

# STRENGTHENING SCIENCE'S VOICE AT EPA

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*Throughout EPA's history, our greatest successes have occurred when policies, regulations, and decisions are based on the results of sound and relevant scientific research . . . . [T]he credibility of our decisions depends on the science underlying them. The quality of the science behind those decisions largely determines how well environmental programs actually work—whether they achieve our health and environmental goals.*

—Former EPA Administrator Christine Todd Whitman<sup>1</sup>

## I

### INTRODUCTION

Most administrators of the Environmental Protection Agency (“EPA”) pay lip service to science, particularly during their confirmation hearings. But the truth is, despite recent reforms, the role of science at EPA still needs to be strengthened.<sup>2</sup> One incident that exemplifies the nature of the problem occurred early in the Reagan Administration: Shortly after taking office, then-EPA Administrator Anne Gorsuch fired most of the scientists on EPA’s Science Advisory Board to replace them with scientists who were good, solid Republicans.<sup>3</sup>

The problem is not limited to one political party or ideological point of view. EPA is truly bipartisan in its tendency to run roughshod over science to follow the political winds. For example, until recently EPA adhered to the scientifically discredited “no-threshold” hypothesis for carcinogens because the results

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1. Governor Christine Todd Whitman, Administrator, U.S. Environmental Protection Agency, Remarks at the EPA Science Forum (May 1, 2002), at [http://www.epa.gov/epahome/headline\\_050102.htm](http://www.epa.gov/epahome/headline_050102.htm).

2. See *infra* Part II. See generally STEPHEN BREYER, *BREAKING THE VICIOUS CIRCLE: TOWARD EFFECTIVE RISK REGULATION* (1993). The Environmental Protection Agency (“EPA”) was created in 1970. It is a relatively small agency in the executive branch, consisting of approximately 18,000 employees. It is a free-standing agency in the sense that it is not part of any other department, but it is not “independent” in the sense that its administrator is appointed by the President, continues to serve at the pleasure of the President, and is confirmed by Senate. While not formally a cabinet department, under the last three presidential administrations, the EPA administrator has been invited to attend cabinet meetings as an informal participant. For further information about EPA’s structure and history, see <http://www.epa.gov/epahome/aboutepa.htm> (last visited May 31, 2003).

3. ANNE BURFORD & JOHN GREENYA, *ARE YOU TOUGH ENOUGH?* (1986).

please environmentalists,<sup>4</sup> and EPA sometimes refuses to acknowledge the worldwide scientific consensus regarding global climate change because doing so would displease conservatives.<sup>5</sup> “Good science” is not a partisan issue, nor does it favor industry over environmentalists.<sup>6</sup> On the contrary, the modern environmental movement was founded on the work of scientists such as Rachel Carson who used science to challenge society to change its ways.<sup>7</sup>

Adam Smith once wrote: “[S]cience is the great antidote to the poison of enthusiasm and superstition.”<sup>8</sup> It is a bipartisan antidote, he might have added, for science can correct the misguided enthusiasms and superstitions of either the right or the left. Recent waverings by EPA over whether to weaken the arsenic standard for drinking water promulgated in the waning days of the Clinton Administration show the importance of good science in holding the Agency’s feet to the fire in the face of political opposition from industry.<sup>9</sup> Good science is not, as some have cynically suggested, merely in the eye of the beholder, nor is it whatever technical information can be cobbled together to support one’s predetermined position.<sup>10</sup> Rather, when the system works properly, good science is a chorus of independent expert voices that come together with sufficient coherence and force to constrain policy, structure debate, and influence policy. Rarely does good science dictate a unique policy outcome; more often, it structures a policy dialogue among different disciplines and constituencies by defining a problem and a range of options, but it may also figure in the decision of which options to adopt.<sup>11</sup>

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4. See *Chlorine Chemistry Council v. EPA*, 206 F.3d 1286 (D.C. Cir. 2000).

5. See, e.g., Andrew C. Revkin and Katharine Q. Seelye, *Report by E.P.A. Leaves Out Data on Climate Change*, N.Y. TIMES, June 19, 2003, at A1. For a recent example of the ongoing political controversy over the causes of global climate change, see Paul Krugman, *Rejecting the World*, N.Y. TIMES, Apr. 18, 2003, at A15 (“We can safely dismiss the idea that the right has carefully weighed the scientific evidence [on climate change] and concluded that the overwhelming consensus of the scientific community is wrong.”).

6. Eric Pianin, *Moving Target on Policy Battlefield; Increasingly, “Science” Used by Proponents and Critics to Score a Shot*, WASH. POST, May 2, 2002, at A21.

7. See RACHEL CARSON, *SILENT SPRING* (1962).

8. ADAM SMITH, *AN INQUIRY INTO THE NATURE AND CAUSES OF THE WEALTH OF NATIONS* V.1.1 (1776).

9. See Press Release, U.S. Env’tl. Protection Agency, EPA Announces Arsenic Standard For Drinking Water of 10 Parts per Billion (Nov. 1, 2001), available at [http://www.epa.gov/epahome/head\\_line\\_110101.htm](http://www.epa.gov/epahome/head_line_110101.htm).

10. Oliver A. Houck, *Damage Control: A Field Guide to Important Euphemisms in Environmental Law*, 15 TUL. ENVTL. L.J. 129, 130 (2001) (“‘Good Science.’ Under what circumstances is science good? When it supports your position. No amount of science that supports the contrary qualifies . . . because there is always more research to be conducted and because with enough digging you can scrape up a scientist to disagree.”).

11. See MARK R. POWELL, *SCIENCE AT THE EPA: INFORMATION IN THE REGULATORY PROCESS* 5-6 (1999) (“The uses of science in environmental policy are many, including ‘reality definition,’ agenda setting, setting the terms of debate, political weaponry and decisionmaking.”).

## II

## WHAT THIS ARTICLE IS AND IS NOT ABOUT

This Article considers the problem of institutional reforms to enhance the role of science in EPA decisionmaking. This is an important problem, but it is not the only issue relating to science at EPA that might be considered. To avoid misunderstanding, it may be important to define at the outset what this Article is *not* about. This Article is *not* concerned with the nature of science, whether all scientists must agree, whether science is “objective,” nor even, for that matter, whether science actually exists. Those are fine philosophical questions that many other articles discuss at length. This Article adopts as a starting point, however, the common sense perspective that there is some coherence, if not unanimity, to scientific thought on some issues of relevance to environmental policy. It then considers how to reform institutions so that existing scientific coherence will have a greater influence on policy.

