the window. If the tornado is indeed approaching the

building then it is easy to imagine that the group would quickly decide to move to the basement. The essential point of this example is that for the group in the auditorium, under these idealized circumstances, a commitment to a specific course of action can be resolved primarily through the systematic pursuit of knowledge, i.e., science.

Let's call the process of bargaining, negotiation, and compromise in such situations *Tornado Politics*. Information plays such a critical role in Tornado Politics because participants in the decision-making process share a common objective – in this case the goal of preserving one's life – and the scope of choice is highly restricted – stay or go. We will return to Tornado Politics shortly, but first consider a very different sort of politics.

Imagine that you are in the same auditorium with the same group of fifty people, but, in this case, instead of deciding whether or not to evacuate, the group is discussing whether or not to allow abortion to be practiced in the community. For simplicity sake, let's just consider abortion generally, yes or no, and not in cases of medical necessity, etc.[4] One person stands up and exclaims, "The practice of abortion violates my religious beliefs and therefore must be banned in our community!" The next speaker states with equal passion, "The community has no right to dictate what can or cannot occur inside a woman's body. The practice of abortion must remain legal!" As the murmur of dozens of conversations grows louder, someone shouts loudly to all in the room, "We must decide what to do!"

How might such a decision be made? For the group in the auditorium to commit to a course of action – to ban or to allow abortion in the community – they might follow some sort of established procedure, such as a vote. They might form two groups (e.g., pro-life and pro-choice) and assign representatives to negotiate an outcome. Or if negotiations go badly they might even take up arms against one another to settle the matter by force. They may even cease attempting to live together as one community. There are clearly many ways in which such a decision might be made.

One strategy that is extremely unlikely to lead to a resolution on this issue is to systematically pursue knowledge about abortion in the same manner that was proposed in the case of the approaching tornado. Why? On this issue among the group there is not a shared commitment to a specific goal; to the contrary, there are conflicting commitments based on differing values. And while information matters in this situation, arguably no amount or type of *scientific* information about abortion can reconcile the different values. Even so, perhaps the community's overarching commitment to live under shared governance might lead to a desire to work together to achieve a legitimate outcome where all agree to live under the decision, once made. In such situations, let's call the process of bargaining, negotiation, and compromise *Abortion Politics*.

The idealized examples of Tornado Politics or Abortion Politics help create a language that will allow us to investigate the complexities and the challenges of making decisions with and about science.

Table 4.1 contrasts the different roles and characteristics of information in decision-making in Tornado and Abortion Politics. On the one hand, in Tornado Politics scientific information is critical for decision-makers to evaluate and compare decision alternatives. The information that is needed to make an effective decision lies outside of the room, hence the methods and perspectives of science are strengths in obtaining useful knowledge. This is very much the logic that underlies calls for scientific assessments designed to provide information to policy-makers. A fundamental assumption in such cases is that once everyone obtains a shared level of understanding a preferred course of action will become obvious and non-controversial. In the case of a rapidly approaching tornado, this is undoubtedly true. The decision faced by the Russian airline pilot is an instance of Tornado Politics.

On the other hand, in Abortion Politics, information certainly is important, but the relevant information is not scientific information about abortion. Information that might be shared in this case might

TABLE 4.1: *Roles and characteristics of information in decision-making*

Tornado Politics	Abortion Politics
Evaluation	Rationalization
Used to help assess decision alternatives	Used to help justify decision commitments
Comprehensive	Selective
Rational	Emotional
Logical	Narrative
Enlightenment	Power
Technocracy	Pluralism

be experiential in the form of narratives or anecdotes, or even information about how others view the issue. Information matters in this scenario, but it plays a very different role in decision-making than in the case of Tornado Politics. A decision in this case will result from the exercise of power in a decision-making system, and information will be used in an attempt to convince those sharing in the exercise of power to align with particular perspectives.

