The Significance of Science

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Social policy only emerges when sociological, economic and purely scientific extrapolations are linked with ethical anticipations. It does not emerge from the calculable and extrapolated future, or solely from ethical maxims and desires, but only from the linking of what we know and can do with what we hope for and desire.

Jurgen Moltman, 1989[2]

Introduction

In October of 2002 a number of scientists expressed concern that President Bush appeared to be "stacking" health advisory panels with scientists chosen more for their political views than their scientific credentials. Why does this matter? A group of scientists writing in *Science* magazine explained that,

> instead of grappling with scientific ambiguity and shaping public policy using the best available evidence (the fundamental principle underlying public health and environmental regulation), we can now expect these committees to emphasize the uncertainties of health and environmental risks, supporting the administration's antiregulatory views. And in those areas where there are deeply held conflicts in values, we can expect only silence.[3]

The implication here is that policy making related to issues where both science and values are strongly contested benefits from open dialogue and debate. Few would disagree with the premise that scientific outcomes should not be predetermined by

[1] This essay was first prepared as a lecture delivered at Spoletoscienza, Festival Dei Du Mondi, Spoleto, Italy, 21 June 2002, sponsored by the Sigma Tau Foundazione.
[2] Quoted in J. T. Sykes, 1997. Advocacy: Bringing Science to Policy and Practice, 1997 World Congress of Gerontology, http://www.cas.flinders.edu.au/iag/proceedings/proc0031.htm
[3] D. Michaels et al. 2002. Advice without consent, *Science* 298:73.

ideological perspectives. Why? The result, invariably, will be bad science and most likely bad policy.

But if politics should not determine science, we might turn the question around and ask if and under what circumstances science determines political outcomes. The actions of advocacy groups, politicians and scientists in a wide range of contentious policy issues that involve science indicates that many do indeed believe that science determines particular political outcomes. Hence, amongst competing interests, arguments for or against particular courses of action are justified, almost exclusively, upon science. To take some examples:

- For decades, debate has been raging about what should be done about global climate change. Some in the fossil fuel industry suggest that the problem is rather minimal and will take care of itself. Others in environmental groups advocate dramatic and immediate changes to global energy policies. The debate is centered on alternative visions of the future, as projected by sophisticated computer models. Both sides use science to justify their preferred course of action or deny that of their opposition.
- Nuclear power has for a long time been a focus of intense political debate. Considerable scientific effort has been devoted into assessing risks associated with nuclear plants and nuclear waste storage, with advocates and opponents of nuclear power each using science to support their positions.
- Genetically modified organisms (GMOs) have been the subject of heated debate, focusing on risks and benefits of introducing this technology into the

environment, and for human consumption of GMO products. Do benefits exceed risks? Are risks and benefits even calculable? However, the debate uses the language of science but is often less about science than about different ideological perspectives on genetic modification, including the aesthetic, spiritual, and ethical implications of the technology.

Issues such as these are made more complex by the powerful economic and political interests that not only have high stakes associated with alternative outcomes, but also have an ability to enjoin scientific experts in support of particular positions.

Concern about the politicization of science is not new and has been studied by scholars, e.g., in the field Science and Technology Studies, for many years. What may be new, or at least more prevalent than in the past, is the degree to which scientists themselves participate in identifying science as the proper battlefield on which to wage political conflict. Examples abound in areas as diverse as international whaling[4] to cloning[5] to sex education[6] to North American archeology.[7] But no example has the public visibility of the debate that followed and continues over the publication of Bjorn Lomborg's *The Skeptical Environmentalist*. The book's publication in 2001 was immediately followed by an unprecedented mobilization of environmental groups and many scientists against the book, its author and publisher and, perhaps to a lesser extent, the claims made in it.

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[4] W. Aron et al. 2002. Scientists versus Whaling: Science, Advocacy and Errors of Judgement, *Bioscience* 52:1137-1140.
[5] *Nature: Medicine*, 2002. Cloning Conundrums, 8:1331.
[6] A. Clymer, 2002. U.S. Revises Sex Information, and a Fight Goes On, *The New York Times,* p. A15.
[7] G. Custred, 2002. The Kennewick Man Case, *Science Insights*, v. 7, No. 1, National Association of Scholars, November.