This Article is also *not* concerned with making the case that the role of science at EPA *should* be enhanced. In another essay (which may be read as a companion piece to this one), I have made the case that science should have an enhanced role in EPA decisionmaking.<sup>12</sup> That conclusion is based in no small part on my own observations and experiences during the two years that I served as EPA general counsel during the late 1980s and early 1990s and during my twenty-five years of participating in EPA policy deliberations as a practicing environmental lawyer. My personal observation was that science did not play a significant role in the policymaking conversation at EPA during the years that I was there, and I do not believe that has changed much in subsequent administrations. In my experience, scientific issues were rarely mentioned, and very few of the participants in the policymaking dialogue at high levels within the Agency were scientifically trained.

The observation that science is conspicuously absent from internal EPA deliberations is consistent with every significant case study of EPA decisions of which I am aware. All of them, no matter the author's political predilections, observe that science is, at most, a peripheral concern that may define a range of options, but rarely figures significantly in the final decision regarding which options to select.<sup>13</sup> As Georgetown University Law Center Professor Steve Goldberg observes: “[R]egulatory agencies are regularly accused of being ‘captured’ by industry, consumer groups, members of Congress, or bureaucratic

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12. E. Donald Elliott et al., *Science, Agencies, and the Courts: Is Three a Crowd?*, 31 *Env'tl. L. Rep.* (Env'tl. L. Inst.) 10,125 (Jan. 2001) (writing about the “science debacle” at EPA).

13. See, e.g., BRUCE A. ACKERMAN & WILLIAM T. HASSLER, *CLEAN COAL/DIRTY AIR: OR HOW THE CLEAN AIR ACT BECAME A MULTIBILLION-DOLLAR BAIL-OUT FOR HIGH-SULFUR COAL PRODUCERS AND WHAT SHOULD BE DONE ABOUT IT* (1981); MARC K. LANDY, MARC J. ROBERTS & STEPHEN R. THOMAS, *THE ENVIRONMENTAL PROTECTION AGENCY: ASKING THE WRONG QUESTIONS* (1990); JOHN WARGO, *OUR CHILDREN'S TOXIC LEGACY: HOW SCIENCE AND LAW FAIL TO PROTECT US FROM PESTICIDES* (1996); Thomas O. McGarity, *Politics by Other Means: Law, Science, and Policy in EPA's Implementation of the Food Quality Protection Act*, 53 *ADMIN. L. REV.* 103 (2001).

inertia. They are never accused, however, of being captured by scientists.”<sup>14</sup>

While I favor strengthening science’s voice in EPA decisions, I am not an imperialist for science. I do not believe that science alone should determine policy, nor that regulation should always wait until science is clear.<sup>15</sup> I merely believe that science is underrepresented in policymaking at EPA today and that the quality of decisions at the margins would be improved by giving science somewhat greater influence. Admittedly, this opinion is not universally shared,<sup>16</sup> but recently, the courts have reversed some EPA decisions for a lack of good scientific underpinnings, and the National Academy of Sciences and both houses of Congress have been actively considering measures to increase the role of science at EPA.<sup>17</sup> Thus, the problem of how those of us outside the Agency might enhance the voices for science inside the Agency is neither trivial nor hypothetical.

It also seems to me to be a problem with broader theoretical ramifications. One of the central, unresolved problems of the administrative state in the United States is how to meld politics and expertise so that neither overwhelms the other.<sup>18</sup> EPA is perhaps the most important of the regulatory agencies that use science, and yet it has a dismal reputation as a science agency.<sup>19</sup> So it is not a trivial problem to consider what can be done to enhance the role of science at EPA.

Finally, it is important to emphasize that this Article adopts the perspective of what those of us outside the Agency can do to increase the extent to which the voices of science are heard in decisionmaking at EPA. There are a host of other reforms that could be implemented if one happened to be EPA administrator. For example, every EPA administrator has a daily personal staff meeting. Every EPA administrator I know of has invited his or her general counsel and his or her political adviser to be present at his or her daily personal staff meeting, thereby symbolizing that law and politics have a seat at the table. I know of only one administrator (Lee Thomas), however, who met regularly with his science advisor (Bernie Goldstein). During Thomas’s administration, science played a much stronger role in Agency deliberations than it does today. In government, proximity to power often creates both the appearance and the

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14. Steven Goldberg, *The Reluctant Embrace: Law and Science in America*, 75 GEO. L.J. 1341, 1365 (1987).

15. See, e.g., Gail Charnley & E. Donald Elliott, *Democratization of Risk Analysis*, in HUMAN AND ECOLOGICAL RISK ASSESSMENT 1399 (Dennis J. Paustenbach ed., 2002); Gail Charnley & E. Donald Elliott, *Risk Versus Precaution: Environmental Law and Public Health Protection*, 32 ENVTL. L. REP. (ENVTL. L. INST.) 10,363 (Mar. 2002); E. Donald Elliott, *Global Climate Change and Regulatory Uncertainty*, 9 ARIZ. J. INT’L. & COMP. L. 259 (1992).

16. See, e.g., Adam Babich, *Too Much Science in Environmental Law*, 28 COLUM. J. ENVTL. L. 119 (2003).

17. See BURFORD & GREENYA, *supra* note 3; *infra* Part III.A.

18. See Elliott et al., *supra* note 12; see also McGarity, *supra* note 13.

19. For a recent article collecting numerous examples, see James W. Conrad Jr., *The Reverse Science Charade*, 33 ENVTL. L. REP. (ENVTL. L. INST.) 10,306 (Apr. 2003). The criticisms of EPA for distorting science are bipartisan. See, e.g., McGarity, *supra* note 13.

reality of power. If I were the EPA administrator, I would definitely include my science advisor in this “power breakfast.” Doing so would enhance the extent to which the Agency’s top leadership would hear a scientific perspective on policy issues. More importantly, it would send a symbolic message throughout the Agency—and to all those outside the Agency who seek to influence it—that science is an important part of the policy conversation that goes on in the administrator’s office. But that is an article for another day. For the moment, my concern is how those of us outside the Agency can enhance the role of science in internal EPA decisionmaking.