But within the context of Abortion Politics there is a strong desire to frame political conflict in terms of the dynamic of Tornado Politics. So, for example, those who have attempted, thus far unsuccessfully, to establish a scientific linkage between abortion and breast cancer help to make the general point that Abortion Politics is not about scientific information. Such efforts reflect a desire to turn Abortion Politics into Tornado Politics, to position the debate in the context of values that are widely shared (health) rather than in the context of those values which are not widely shared (pro-life *vs*. pro-choice).

In Table 4.1, the roles and characteristics listed under Tornado Politics are similar to how we might describe scientific information, whereas those listed under Abortion Politics are quite contrary to conventional descriptions of scientific information. Because our society values scientific information so highly, its characteristics are

often portrayed in a positive light and are presented as being authoritative, and information with non-scientific characteristics is portrayed in a correspondingly negative light. For example, no scientist wants to see his/her work described as "emotional" or "selective." But, "comprehensive," "logical," and "rational" are positive attributes, whether the information being described is scientific or not. This is one reason why advocates of different political views agree on the need for policy to be based on "sound science" or "scientific integrity."

But a fundamental lesson of the thought experiments is that neither Tornado Politics nor Abortion Politics presents a "better" means of decision-making, but that the different types of politics arise from the context of decision-making. Similarly, the role of information in one scenario versus another cannot be judged to be a "better" strategy, as each is appropriate for the context. This perspective is well understood by many advocates whose job it is to promote particular political positions.[5]

For example, in March 2003, *The New York Times* reported on a memo prepared by a Republican Party strategist discussing the party's approach to the environment (Lee 2003). The memo offered the following advice, as presented in the article:

> The term "climate change" should be used instead of "global warming" because "while global warming has catastrophic connotations attached to it, climate change suggests a more controllable and less emotional challenge."
> "Conservationist" conveys a "moderate, reasoned, common sense position" while "environmentalist" has the "connotation of extremism."
> "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 more willing to trust scientists than politicians."

Kim Haddow of the Sierra Club, a group with positions usually at odds with the Republican Party, said that the memo's "advice is right.

It's very smart – confounding, troubling, but smart." It is "smart" because the guidance in the memo for the presentation of environmental information is appropriate for the context of political debate – in this case, Abortion Politics.

A real-world example of a situation that evolved from Tornado Politics to Abortion Politics is the contested 2000 presidential election (Sarewitz 2001; see also 2004). The selection of the US president on Election Day is typically a very straightforward process that exemplifies the dynamics of Tornado Politics.

Vote.

Count the votes.

The candidate with the most electoral votes wins the election.

This is clearly a case of Tornado Politics, where the relevant information is the number of votes cast for each candidate, collected comprehensively and rationally, under a widely shared agreement that selecting a legitimate winner is a valued outcome of the election. But, in 2000, with the electoral votes just about equal in forty-nine states, the election in Florida was so close that it was unclear who had received more votes. Whoever won Florida would win the presidency. The candidates quickly proposed alternative means for resolving the uncertainty:

Count only these votes.

No, count these.

Finish by Friday.

Take as long as is needed.

Count the hanging chads.

What is a hanging chad?

Revote here.

Revote there.

Take it to court.

The systematic pursuit of information mattered less and less, and supporters of both George W. Bush and Al Gore sought to manipulate the process in such a way that would result in their candidate being

elected. The situation evolved from one in which everyone had a shared interest in a legitimate outcome under the rules, to one in which the rules themselves were being debated based on the political advantage they would give to either candidate. Ultimately, as we all know, the election was decided by the Supreme Court.