This essay argues that the politicization of science in the case of *The Skeptical Environmentalist* affair merits attention not because of its character assassination and pressure politics -- these are nothing new – but because of it represents an a very public example of how scientists seek increasing to connect there work to policy through power politics. Such efforts pose important challenges for both science and policy.

In *The Skeptical Environmentalist* Lomborg, a Danish statistician by training and a self-described environmentalist, advances a not-so-novel view popularized by Julian Simon, the late economist, that environmental problems are not as severe as advertised by environmental groups, and that some combination of business as usual and incremental change will be sufficient for children born today to "get more food, a better education, a higher standard of living, more leisure time and far more possibilities – without the global environment being destroyed."[8] For most environmental advocates, especially those whose policy proposals resemble nothing like business as usual, Mr. Lomborg's book must seem like a declaration of war on the entire movement. Environmental groups such as the World Resources Institute and Union of Concerned Scientists began an aggressive public campaign seeking to discredit Lomborg and Cambridge University Press.[9] Lisa Sorensen of the Union of Concerned Scientists justified the offensive, "this book is going to be misused terribly by interests opposed to a clean energy policy."[10] An

[8] B. Lomborg, 2001. *The Skeptical Environmentalist*, Cambridge University Press.
[9] See, e.g., http://newsroom.wri.org/mediakits_contents.cfm?MediaKitID=1 and http://www.ucsusa.org/global_environment/global_warming/page.cfm?pageID=533
[10] C. Woodard, 2001. The Tabloid Environmentalist, http://www.tompaine.com/feature.cfm/ID/7089 December 7.

organized campaign among environmental groups to discredit the book comes as no surprise.

What is a surprising is the manner in which a number of respected scientists have seen fit to enter this political fray, for the most part, on the side of the environmental advocates. That scientists are political is neither new nor problematic. A problem exists in that in their opposition to *The Skeptical Environmentalist* these scientists have chosen to use science itself as their preferred weapon in political battle. The approach taken has not been to quibble with the policy recommendations made by Lomborg, nor to point out how his book may have been misused by others in political debate, nor to claim that he has mistakenly placed economic and human values above ecological values. Rather, they claim that Lomborg gotten his "science" wrong, and consequently, the politics of those who accept Lomborg's views must also be wrong.

Thomas Lovejoy of the World Bank, writing in Scientific American against Lomborg, provides the general view of science and policy that apparently underlies the logic those who have sought to attack Lomborg on the basis of the political implication of his book,

> Researchers identify a potential problem. Scientific examination tests the various hypotheses, understanding of the problem often becomes more complex, researchers suggest remedial policies – then the situation improves.[11]

[11] T. Lovejoy, 2002. Biodiversity: Dismissing scientific process, *Scientific American,* January *http://www.sciam.com/article.cfm?articleID=000F3D47-C6D2-1CEB-93F6809EC5880000&pageNumber=10&catID=2#author4*

In other words science and scientists drives policy and are the key to solving environmental policy problems. Absent from this perspective is any notion of politics, the messy give and take of debate, deliberation, and compromise achieved through democratic institutions. *Scientific American*'s collection of critical responses to Lomborg by scientists and environmentalists underscored this perspective with its subtitle "Science defends itself against *The Skeptical Environmentalist*", as if Lomborg's critics were speaking for science itself.

But a great irony here is that such cases are deeply imbued with values and politics.[12] Herrick and Jamieson have argued of the general trend of waging political battles through science that "the imprimatur of science is being smuggled into deliberations that actually deal with values and politics."[13] That science alone cannot resolve political debates seems well-appreciated by many scholars, yet continues to manifest itself in the politicization of science. Daniel Kemmis note this apparent paradox and its effects in the context of natural resource decision making.

> So why would anyone continue to speak and act as if good science by itself could get to the bottom of these bottomless phenomena and in the process give us "the answer" to difficult natural resource issues? In large part this is simply a holdover of an anachronistic view of how the world works and of what science can tell us about that world. In this sense, the repeated invocation of good science as the key to resolving complex ecosystem problems has itself become bad science.