### III

#### THE NATURE OF THE PROBLEM AND WHY JUDICIAL REVIEW CANNOT SOLVE IT

Elsewhere I have described the root of the problem with the role of science at EPA today as the “triumph of politics.” I have pointed out that very few knowledgeable persons would contend that our environmental decisions today are too much dominated by neutral scientific expertise and do not reflect enough politics.<sup>20</sup> Administrative agencies were created in the United States, at least in part, to supplant legalistic common-law decisions by injecting more “politics and expertise” into the system.<sup>21</sup> Unfortunately, however, the first generation of administrative lawyers spoke of “politics and expertise” as if they were a single compound noun, and never really unraveled the tensions between the two.<sup>22</sup> One of the central problems in United States administrative law is structuring the creative tension between politics and expertise. The challenge is to meld the two so that scientists and politicians work together to produce policies that are better than either would produce on their own. No one contends that science should replace or dominate politics. Rather, the issue is how to ensure that each plays a substantial role without overwhelming the other. My belief is that there is currently too much politics and not enough science in our environmental decisions, or, as my mentor at EPA, former administrator William Reilly, used to put it: “I wish that we at the EPA had the analytic rigor to match our enthusiasm.” I have considered the alternative of trying to insulate EPA somewhat more from political influences, so that it might reflect neutral technocratic expertise to a greater extent. But in view of the great importance and economic impact of the decisions EPA makes, and the nature of our democratic system, I do not believe that it is practical to weaken the political influences on EPA. The goal, therefore, must be to strengthen the scientific

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20. An exception to this general principle is if science is immature and has little to contribute to the policy conversation and, therefore, decisions should be made based on default principles, such as the “precautionary principle.” See *supra* note 15; see also Christopher D. Stone, *Is There a Precautionary Principle?*, 31 *Envtl. L. Rep. (Envtl. L. Inst.)* 10,790 (July 2001). For an example of reduced evidentiary burdens when science is immature, see *Ferebee v. Chevron Chem. Co.*, 736 F.2d 1529 (D.C. Cir. 1984).

21. See JAMES LANDIS, *THE ADMINISTRATIVE PROCESS* (1938).

22. *Id.*

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Some agencies achieve the goal of melding science and policy considerations tolerably well—or at least, far better than EPA does. For example, while the Food and Drug Administration (“FDA”) is criticized for many things, it is almost never criticized for getting the science wrong, and EPA is almost never praised for getting the science right!

There are a number of significant differences between FDA and EPA. One particularly pertinent one is that FDA decisions are rarely challenged in court—and they are almost never *successfully* challenged—while virtually all EPA decisions go to court, and they are often remanded. This has led to what Professor Wendy Wagner has aptly named the “science charade” at EPA: Decisions reached on political grounds are often rationalized on scientific ones, because the courts defer more to the Agency when it successfully mystifies its decisions by wrapping them in the mantle of science.<sup>23</sup> This phenomenon is really just a straightforward application of the economic theory of supply and demand. Other things being equal, repealing a tax increases the supply of a good by decreasing its price. Similarly, if courts promise greater deference to Agency decisions based on science<sup>24</sup> (that is, they lower the expected cost), one should find a “reasons-displacement effect”<sup>25</sup> at the margins to increase the supply of science-based Agency rationales.

While the incentives created by judicial review do have some effect, in my view, the causes of the lamentable position of science at EPA lie deeper in EPA’s organization, structure, and traditions than the incentives created by judicial review. For the same reasons, I am skeptical that an episodic external factor such as judicial review can have much real effect on issues as fundamental as the relative role of science in agency decisions. Many administrative lawyers turn instinctively to changing standards of judicial review as a cure-all for whatever ills they perceive to ail agencies (thereby bringing to mind the old adage: “When you’re a hammer, everything looks like a nail.”). A good example is Alan Raul’s proposal in this Symposium for “regulatory *Daubert*.”<sup>26</sup> Raul’s proposal would fundamentally alter the relationships between agencies and reviewing courts. Traditionally, courts reviewing agency decisions do not rule on the admissibility of individual items of evidence, but rather review the record as a whole to ensure that an agency’s decision has reasonable factual support on the record as a whole.<sup>27</sup> While Raul would apparently alter this def-

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23. Wendy E. Wagner, *The Science Charade in Toxic Risk Regulation*, 95 COLUM. L. REV. 1613 (1995).

24. See, e.g., *Baltimore Gas & Elec. Co. v. Natural Res. Def. Council, Inc.*, 462 U.S. 87 (1983).

25. For empirical evidence that a change in the law increasing judicial deference does in fact result in a “reasons displacement effect” so that more agency decisions are rationalized on the basis that has been promised greater judicial deference, see Peter H. Schuck & E. Donald Elliott, *To the Chevron Station: An Empirical Study of Federal Administrative Law*, 1990 DUKE L.J. 984.

26. Alan Charles Raul & Julie Zampa Dwyer, “Regulatory *Daubert*”: *A Proposal to Enhance Judicial Review of Agency Science By Incorporating Daubert Principles into Administrative Law*, 66 LAW & CONTEMP. PROBS. 7 (Autumn 2003).

27. See *Universal Camera Corp. v. NLRB*, 340 U.S. 474 (1951); Administrative Procedure Act

erential standard, I doubt that even this fundamental change in the standards for judicial review would actually do much to strengthen the role of science at EPA.

Judicial review can have a powerful effect on a particular case or policy, but, for a host of reasons, the signals emanating from the judiciary are too episodic, confused, and inconsistent to have much of a systematic effect on reforming agency practices. As Professors Mashaw, Merrill, and Shane observe in their administrative law casebook, judicial scrutiny is “intermittent” and “the ultimate effects of judicial review are quite unpredictable at the time of decision.”<sup>28</sup>

That is not to say, however, that I would be opposed to any and all modifications of judicial review to strengthen the role of science. For example, in the case of collegial agencies such as EPA that meld different disciplinary strands such as politics and science, I would consider modifying the so-called “*Morgan* rule” that reviewing courts do not go behind an agency’s written decision to inquire into the mental processes of decisionmakers.<sup>29</sup> It seems bizarre that courts must defer to an EPA decision based on the Agency’s alleged scientific “expertise” if all the scientists at the Agency opposed the decision on the science but were overruled by the politicians. In deciding how much deference to give an agency decision based on alleged expertise, a court should be entitled to know whether the particular decision is grounded on science or policy. The outcome in *Morgan* is understandable on its facts: the court wanted to avoid exposing how little the Secretary of Agriculture personally knew about the decisions that were made in his name, and perhaps it also desired to protect the confidentiality of deliberative advice. But respecting those principles does not have to lead us to ignore the debates between disciplines that go on inside agencies. In other areas, we have managed to survive putting into the public record the changes made to proposed EPA rules by economists and policy analysts at the Office of Management and Budget (“OMB”), although admittedly these changes do not become part of the record for judicial review.<sup>30</sup> When the scientists at EPA, such as the Science Advisory Board, have refused to approve the Agency’s scientific rationale, a court should consider that refusal in giving lesser deference to the Agency’s decision.<sup>31</sup> That simple change in existing law would be at least as effective and far more consistent with traditional administrative law principles than Alan Raul’s radical proposal for “regulatory *Daubert*.”