Daniel Sarewitz (2000) asks if the election could have been resolved through science, "Suppose we had asked a team of scientists – rather than the US Supreme Court – to determine the winner of the Florida presidential election . . . Could such an approach have worked?" His answer is no,

> because uncertainty does not cause conflicting values. As a political matter, the direction of causation is quite the opposite: uncertainties emerge because the value conflict – an election, an environmental controversy – remains politically unresolved. Conversely, once a value conflict is settled through political means, the underlying uncertainties effectively disappear. The Supreme Court is a legitimate means for achieving this end; a team of scientists is not. (2000)

In the case of the 2000 election, thank goodness that the US Constitution has mechanisms for resolving disputes played out as Abortion Politics, not because of the outcome of the election, but because there was a legitimate outcome at all. An approach based on Tornado Politics (i.e., trying to precisely count the votes) may have led to greater uncertainties in who received more votes (e.g., what counts as a vote anyway?), proving that in some cases information is simply incapable (just as in the case of Abortion Politics) in resolving a dispute over values. Often, wars and conflict result where the mechanisms of Abortion Politics are not considered as legitimate as are decisions rendered by the US Supreme Court.

Now let's take the thought experiment a step further. Imagine if in the tornado example the group in the auditorium decided to adopt the mechanisms of Abortion Politics as the means for making a decision. That is, instead of seeking to assess the location and path of the

tornado, they decided instead not to gather information and they held a vote. This is almost so absurd as to be nonsensical. To disconnect the decision from the circumstances of the tornado is to invite a tragic outcome – such as was the fate of the Russian pilot or at best a good outcome determined only by chance.

Conversely, imagine if in the abortion example the group were to adopt Tornado Politics as the means for making a decision. Here as well, one's thought experiment capabilities are pushed to the limit in trying to imagine what scientific study could conceivably be undertaken that would lend any useful information to this decision process.[6] But this dissonance illustrates a central point of the thought experiment: In the idealized tornado case, scientific information matters. In fact, in the very simple example presented here the information determines the decision. In the abortion case, scientific information matters not at all, and its pursuit would represent a distraction from the task of reconciling different value commitments through bargaining, negotiation, and compromise. As Daniel Sarewitz writes, "not only is there nothing wrong with the consequent messiness [of democratic politics], but all historical indications suggest that there is no viable alternative in a society that values freedom and justice and seeks to balance individual rights with the collective good" (2000).

Conflation, often willful, of Abortion and Tornado Politics encourages the mapping of established interests from across the political spectrum onto science and then uses science as a proxy for political battle over these interests. As Herrick and Jamieson observe, "the imprimatur of science is being smuggled into deliberations that actually deal with values and politics" (Herrick and Jamieson 2000: 15). An example of this dynamic has occurred in the United States in the debate over embryonic stem-cell research.

The issue of stem cells is controversial because – just as their name

implies – embryonic stem cells come from human embryos, which may have been cloned for research purposes. Predictably, the use of embryos that are destroyed in the process of embryonic stem-cell research has caught the attention of anti-abortion/abortion rights advocates, who count among their ranks President George W. Bush. In October 2001, President Bush announced a policy that would prohibit the destruction of any embryo for use in federally funded stem-cell research, and limited scientists to research on existing lines (White House 2001a).

President Bush admitted that there may be potential benefits from embryonic stem-cell research, but he refused to compromise his principles to realize those benefits, no matter how large those benefits may be. For President Bush stem cells are an issue to be dealt with through the mechanism of Abortion Politics, and there is apparently no scientific information on the potential benefits of stem-cell research to alter his views.

By contrast, during the 2004 presidential campaign, Senator John Kerry characterized the stem-cell issue in a way that among those who share his perspective on the morality of stem-cell research was much more consistent with the notion of Tornado Politics. For example, in a speech Senator Kerry argued, "By supporting stem-cell therapy, we have the possibility to control the future. Not only can we reduce the economic cost of health care, we can reduce the emotional and social cost to families" (US Newswire 2004a). Kerry evidently believed that the potential benefits of embryonic stem-cell research justified going forward with research, under the assumption that many people share his belief that stem-cell research ought to be evaluated in terms of costs and benefits. Among those who have decided that stem-cell policy should be guided by a calculation of the costs and benefits of health care and are unmoved by arguments to restrict stem-cell research, scientific information is critically important because it provides a basis for evaluating the trade-offs between the costs and benefits associated with different courses of action.