[12] Compare, R. Frodeman, 2003. *Geo-Logic* SUNY Press, New York.
[13] Herrick, C. N. and D. Jamieson, 2000. Junk Science and Environmental Policy: Obscuring Public Debate with Misleading Discourse, *Philosophy and Public Policy Quarterly*, Vol. 21, Spring:11-16. http://www.puaf.umd.edu/IPPP/reports/Spring-Summer%20Vol21%202001/221056.pdf

> What is infinitely worse is that this bad science is all too readily made the servant of bad government.[14]

Political decisions involving different interest groups are inherently difficult to resolve, because any adopted policy is bound to infringe upon someone's (overt or vested) interests -- hence the need for decision processes for resolving various claims of constituents. The process of achieving a legitimate outcome involves bargaining, negotiation and compromise -- the essence of "politics."

The Lomborg affair is an example of a general problem: through their actions, many scientists encourage the mapping of established interests onto science. This facilitates the politicization of science, arguably increases political gridlock and in the process limits the positive contributions that science undoubtedly can and should make to policy development.

Daniel Sarewitz argues that expectations for science to resolve political conflict almost always fall short because science provides an "excess of objectivity" useful in supporting a broad range of conflicting subjective positions.

> Rather than resolving political debate, science often becomes ammunition in partisan squabbling, mobilized selectively by contending sides to bolster their positions. Because science is highly valued as a source of reliable information, disputants look to science to help legitimate their interests. In such cases, the scientific experts on each side of the controversy effectively cancel each other out, and the more powerful political or economic interests prevail, just as they would

[14] D. Kemmis. 2002. Science's Role in natural Resource Decisions, *Issues in Science and Technology*, Summer.

> have without the science. This scenario has played out in almost every environmental controversy of the past 25 years.[15]

Of course, there are cases in which science and information do matter in the process of deciding between alternative courses of action. This is simply because "decision making is forward looking, formulating alternative courses of action extending into the future, and selecting among alternatives by expectations about how things will turn out."[16] One of the important roles of science in policy making is to inform expectations about "how things will turn out." Yet, science is rarely a sufficient basis for selecting among alternative courses of action because desired outcomes invariably involve differing conceptions of the sort of world we want in the future. To use the examples introduced above, whether or not avoiding particular amount of climate change is desirable, or whether or not the risks of nuclear power or GMOs exceed the benefits are not issues that can be resolved by science alone, but instead must be handled through political processes characterized by bargaining, negotiation and compromise through the exercise of power.

In spite of vigorous differences of political opinion amongst combatants in each of these issues, without exception they share the belief that science is the appropriate battleground, under the assumption that if a perception can be created that science is on your side, you win. As a result, science is often "politicized" as a strategic and tactical resource in ideological debate. That advocates of particular positions "spin," selectively use or even misuse information to present their preferred action in the best light is a

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[15] Sarewitz, D. 2000. Science and Environmental Policy: An Excess of Objectivity, pp. 79- 98 in: Earth Matters: The Earth Sciences, Philosophy, and the Claims of Community (Prentice Hall, 2000), edited by Robert Frodeman.

[16] H. D. Lasswell and A. Kaplan, 1950. **Power and Society: a framework for political inquiry**, Yale University Press.

staple of political debate and, as such, is not particularly problematic for either science or politics. Politicized science has always been and always will be an inherent component of the political process. A real danger for both science and politics occurs, when members of the scientific community itself participate in the politicization of science, particularly through the media.

"Science" is not a monolithic entity. Sarewitz observes "science is sufficiently rich, diverse, and Balkanized to provide comfort and support for a range of subjective, political positions on complex issues such as climate change, nuclear waste disposal, acid rain, or endangered species."[17] Part of the reason for such diversity stems from the perspectives of scientists themselves, as well as from the nature of the objects that they study. To take climate policy as a case in point, the scientific uncertainties are so great that it is impossible to exclude a wide range of future outcomes, ranging from relatively mild to globally catastrophic. And even if science could provide a crystal-ball view of the future, justification for any particular policy on climate change would depend on more than what science alone is capable of providing, such as clarification of desired goals to be achieved through climate policy.

Politics unfettered by science can be messy enough -- consider the abortion 'debate' in the United States. But when politics is played out through science, the result serves to foster political gridlock and the politicization of science, to the detriment of science and policy alike.