While some changes in judicial review could be marginally helpful in increasing the authority of science inside EPA, more effective reform of the

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(“APA”), 5 U.S.C. § 702 (2000).

28. JERRY L. MASHAW, RICHARD A. MERRILL & PETER M. SHANE, ADMINISTRATIVE LAW: THE AMERICAN PUBLIC LAW SYSTEM, CASES AND MATERIALS 799-800 (4th ed. 1998).

29. See *United States v. Morgan*, 313 U.S. 409, 422 (1941) (holding that the court’s function was not to inquire into the mental processes of the Secretary of Agriculture).

30. See, e.g., Clean Air Act, 42 U.S.C. § 7607(d)(4)(B)(ii) (2000).

31. *But see* Am. Petroleum Inst. v. Costle, 665 F.2d 1176 (D.C. Cir. 1981), cert. denied, 455 U.S. 1034 (1982) (declining to require EPA to obtain second review and approval from Clean Air Science Advisory Committee after changes were made in response to its initial non-concurrence).

role of science at EPA must be based on more basic—and more mundane—reforms at the level of Agency structure and procedure.

#### IV

##### THREE PROPOSALS TO ENHANCE THE VOICE FOR SCIENCE AT EPA

In this Part, I outline three proposals to strengthen the role of science in decisions at EPA. The theoretical preconceptions that underlie these proposals are thoroughly conventional. With the consensus of academic opinion, I adopt the interest-group-representation model of administrative behavior and presume that agencies respond to political pressure from external constituencies, but I also assume that the internal structures and arrangements inside an agency do matter.<sup>32</sup> These two premises may at first appear inconsistent, but in fact they are not. External political pressures ebb and flow. In response to a series of particularly obvious failures to follow the counsel of science, there today may be a temporary political outcry to improve the role of science at EPA, but it will soon pass as other issues take center stage. One of the key challenges of institutional design is to ride the temporary wave of political support to build structures both inside and outside of the Agency that will continue to push for good science after that political groundswell has abated. Most structures of government (including EPA itself) are the longer-lasting products of such ephemeral impulses of political energy. Those movements that succeed at continuing to influence government over time are those that refuse to be bought off by a few evanescent press releases or political gestures, but instead obtain structural and institutional changes that can continue to push the goals of the movement after its political energy has ebbed. My recommendations can be thought of as strategies for perpetuating the current political energy for the reform of science at EPA into more abiding structures that will continue to be institutional advocates for good science inside and outside of the Agency after the current political focus on good science has passed on to other issues. In other words, just as biological structures reflect past environmental conditions, Agency institutional structures embody past external political environments.

Much of the art of government consists of creating institutional reifications for particular policies and interests inside the government to embody political movements and convert them into abiding institutional structures. Thus, for example, EPA's Office of Environmental Justice was created to argue for, and to represent, the interest of environmental justice inside the Agency, and it draws support from organized constituencies that represent the interests of environmental justice outside the Agency. I argue that science needs a similar

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32. Richard B. Stewart, *The Reformation of Administrative Law*, 88 HARV. L. REV. 1667, 1762 (1975) ("The problem of administrative procedure is to provide representation to all affected interests."). For a summary of theories about the relationship between agency structure and the political environment, see Steven P. Croley, *Theories of Regulation: Incorporating the Administrative Process*, 98 COLUM. L. REV. 1 (1998). For a good summary of the academic literature on the interest-group representation model of the administrative process, see PETER L. STRAUSS ET AL., GELLHORN AND BYSE'S ADMINISTRATIVE LAW: CASES AND COMMENTS 345-51 (10th ed. 2003).



support structure, with both internal and external interest groups that represent and agitate for the values of science.

No theory of political change as to how to actually bring these reforms to fruition is proposed; for now, these outcomes are merely defined as desirable end-states. My recommendations are: (A) create a high-level advocate for science, (B) empower scientists to make policy recommendations, and (C) create a "Science Watch" nongovernmental organization ("NGO") to represent science in the administrative process.

#### A. Create a High-Level Advocate for Science

One of the most important things that could be done immediately to improve the role of science at EPA is to create a high-level advocate for science. A "chief science officer" should be created with a mandate to ensure that the Agency's actions abide by minimum standards of scientific integrity. Bills to do just that are currently pending in both the House and Senate.<sup>33</sup> The National Academy of Sciences ("NAS") recently recommended creation of an EPA deputy administrator for science:

Just as the advice of the Agency's legal counsel is relied upon by the administrator to determine whether a proposal is "legal," an appropriately qualified and adequately empowered science official is needed to attest to the administrator and the nation that the proposed action is "scientific"—that it is consistent, or at least not inconsistent, with available scientific knowledge . . . .<sup>34</sup>

I support these proposals for reasons that I have stated at length elsewhere.<sup>35</sup>

One can reasonably disagree with the NAS over the details of whether the chief science officer should be at the deputy administrator level, an under secretary in a new cabinet-level EPA, or a new "general counsel for science," analogous to the "general counsel for law." The important idea, however, is to have a permanent, high-level advocate for scientific rigor in the policy debates at EPA.

In an attempt to moot these pending legislative proposals to create a deputy administrator for science, then-EPA Administrator Christie Whitman recently

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33. On April 30, 2002, the House unanimously passed H.R. 64 to create a new deputy administrator for science and technology at EPA. According to its chief sponsor, Representative Vern Ehlers, the only professional research scientist serving in Congress:

The bill creates a new Deputy Administrator for Science and Technology at the EPA. This position would be equal in rank to the current Deputy Administrator and would report directly to the Administrator of the EPA. The new Deputy will be responsible for coordinating scientific research among the scientific and regulatory arms of the Agency and ensure that sound science is used in regulatory decisions. The bill would also convert the position of Assistant Administrator at the Office of Research and Development to Chief Scientist, who would serve a five-year term.

Press Release, Ehlers Successful in Providing Sound Science to EPA (Apr. 30, 2002), available at [http://www.house.gov/ehlers/press\\_releases/HR64.htm](http://www.house.gov/ehlers/press_releases/HR64.htm).