Confusion about the role of science in the stem-cell debate arises when those sharing President Bush's perspective and those sharing Senator Kerry's perspective fail to understand not just each other's perspective, but the fact that they are engaged in fundamentally different types of politics. For example, the forty-eight Nobel laureates who endorsed John Kerry did so in part because they believe that the Bush Administration has placed "unwarranted restrictions on stem-cell research" that are impeding medical advances (Scientists and Engineers for Change 2004). The laureates seem to have assumed that the issue is in fact about medical advances. But for many people who share the views of President Bush, this argument would appear to miss the point. Senator Kerry made a similar case for stem-cell research in a June 2004 radio address: "Believe it or not, there was a time when some questioned the morality of heart transplants" (US Newswire 2004b). In other words, Kerry seemed to believe that it would only be a matter of time before everyone recognized that the benefits of stem-cell research outweigh any costs. That is, the issue will eventually become a matter of Tornado Politics where values are widely shared. If so, once everyone sees the tornado coming, the correct course of action will be obvious and generally accepted.

In his August 2001 address to the nation on stem-cell research, the president justified his decision to limit research to then-available stem-cell lines as follows:

> My position on these issues is shaped by deeply held beliefs. I'm a strong supporter of science and technology, and believe they have the potential for incredible good – to improve lives, to save life, to conquer disease. Research offers hope that millions of our loved ones may be cured of a disease and rid of their suffering. I have friends whose children suffer from juvenile diabetes. Nancy Reagan has written me about President Reagan's struggle with Alzheimer's. My own family has confronted the tragedy of childhood leukemia. And, like all Americans, I have great hope for cures. I also believe human life is a sacred gift from our Creator.[7] (White House 2001a)

For President Bush the issue was not a scientific issue at all, because no matter what scientists or those who rely on scientific information say about potential benefits, this information is highly unlikely to change his position. Five years after announcing his initial policy, President Bush vetoed legislation that would have allowed federal funding of embryonic stem-cell research.

Some scientists who support federal funding for stem-cell research have sought to use science to develop "ethically acceptable" approaches to stem-cell research, e.g., research that does not require the destruction of embryos. They are seeking to move the debate from Abortion Politics to Tornado Politics by removing the basis for the values disputes over stem-cell research. So far, such an approach has instead backfired from the standpoint of the political interests of these scientists because it begins by granting that the issue is indeed a matter of Abortion Politics – in other words, it begins by accepting that research that destroys embryos is unethical. In at least one prominent case an effort to develop such "ethically acceptable" stem-cell research was accompanied by an embarrassing overstatement and misrepresentation of what science has achieved, leading Senator Arlen Spector (D-PA), a strong supporter of stem-cell research, to comment, "It's a big black eye if scientists are making false and inaccurate representations" (Weiss 2006). The *American Journal of Bioethics* asked, "Can't we just be honest and say that we favor embryonic stem cell research, at least for now . . . even though the research destroys embryos?" (Weiss 2006).

The stem-cell issue cannot be resolved through appeals to science, but instead through the process of politics. Efforts to turn the stem-cell debate into a matter of Tornado Politics have arguably done more than just failed to secure federal research funding, they have given a black eye to the broader scientific enterprise. So long as there is dispute over values in a particular context, appeals to science can offer little to resolve those values differences, and may instead transform scientific debate into political debate.

Chapter recap

This chapter has addressed one question:

> *What are the implications of different degrees of values consensus in decision contexts for the role of science in policy and politics?*

Figure 4.1 shows how the highly idealized notions of Tornado and Abortion Politics map onto the framework of the roles of science in policy and politics presented in Chapter 2. In a situation characterized by a broad consensus on values, admittedly an imprecise characterization, science and scientists have great potential to play a positive role in providing scientific information without necessarily engaging such information with action alternatives, that is, as Science Arbiters or Pure Scientists. By contrast, in a situation characterized by values conflict, policy advocates typically seek to use scientific information as a means of arguing for one course of action over another. Hence, the relationship of science to alternative courses of action is more