[17] Sarewitz, Excess of Objectivity

How is it that science has become so political? The answer lies in the perverse incentive structure that shapes modern science. There is, to use an old political science term, an "iron triangle" of mutually reinforcing interests.

In one corner of the triangle we find the politician who is loath to make a difficult decision, which by definition is one that will upset some part of her constituency. Consequently, the politician is more than happy to pass the onus of resolving environmental disputes to the scientist, typically via a large government program for research designed to provide "answers." For if the scientist can provide "answers," then the politician can avoid making the difficult decision, or at least put it off until someone else holds the position.

In another corner of the triangle we find the scientist, who finds herself being offered tremendous resources to perform research. Not only does this research meet the desire of the research community to expand knowledge in their field, but also according to the politician, it has profound importance for resolving important policy issues. Two birds with one stone! The scientist thus readily accepts the generous resources for research and along with it a mandate to provide "answers."[18]

Completing the triangle, in the third corner we find the advocate. The advocate looks to science to provide a compelling justification for why her preferred policy position ought to be adopted rather than her opponent's position. Her opponent thinks

[18] Substantial research funding creates its own political constituency, see Pielke, Jr., R. A. and D. Sarewitz, 2003. Wanted: Scientific Leadership on Climate*, Issues in Science and Technology*, Winter, pp. 27-30.

along the exact same lines, and also looks to invoke science in support of his preferred policy position. Why science? Science brings with it an air of impartiality and being "above the fray." Ironically, the use of science in such advocacy works to undercut any claims of impartiality. Like the politician, the advocates each look to science to resolve environmental debate; so long as the resolution is in line with the answers they already have in hand.

And so, this mutually reinforcing iron triangle of shared interests serves to replace explicit political debate about policy issues with implicit political debate shrouded in the language and practice of science.

A result is that debate putatively over science increasingly relies on tactics such as ad hominem attacks and criticism of process (such as peer review or sources of funding), through paid advertisements, press releases and other publicity campaigns. As political battles are waged through 'science', many scientists seem to be willing to adopt tactics of demagoguery and character assassination as well as, or even instead of, reasoned argument, as in the case of the more extreme opposition to Lomborg's book.[19] Thus, reasoned discussion on policy within and outside the scientific community is stifled, and science becomes yet another playing field for power politics, complete with the trappings of media spin and a win-at-all-costs attitude. And in the process the importance of what science can offer policy makers is lost in the fog.

[19] For example, S. Pimm and J. Harvey in their *Nature* review of The Skeptical Environmentalist compare Lomborg to those who deny the occurrence of the Holocaust or the existence of the AIDs virus. S. Pimm and J. Harvey, 2001. No need to worry about the future, *Nature* 414:149-150.

What might be done? To answer this question, let's first go a ways down the path of what ought *not* to be done. Imagine a world in which scientific advice was provided to decision makers only through established political institutions. In the United States scientists would be categorized by whether they belonged to the Democratic or Republican parties, in Great Britain by membership in Labor, Conservative, Liberal Democrat parties, etc. Scientific journals as well (peer-reviewed no doubt) would be published through the party structures, e.g., Labor's *Nature* and Republican *Science*. Public funding for research would be provided to political party organizations which would then disseminate resources as they saw fit, perhaps relying on traditional peer-review. Would there be any problem with such a structure? It would be difficult to find any practicing scientist who would advocate structuring the scientific enterprise in such a manner. Indeed the time-honored practices of peer-review and other mechanisms of insulating science from politics seek to avoid the direct influence of politics on science. One reason for the high esteem which science is held is its independence from politics. But ironically, the structure of science today is much more like the imaginary world described above than many would like to admit.

Because scientists have traditionally focused exclusively on "science" (i.e., by definition absent any policy context) advocates are delegated the task of interpreting the significance of science for decision makers. So if one wishes to answer the question "so what does this particular bit of science mean for action?" in almost any scientific context, with very few exceptions one has to go to political advocates for the answer. An

alternative is for the scientific community itself to take responsibility to address the significance for policy of scientific results.