34. NAT'L RESEARCH COUNCIL, STRENGTHENING SCIENCE AT THE U.S. ENVIRONMENTAL PROTECTION AGENCY: RESEARCH MANAGEMENT AND PEER-REVIEW PRACTICES 7 (2000).

35. S.159, *A Bill to Elevate the EPA to a Cabinet Level Department: Hearing Before the United States Senate Committee on Governmental Affairs*, 108th Cong. (July 24, 2001) [hereinafter *Hearing on S.159*] (testimony of E. Donald Elliott).

gave the title “science advisor” to the head of EPA’s existing Office of Research and Development (“ORD”).<sup>36</sup> This alternative approach was specifically considered and rejected as inadequate by the NAS panel.<sup>37</sup> NAS cited two basic reasons: First, the NAS panel felt that it was a full-time job for the head of ORD to administer EPA’s research program, which now spends roughly half a billion dollars a year.<sup>38</sup> Second, the NAS panel felt that one assistant administrator at EPA would find it difficult to question the policies advocated by another assistant administrator who runs a program office such as Air, Water or Waste.<sup>39</sup> A third possible reason, which was perhaps unspoken, is that the skills and background that qualify one to administer a half-billion-dollar-a-year scientific research effort are not necessarily the same as those that qualify one for bureaucratic infighting over proposed Agency policy initiatives, and the two skill sets are rarely found in the same person.

I agree with the NAS’s objections, including the unspoken one, and accordingly consider Administrator Whitman’s recent press release to lie somewhere between a gesture and a half-step forward.<sup>40</sup> Although inadequate, the positive aspects of giving the additional title of “science advisor” to the new “assistant administrator for ORD,” the traditional title of EPA’s highest-ranking science official, should not be overlooked. Nomenclature can be important because it helps to define roles and expectations. “Assistant administrator for the Office of Research and Development,” carries an unfortunate implication that science is relevant only to the Agency’s program of research, and that therefore the assistant administrator for ORD has no business interfering with the ongoing program of regulatory development being conducted by other offices. None-

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36. As an EPA press release reports:

EPA Administrator Christie Whitman announced on May 24, 2002 that, in order to strengthen the role of science at the Agency, she has appointed Dr. Paul Gilman to be the Agency’s Science Advisor. Dr. Gilman was recently sworn in as EPA’s Assistant Administrator of the Office of Research and Development (ORD), responsible for coordination and strategic planning for the Agency’s ongoing scientific research efforts. ‘I am pleased to announce that Paul Gilman will officially serve as my Science Advisor,’ said Whitman. ‘In this capacity, he will be responsible for working across the Agency to ensure that the highest quality science is better integrated into the Agency’s programs, policies and decisions. I am certain that under Paul’s leadership, we are embarking on a new era at the EPA—one where our commitment to the quality and relevance of science is greater than ever before.’ As Science Advisor, Gilman will be charged with ensuring that the Agency draws on the best science to support policy development and decision making as EPA fulfills its mission of protecting human health and the environment, ensuring a good quality of life for the American people. Specifically, Gilman will work closely with Administrator Whitman’s Regulatory Development and Task Force Review on science issues, review policies and procedures related to the Science Advisory Board, recommend options to improve the Integrated Risk Information System and develop recommendations regarding the role of EPA Regional Laboratories. Prior to joining EPA, Gilman has held numerous senior positions in both government and private industry where he has been involved in science policy development and research.

Press Release, U.S. Envtl. Protection Agency, Whitman Appoints Gilman Science Advisor (May 24, 2002), available at <http://www.epa.gov/ord/htm/sci-adv1.htm>.

37. NAT’L RESEARCH COUNCIL, *supra* note 34, at 5.

38. *Id.*

39. *Id.*

40. See *supra* note 36.

theless, a few of the previous incumbents of this office have managed to have a significant, if sporadic, effect on policy, largely through force of personality and a close relationship with the administrator. By giving the head of ORD the title of "science advisor," the Administrator Whitman was perhaps validating a somewhat broader role for a science advocate in policy deliberations within the Agency. However, if one reads the announcement closely, the text stops just short of actually giving the "science advisor" a mandate to question the science underlying initiatives by other program offices. Just as the title was bestowed in an instant by the stroke of the Administrator's pen, so too could it be taken away. Or, more likely, the title could simply not be renewed in the next administration, after the legislative furor over increasing the role of science at EPA abates.

For these reasons, I continue to favor legislating a permanent, high-level "chief science officer" at EPA. That position could be adapted to build on and strengthen some important reforms in the role of science at EPA that were accomplished during the last eight years under the Clinton-Gore-Browner Administration.<sup>41</sup> A quiet revolution in the role of science at EPA has been accomplished through the expanded role of peer review under Executive Order 12,866.<sup>42</sup> In part to stave off more draconian proposals for expanded peer review in the Republican-backed "regulatory reform" bills, the Clinton Administration in the Order mandated that agencies, including EPA, institute peer-review policies.<sup>43</sup>

Under EPA's peer-review policy, virtually all important scientific questions now receive peer review by panels of independent, outside scientists.<sup>44</sup> In my view, expanding peer review is a very important reform. Like my mentor, Judge David Bazelon, I have long had more faith in peer review than in the ability of "scientifically illiterate judges" to penetrate the details of highly technical and scientific decisions.<sup>45</sup> In my experience, EPA's outside peer-review panels generally do an excellent job of identifying the hidden issues that often underlie the treatment of scientific questions by the program offices. Unfortu-

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41. EPA's website describes the recent reforms in the role of science at the Agency as follows: Over the past 4 years, ORD [EPA's Office of Research and Development] has taken major steps to ensure that it carries out a program of sound science to inform Agency decisions without allowing regulatory objectives to distort scientific findings or analyses. These steps have included open, transparent, and peer-reviewed research planning; competitively awarded extramural research grants; independent peer review of ORD science publications, assessments, and documents; and rigorous peer review of ORD's research laboratories and centers.

OFFICE OF SCI. POLICY, U.S. ENVTL. PROTECTION AGENCY, *ROLE OF SCIENCE AT EPA*, at <http://www.epa.gov/osp/science.htm> (last updated Aug. 20, 2003).