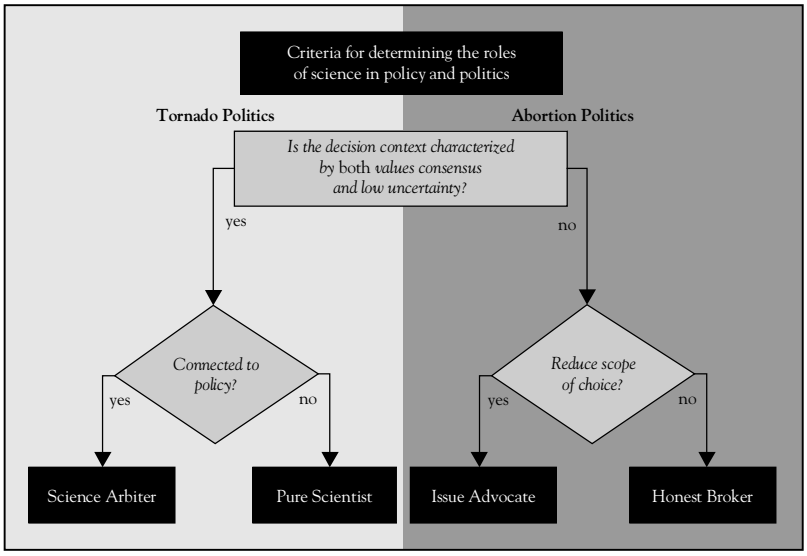

Figure 4.1 The idealized realms of Tornado and Abortion Politics

effectively clarified when science is explicitly associated with choice, either through issue advocacy or honest brokering of policy alternatives.

In reality, unlike carefully constructed thought experiments, decisions, particularly those involving contested environmental issues, take on characteristics of Tornado and Abortion Politics simultaneously. In such situations the following circumstances often apply. Alternative courses of action materially affect outcomes. To some degree, scientific information matters for understanding both the motivation for the decision and the consequences of alternative courses of action. At the same time, different perspectives and values shape commitments to alternative courses of action. There may be fundamental, irreducible uncertainty about the problem and policy options. Knowledge itself may be contested. And there may be a lack of shared values on both ends and means. In such contexts it is important to accurately assess what science can and cannot do as a contribution to the democratic process.

In the language of this chapter, the effectiveness of science in decision-making will vary considerably, to the extent that a particular decision context exhibits characteristics of Tornado Politics and Abortion Politics. In many situations, just as what seems in the stem-cell debate, elements of Tornado Politics and Abortion Politics will occur simultaneously as those seeking to scientize debate frame the issue in terms of information and perhaps uncertainty, while those seeking to politicize the debate will emphasize the values disputes and perhaps the consensus on knowledge.

It is important to recognize that those seeking to politicize policy debates that involve science hold the trump card. So long as there is a dispute over values, the issue will necessarily take on the dynamics of Abortion Politics, irrespective of the actions of those seeking to scientize the debate.

The strategies of Tornado Politics are effective when there is a broad consensus over values. In other words, scientists and scientific

institutions are likely to be effective as Pure Scientists or Science Arbiters only in those cases where there is a broad agreement on values. Where no such agreement exists, science offers much less prospect of contributing to effective decision-making. Even worse, in cases where significant values conflicts exist, efforts to serve as Pure Scientists or Science Arbiters are likely to foster the politicization of science. If values conflicts cannot be avoided, then one might still hold out hope that uncertainty somehow can be reduced or eliminated, in order to clarify the role of science in decision-making, and if nothing else to delineate available options and their consequences. In later chapters we shall see such strategies at work in the cases of environmental politics and debate over the decision to go to war in Iraq. Often, the effect of efforts to characterize situations of Abortion Politics as Tornado Politics is to bring issue advocacy into the realm of Science Arbiters and Pure Scientists. If this were not complicated enough, in addition to disputes over values, another characteristic of decision processes that it is important to clarify in order to improve understandings of science in policy and politics is uncertainty, which is the focus of Chapter 5.