In thinking about how things might be different it is absolutely critical to differentiate *science results* from their *policy significance*. To illustrate the distinction, consider the central conclusion of the Intergovernmental Panel on Climate Change (IPCC): that global average temperature in 2100 will increase anywhere from 1.4 to 5.8 C.[20] This is a scientific result and communication of what it means (i.e., the origins of the estimates, how "global average" is defined, the confidence level of the projection, etc,) to the non-expert may take some effort. But communication of what this result *means* is not the same as assessment of what it *signifies* for alternative courses of action. The latter is the essence of policy advice. The IPCC presents statements of trend, condition and projection. Assessment of significance for action depends upon how trends, conditions and projections are related to valued outcomes, such as human health and environmental sustainability, as well as economic prosperity, etc. The current state of the scientific enterprise is such that the independent scientific community (i.e., those scientists without close relationships to political advocacy groups, industry, and government) typically eschews explicit discussion of the significance of science.

This leads to two typical outcomes: either political advocates are delegated the task of interpreting the significance of science for decision makers, or the voices of independent scientists seeking to provide such advice are lost in the fray. So if one

[20] The IPCC is organized by the United Nations and the World Meteorological Organization, see http://www.ipcc.ch

wishes to answer the question "so what does this particular bit of science mean for action?" in almost any scientific context, with very few exceptions decision maker look to political advocates for the answer, in effect creating a world where the significance of science is filtered through existing interests. For instance, because government scientists dominated the British response to BSE, observers may rightly find it difficult to distinguish policy justified on scientific results from political expediency.

A better alternative is for the independent scientific community itself to take some responsibility to address the significance for policy of scientific results. This would mean not simply seeking to better "communicate" the results of science to the policy maker, but to develop the capability to place science into policy context, i.e., to address the question: what policy alternatives are consistent with and inconsistent with scientific results? If the scientific community indeed wishes to claim independence from partisan politics, then with this comes an obligation to provide independent guidance on the significance of science for policy alternatives.

Assessing the significance of science requires an ability to clearly distinguish *policy analysis* from *political advocacy.* The former implies increasing the range of alternatives available to decision makers by clearly associating the existing state of scientific knowledge with a range of choices. The latter seeks to decrease the range of alternatives (often to a single preferred option) available to policy makers. Because scientific results always have some degree of uncertainty and a range of means can achieve particular policy objectives, the task of political advocacy usually involves

considerations that go well beyond science. This is one reason why Lovejoy's formula is not just simplistic but detrimental to science itself. Science never yields just one answer. The world is not that simple.

Of course, recognizing a distinction between advocacy and analysis should not preclude particular scientists from stepping into the political arena in cases where they feel strongly enough. But they should do so in full recognition of the various roles they might play in policy and political processes. And of course, advocacy groups from all perspectives have readily at their disposal plenty of distinguished scientists to enlist in support of their cause. What makes the scientific enterprise notable today is the paucity of guidance provided to policy makers seeking to expand the range of policy alternatives. Science might diffuse political debate (and gridlock) by contributing to identification of choices not seen and paths not taken.

For the consumer of scientific knowledge in the context of policy debate here are two sets of questions to ask of suppliers of policy analyses, the answers to which might help to better assess the significance of science.

- If your policy position is indeed based on scientific results, what scientific information would be necessary to change your position? If the answer is "no information" then why depend on science at all?
- A range of policies is consistent with particular scientific results. What range of means do you see as consistent with the state of science in order to achieve

desired ends? Within such a range, what factors other than science do you use to settle on one policy over another?

The perspective here should not be read to suggest that advocates cannot provide valuable guidance on policy; they can and frequently do. Instead, it is a statement of the need of the scientific community itself to share responsibility for assessing the significance of science for policy, beyond merely mapping science onto their own interests. No argument is made here that such assessments offer a panacea for the challenge of decision making in complex environmental or other scientific areas. The hope instead is that through such a process scientists themselves can work to limit the politicization of science and contribute to a more effective understanding of the limits of science in political debate. What makes the scientific enterprise notable today is the paucity of guidance provided to policy makers seeking to expand the available range of policy alternatives.