42. Exec. Order No. 12,866, 58 Fed. Reg. 51,735 (Oct. 4, 1993).

43. *Id.*

44. See Memorandum from Carol Browner, to Assistant Administrators, Re: Peer Review Program (June 7, 1994), available at <http://www.epa.gov/OSP/spc/memo0607.htm>. EPA's current policies and procedures for peer review are summarized in OFFICE OF SCIENCE POLICY, U.S. ENVTL. PROTECTION AGENCY, *PEER REVIEW HANDBOOK* (EPA 100-B-00-001) (2d ed. 2000), available at <http://www.epa.gov/OSP/spc/prhandbk.pdf>.

45. See *Ethyl Corp. v. EPA*, 541 F.2d 1, 67-69 (D.C. Cir. 1976) (en banc) (Bazelon, J., concurring), cert. denied, 426 U.S. 941 (1976).

nately, however, these excellent peer-review documents may not always receive all the attention and follow-through that they deserve. To state the problem more precisely, the peer reviews now come back to the very same program offices generating the documents that the reviewers are questioning; and, as often as not, the excellent comments and questions raised by peer reviewers are essentially ignored by EPA in developing final rules. In other words, peer review is a paper tiger.

To close the circuit, and to improve the weight that peer reviews receive in EPA's deliberations, the peer reviews should come back to the staff of the chief science officer and to OMB, as well as to the program office, for an independent review. When the chief science officer feels that peer reviewers have raised substantial points that have not been sufficiently answered by the program offices proposing the new rule, the chief science officer should have sufficient standing with the administrator to stop the process and raise questions at the highest levels. This internal process would be analogous to one that EPA itself fulfills externally when reviewing other agencies' proposed regulations and when drafting environmental impact statements.<sup>46</sup>

Creating a new high-level advocate for science is particularly important in light of recent reforms that have literally taken scientists out of the loop for most rulemakings. Until recently, EPA maintained a quaint institution called "red border review," under which a proposed rule was circulated for comment to all of the offices before it was sent to the administrator's office for signature.<sup>47</sup> This system provided one final opportunity for members of the Agency other than those that had originally drafted the rule to review and question it.<sup>48</sup> It was rare that one of the media program offices would question a rule drafted by another of the media offices, but it did occasionally occur. More frequently, however, the economists at what was then the Office of Policy Planning and Evaluation,<sup>49</sup> or the lawyers at the Office of General Counsel or Enforcement, and sometimes even the scientists at ORD would question the basis for a rule or other action that one of the program offices was proposing during this internal review period.

During the Clinton Administration, this process of broad internal review at EPA was eliminated, allegedly to streamline the process.<sup>50</sup> Today, a program

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46. See Clean Air Act § 309, 42 U.S.C. § 7609 (2000).

47. See JOHN QUARLES, CLEANING UP AMERICA: AN INSIDER'S VIEW OF THE ENVIRONMENTAL PROTECTION AGENCY (1976).

48. *Id.*

49. This office is now called the Office of Policy, Economics, and Innovation. For a chronology of the changes in the name of this office at EPA, see <http://www.epa.gov/history/org/ao/opr/index.htm> (last visited Sept. 12, 2003).

50. See, e.g., NAT'L ADVISORY COUNCIL FOR ENVTL. POLICY AND TECHNOLOGY, U.S. ENVTL. PROTECTION AGENCY, RECOMMENDATIONS OF THE EFFLUENT GUIDELINES TASK FORCE: REMOVING THE BOTTLENECKS FROM THE EFFLUENT GUIDELINES PROCESS (Oct. 1996), at <http://www.epa.gov/ost/guide/taskforce/bottleneck.html> ("The historical EPA process for Agency-wide review and sign-off of regulations appears to be a problem due to the need to obtain consensus from all participants, and sometimes because of an excessive number of participants. This contributes to delays and frequent last-minute "fire drills" to obtain consensus."); see also *Hearing on S.159, supra* note 35

office with only the concurrence of Office of General Counsel can take its rule directly to the administrator for signature. The economists and scientists no longer have a chance to question it. To be sure, those other offices may have participants on the staff-level working group that drafts the proposed rule in the first place. But high-level review by scientists and economists at a political level inside the Agency has been eliminated. A chief science officer would put a “scientific reality check” back into the process, just as final review by the general counsel builds a “legal reality check” into the process.

Another problem with today's peer-review process is that peer review is essentially a quality control process that generally takes place after the Agency has made up its mind on the main outlines of what it is going to do. To be effective, quality control must be built into the front-end of the process, rather than “inspected in” at the end of the line.<sup>51</sup> Similarly, science needs to be involved early in the decisionmaking process in addition to being a quality-control constraint at the end.<sup>52</sup> As I discuss in more detail in subpart C, a science advocate inside the Agency will be more powerful and effective if he or she can draw support from an external constituency or stakeholder.<sup>53</sup>

## B. Empower Scientists to Make Policy Recommendations

It has become a canon of institutional faith at EPA that scientists should just stick to the facts and not make policy recommendations. This strong separation between science and policy may be attributable in part to the analytic distinction between “risk assessment” and “risk management” that has been propounded by, among others, William Ruckelshaus, EPA's first administrator and one of its key intellectual leaders.<sup>54</sup>

Whatever its source, there is a strong cultural difference between the role of science at EPA and the role of science at many other agencies such as FDA. At other agencies, scientists speak with their greatest authority on scientific issues, but they are invited to make recommendations on policy issues as well.<sup>55</sup> This

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(remarks of E. Donald Elliott and Carol M. Browner).

51. E. Donald Elliott, *TQM-ing OMB: Or Why Regulatory Review Under Executive Order 12,291 Works Poorly and What President Clinton Should Do About It*, 57 LAW & CONTEMP. PROBS. 167, 177-79 (Spring 1994).

52. See *infra* text accompanying note 60.

53. Cf. William Pedersen, *Formal Records and Informal Rulemaking*, 85 YALE L.J. 38 (1975) (arguing that lawyers inside EPA derive power from the threat of reversal by the courts).

54. See, e.g., William Ruckelshaus, *Risk in a Free Society*, 14 *Env'tl. L. Rep. (Env'tl. L. Inst.)* 10,190 (1984); see also PRESIDENTIAL/CONGRESSIONAL COMMISSION ON RISK MANAGEMENT AND RISK ASSESSMENT, *FRAMEWORK FOR ENVIRONMENTAL HEALTH RISK MANAGEMENT* (1997).

55. For example, the charter of the Science Advisory Board at FDA is a broad one: “The Science Advisory Board advises the Commissioner in discharging her responsibilities as they relate to addressing specific and technically complex scientific issues of regulatory importance to FDA.” U.S. FOOD AND DRUG ADMIN., *CHARTER, SCIENCE BOARD TO THE FOOD AND DRUG ADMINISTRATION*, at <http://www.fda.gov/oc/advisory/charter.html> (last visited Sept. 12, 2003). But the stated mission of EPA's Science Advisory Board is much narrower: “Congress established the EPA Science Advisory Board in 1978 and gave it a broad mandate to advise the Agency on *technical matters*. The Board's principal mission includes . . . [r]eviewing the quality and relevance of the scientific and technical information being used or proposed as the basis for Agency regulations.” U.S. *Env'tl. Protection Agency*,

rarely happens at EPA, where scientists are usually told to stick to the science and to leave policy decisions to others. For example, EPA's Science Advisory Board rarely makes policy recommendations to the administrator, usually confining itself instead to reviewing and commenting on "purely scientific" questions. It is true that some important policy decisions at EPA are made by scientists—for example, what uncertainty factors to use in performing risk assessments.<sup>56</sup> But, ironically, scientists have seized control of these policy decisions precisely by embedding them in a highly scientific discourse and denying that they are really policy decisions at all.

Whatever utility there may be to an analytic distinction between risk assessment and risk management—between science and policy—it is an organizational disaster to exclude scientists from policy conversations. The organizational theory that calls for a strict separation between science and policy marginalizes science and prevents it from playing its proper role in informing good policy. The EPA norm that scientists should be seen but not heard on policy issues causes more harm than good in several ways.

Most people enjoy exercising power.<sup>57</sup> The same can be said for scientists. Good scientists do not come to work for regulatory agencies in the federal government because of high prestige, or high salary, or great working conditions, or terrific research opportunities. They are drawn to regulatory agency work for the same reasons that lawyers or economists are drawn there, and primary among them is the chance to contribute to making what they consider to be good public policy. In other words, a chance to exercise power—or at least to advise the powerful—is one of the top motivations to attracting good people to public service.

When we attempt to consign scientists to a *Dragnet*-style, "just the facts" role in the policy process, we undermine one of the primary incentives for qualified scientists to join regulatory agencies. By telling scientists that their policy recommendations are unwelcome, we deter good people, and we forego the benefit of the good ideas they might have suggested.

Moreover, the edict of purging policy from science is self-defeating. Science and policy merge almost imperceptibly into one another. If told that it is improper to make policy recommendations, scientific groups are much more likely to smuggle in their policy predilections covertly, either consciously or unconsciously. We would be far better advised to invite scientific advisory bodies to *separate* their scientific conclusions from their policy recommendations, and to empower them to address both. This is the approach followed by

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EPA Science Advisory Board, at <http://www.epa.gov/science1/index.html> (last visited Sept. 12, 2003) (emphasis added). The language reflects the practice of the two agencies. At FDA, scientists often make policy recommendations, whereas at EPA they do so far less often.

56. See, e.g., REGULATORY IMPACT ANALYSIS PROJECT, INC., CHOICES IN RISK ASSESSMENT: THE ROLE OF SCIENCE POLICY IN THE ENVIRONMENTAL RISK MANAGEMENT PROCESS (Steven Milloy project manager, 1994).

57. "A sense of power is the most intoxicating stimulant a mortal can enjoy." CAROLINA L. HUNT, THE LIFE OF ELLEN H. RICHARDS ch. 11 (1912) (quoting Ellen Henrietta Swallow Richards).

FDA and many other agencies, and it seems to work well.

### C. Organize a “Science Watch” NGO to Represent Disinterested Scientists in the Administrative Process

Disinterested scientists are a discrete and insular minority that is systematically underrepresented in the present administrative process.<sup>58</sup> “The present political system of environmental regulation is highly sensitive to certain voices (well-organized, technically sophisticated pressure groups, including environmentalists . . . ), but other voices without a lobby are largely left out of the dialogue (disadvantaged economic and racial minorities, *disinterested scientists*).”<sup>59</sup>

Of course, individual scientists are sometimes *hired* to speak on behalf of industry or environmental groups or other interested parties. But, for the moment, I am concerned with voicing the views of *disinterested* scientists—those who have no financial stake in the controversy and whose only interest is the scientific integrity of the process. Independent scientists are sometimes asked to serve on peer-review bodies such as EPA’s Science Advisory Board, or NAS committees. But these reviewing institutions, useful as they are, typically become involved only late in the process to bless or criticize an EPA policy that has already largely taken shape.<sup>60</sup> They also generally respond to questions that are posed to them by others and do not play a creative role in defining and shaping policy options. Nor can they avail themselves of many levers of power for influencing the administrative process, such as lobbying Congress, the White House, and agency officials, filing comments, litigating, or issuing press releases. Because they lack an economic stake in the outcome, groups of independent scientists rarely hire lawyers, participate as stakeholders, write comments, lobby Congress, or sue to challenge rules that offend their sense of scientific integrity. Nor do independent scientists do any of the other things that other interest groups representing other perspectives do to try to influence the administrative process. They do not do so precisely because they are not organized as an interest group and they do not have a sufficient financial interest in the outcome of the controversy for them to incur the very substantial transaction and process costs required to participate in the administrative process. The absence of an institutional stakeholder for science who can use the same techniques other interest groups use creates a fundamental imbalance of power.

The absence of independent scientists as an organized interest group leaves a void in our administrative process and biases outcomes. The prevailing

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58. Cf. JOHN HART ELY, *DEMOCRACY AND DISTRUST: A THEORY OF JUDICIAL REVIEW* 76 (1980); Bruce Ackerman, *Beyond Carolene Products*, 98 HARV. L. REV. 713, 722-24 (1985).

59. E. Donald Elliott, *Toward Ecological Law and Policy*, in *THINKING ECOLOGICALLY: THE NEXT GENERATION OF ENVIRONMENTAL POLICY* 170 (Marian R. Chertow & Daniel C. Esty eds. 1997) (emphasis added).

60. NAT’L ENVTL. POLICY INST., *ENHANCING THE INTEGRITY AND TRANSPARENCY OF SCIENCE IN THE REGULATORY PROCESS* 17-18 (1996) (advocating more “early peer involvement” as opposed to limiting peer review to the end of the process).

modern vision of public participation in the administrative process is based on interest group pluralism, in which “interested parties” (revealing words) compete in a marketplace of ideas.<sup>61</sup> Thus, in a typical administrative proceeding to set an environmental standard, someone speaks for the regulated industry, for the environment, for local and state governments, and for small businesses. No one speaks for science *qua* science. Science is typically only heard when it happens to support the position of one of these organized interests groups. Independent, disinterested scientists are literally unrepresented in the process.