How might such guidance be provided? Consider again the IPCC, which in 2001 published its Third Assessment Report and has largely received positive reviews of its attempts to find a scientific consensus on climate change (see, e.g., *Nature* 412:112). The IPCC explicitly seeks to provide scientific information to aid in policy making, but does not endorse particular policies. But this desire to be simultaneously policy relevant and policy neutral by providing only scientific results (primarily through its Policymakers' Summaries) and ignoring policy itself the may be its greatest weakness, in that the IPCC does not say what actions are consistent or inconsistent with its findings. Consequently, to understand the significance of the IPCC reports for policy alternatives, a decision

maker is forced to rely exclusively on the interpretations (and misinterpretations) provided by corporations, governments or political advocacy groups, each of which is committed to defend a particular political position**.** Invariably such interpretations are at odds with one another yet consistent with all or parts of the IPCC. When well-meaning IPCC scientists enter the fray one at a time, nothing more is accomplished than politicizing the IPCC itself.

One attempt to solve this dilemma in the case of climate policy would be for the IPCC to establish a new, independent group in addition to the three existing ones on "science", "impacts" and "economics", explicitly for placing the findings of the other three working groups into policy context. The new group (a Working Group Zero on "policy"?) would not endorse particular policies but assess a broad range of policy alternatives and objectives consistent with IPCC assessments. Not only would this provide an independent perspective on the significance of IPCC science, but also it could provide valuable feedback to the broader research community as to what issues would benefit from additional scientific attention. This would further help to stem criticism made by some (including myself) that the IPCC has implicitly built in a preference for certain policies over others, such as reflected in its belated turn to issues of adaptation.[21]

To take another example, the U.S. National Science Foundation now has a criterion for evaluating proposals based on whether the proposed research benefits society, as do various U.K. and international funding bodies (who ask how research can

[21] Pielke, Jr., R. A., 1998: Rethinking the role of adaptation in climate policy. *Global Environmental Change*, 8(2), 159-170.

provide economic benefits). Although many scientists support this idea, many do not know how to assess the significance of their work in this way, not surprisingly given that such assessments require a particular kind of expertise. The U.S. National Academy of Sciences has occasionally provided such guidance on a range of issues, recently including arsenic in water, reproductive cloning and streamflow for salmon and farmers, but not for many years now on policy issues related to climate change. And the Academy certainly has a penchant for recommending "more research" as the best policy response in almost every context.

Yet authoritative and non-partisan bodies such as national science academies and societies can and should assume some responsibility for placing the significance of science into policy context. The United States used to have an institutional capacity for the provision of advice on the significance of science in its Congressional Office of Technology Assessment (OTA), which was terminated by Congress in 1995**.** Some, aware of the void left in OTA's absence, are currently seeking its resuscitation, but with unknown chances of success.[22] OTA for the most part avoided partisanship by associating scientific and technological results with a wide range of possible policy outcomes, leaving for decision makers the task of selecting particular courses of action. Given that OTA's termination was largely symbolic, having to do with Newt Gingrich's promise to reduce the size of government in his "Contract With America", and the dire need in the U.S. for science and technology to inform policy, one might think that reviving OTA would receive serious consideration. But rather than wait for policy

[22] Chubin, D. 2000. Filling the policy vacuum created by OTA's demise, *Issues in Science and Technology Policy*, Winter, http://www.nap.edu/issues/17.2/stalk.htm

makers to suddenly discover the value of an OTA, the science community itself should recognize its own interests and assume some responsibility for improving the provision of policy analyses to decision makers.

There is no magic bullet or panacea solution to the challenges presented by the politicization of science. And perhaps worst of all would be a withdrawal of the scientific community from involvement in contested political issues, as was historically the case when scientists sought to be "value free." Instead, scientists should actively engage the broader society who supports their work under the expectation of beneficial outcomes. Such engagement should focus on expanding choices available to decision makers, rather than seeking to reduce the scope of choice through political advocacy. The alternative is the continued politicization of science.

Political advocates will always selectively use and misuse science in support of their agendas. However, the scientific community itself need not view this process as its only mechanism for connecting research with decision making. The Lomborg affair is an extreme case that provides an opportunity for the scientific community to take a critical look at its own role in the political process and ask whether it is meeting its potential to contribute useful knowledge to policy development.

There is a middle ground, where some scientists resist the urge to join the political fray and instead seek through independent, authoritative bodies to provide insight that expands the choices available to policy makers and the public, perhaps in some cases

showing the way past gridlock and political stalemate, and in others offering realism about the limits of science in politics. It is possible for those within the independent scientific community to distinguish policy from politics, analysis from advocacy. The future of both policy and science depends upon it.