Perhaps it is time for science *qua* science to get into the game by organizing a nongovernmental organization of independent environmental scientists whose only common interest is speaking up for the integrity of science in the process. For purposes of discussion, I will call this imaginary new entity “Science Watch.” The Science Watch NGO might be composed of an independent, self-perpetuating board of directors who are eminent and experienced scientists. They should be empowered to decide which controversies Science Watch will engage in and what positions it will take. They could hire legal counsel, lobbyists, and public relations firms to make their points, just as environmental advocacy groups not only file comments and lawsuits but also run newspaper ads to influence public perception and debate on environmental issues.<sup>62</sup> My point is not that running issue ads is inappropriate (although they do tend to oversimplify), but rather that independent scientists do not currently run counter-ads, thereby leaving the field susceptible to extreme claims by both industry and environmentalists, both of whom may have an axe to grind. To avoid claims of bias, Science Watch would, like many environmental NGOs, be funded entirely by a diverse group of foundations. Moreover, adapting an idea recently proposed by Bruce Ackerman and Ian Ayres in the context of campaign finance reform, the decisionmakers at Science Watch should be kept in the dark regarding the identity of their funders and what those funders’ stakes in the outcome of decisions might be.<sup>63</sup>

The initial board of Science Watch would face a number of important decisions: Should they engage on the “hard issues” on which scientific consensus is not yet formed, or should they focus on issues on which a scientific consensus has begun to arise? Should they denounce abuses of science or provide wise counsel on the difficult issues? In principle, these issues are no different than those faced by the boards of Environmental Defense Fund or the ACLU when they decide where to deploy their scarce resources to best further the interests that they represent. The main point, however, is that many values and perspec-

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61. See, e.g., Richard B. Stewart, *The Reformation of Administrative Law*, 88 HARV. L. REV. 1667 (1975).

62. For example, see the series of newspaper ads on the alleged effect of toxic chemicals on children’s health at <http://www.childenvironment.org> (last visited June 1, 2002), or the many efforts to influence press coverage undertaken by the Environmental Working Group at <http://www.ewg.org> (last visited Jan. 16, 2003).

63. BRUCE ACKERMAN & IAN AYRES, VOTING WITH DOLLARS: A NEW PARADIGM FOR CAMPAIGN FINANCE 26-30 (2002).



tives, such as protecting the environment, protecting civil liberties, or reducing the influence of money in politics were once unrepresented (or at least, underrepresented) in the policy process. Science finds itself largely in that same situation today, without any group that systematically represents the value of scientific accuracy and integrity in the policy process. Perhaps founding a Science Watch NGO is no less realistic than founding the ACLU, Common Cause, or Greenpeace once seemed.

It should also be remembered that professional societies have traditionally fulfilled similar roles as independent voices for a profession or discipline. For example, for many years the American Psychiatric Association has filed amicus briefs in numerous court cases involving mental health issues.<sup>64</sup> Perhaps professional scientific societies in the environmental area such as the Society for Risk Analysis, the Society for Environmental Toxicology and Chemistry, or the Air and Waste Management Association should become more involved as direct participants in EPA proceedings. They would act as independent voices for scientific rigor and integrity. The Society of Toxicology already issues occasional position statements reacting to governmental actions and public perceptions on issues of science.<sup>65</sup> Perhaps we now need to take a further step by creating a new Science Watch NGO consisting of independent scientists—with motivations and credentials beyond question—who are prepared not only to speak out occasionally on important issues of science in environmental regulation, but also to take more active measures to influence the regulatory process.

The objections to such an organization are obvious. Who can be so audacious as to purport to speak for science? Will science not lose its moral authority if it becomes an interest group just like all the others? Who would fund such an organization? Since scientists cannot agree on anything, would not whatever position this group takes be misleading? All of these objections have some merit, and would have to be accommodated, but they all also can be answered, at least to some extent, if one substitutes the word “environment” and its cognates for “science” in the questions above. Other NGOs representing equally abstract values and diverse constituencies manage to exist and to influence policy successfully.<sup>66</sup> And even when science has no definitive answers to offer, it can still contribute by clarifying uncertainties and exposing misstatements as to what is and is not known.

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64. See, e.g., *Sell v. United States*, 123 S. Ct. 2174, 2185 (2003) (citing Brief for American Psychiatric Association as Amicus Curiae); *Kansas v. Hendricks*, 521 U.S. 346, 360 n.3 (1997) (same); *Youngberg v. Romeo*, 457 U.S. 307, 309 n.1 (1982) (same).

65. See, e.g., Society of Toxicology, Position Paper, *The Safety of Genetically Modified Foods Produced Through Biotechnology* (Sept. 25, 2002), available at [http://www.toxicology.org/Information/GovernmentMedia/GM\\_Food.html](http://www.toxicology.org/Information/GovernmentMedia/GM_Food.html).

66. For example, the American Civil Liberties Union is committed to protecting the Bill of Rights. <http://www.aclu.org> (last visited Sept. 12, 2003). Common Cause “regularly publishes investigative studies on the effects of money in politics and reports on a variety of ethics and integrity-in-government issues.” <http://www.commoncause.org> (last visited Sept. 12, 2003). Accuracy in Media is committed to promoting “fairness, accuracy and balance in news reporting.” <http://www.aim.org> (last visited Sept. 12, 2003).

Science is unlikely to play an enhanced role in EPA decisions unless an external stakeholder group applies increased pressure for scientific rigor and integrity in the same way that other stakeholder groups lobby for other values. Advocates for a value or perspective inside an agency draw their strength and support from constituencies outside the agency. One recent EPA administrator was rumored to have asked rhetorically in an internal meeting how many votes on Capitol Hill the scientists could deliver. Whether true or apocryphal, that story captures the reality that as long as scientists and those who care about science remain unorganized, they cannot expect to match the influence of other groups that are organized to utilize tools affecting the administrative process.

## V

### CONCLUSION

More influence for science is not the single answer for all that ails environmental decisionmaking. Of course, science is not totally objective, nor does it provide definitive answers to all relevant questions. Progress in improving government decisionmaking is always slow and incremental, particularly when fundamental changes in institutional culture and practice are at issue. But they can happen—slowly. Institutional changes providing a greater infusion of economic thinking into the regulatory process over the last three decades have improved regulation. In much the same way, over the next decades, a key issue that will occupy reformers will be how to improve the scientific basis for environmental decisions so as to marry science more productively with policy.