

# Rethinking Judicial Review of Expert Agencies

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*The role of generalist courts in reviewing the work of expert agencies is generally portrayed as either an institutional necessity on the one hand or a Pandora's Box on the other. Courts are expected to ensure the accountability of agency actions through their legal oversight role, yet on matters of science policy they do not have the expertise of the agencies nor can they allow themselves to become amateur policymakers in the course of their review. Given these challenges, we set out to better understand what courts are doing in their review of agency science. We conducted a qualitative examination of the courts' review of challenges to agency scientific choices in the entire set of the Environmental Protection Agency's (EPA's) National Ambient Air Quality Standards (NAAQS). Our study revealed an increasingly rigorous and substantive engagement in the courts' review of scientific challenges to the EPA's NAAQS over time that tracked the Agency's own progress in developing rigorous analytical approaches. Our findings, albeit preliminary, suggest the emergence of a constructive partnership between the courts and agencies in science policy in NAAQS cases. In overseeing scientific challenges, the courts appear to serve as a necessary irritant, encouraging the agency to develop much stronger administrative governance and deliberative decisions on complex science-policy issues. Conversely, in developing stronger decision-making processes, the resulting agency efforts have a reciprocal, positive impact on the courts' own standards for review. The courts and agencies thus appear to work symbiotically through their mutual efforts on the establishment of rigorous analytical yardsticks to guide the decision process. While our findings may be limited to the NAAQS, which likely present a best case in administrative process, the findings may still offer a grounded, normative model for imagining a constructive and even vital role for generalist courts in technically complex areas of social decision making.*

## Introduction

The role of generalist courts reviewing the work of expert agencies in the United States is generally portrayed as an institutional necessity on the

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one hand and a Pandora's Box on the other. Louis Jaffe once wrote that "[t]he availability of judicial review is the necessary condition, psychologically if not logically, of a system of administrative power which purports to be legitimate, or legally valid."<sup>1</sup> But courts do not have the expertise of the agencies they are reviewing; they are legal institutions. They are also not political and need to restrain from becoming amateur policy makers in the course of their review. By granting courts authority to review science-based regulatory decisions, there is a risk they will unravel layers of careful scientific work as a result of their combined ignorance and judicial second-guessing.

The promise and perils of judicial review of agency science has been a longstanding puzzle, tantalizing scholars and commentators alike.<sup>2</sup> Judges have openly admitted they are engaging in experimental strategies in reviewing challenges to agency science,<sup>3</sup> while simultaneously posing the overarching question: "What does and should a reviewing court do when it considers a challenge to technical administrative decision-making?"<sup>4</sup> On the other hand, it is well known that a variety of evils—ranging from agency incompetence to special-interest capture to illicit political manipulations—have been concealed from view by agency computational models and scientific terminology.<sup>5</sup> Indeed, agency technical rules may be the new playground for beltway politics, a proclivity ripe for judicial oversight.

Over the last several decades, scholars have pored through court opinions in search of the answer to this puzzle of judicial review of agency science. But in this work, they have come up empty-handed, concluding that courts essentially pass agency scientific judgments through without engaging in the substance.<sup>6</sup> Indeed, even the conclusion that courts are at

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1. LOUIS L. JAFFE, *JUDICIAL CONTROL OF ADMINISTRATIVE ACTION* 320 (1965).

2. *See, e.g.*, Patricia M. Wald, *Judicial Review in Midpassage: The Uneasy Partnership Between Courts and Agencies Plays On*, 32 *TULSA L.J.* 221, 221 (1996) (surveying the "hot spots of judicial review [of agency decisions] over a half-century"); E. Donald Elliott et al., *Science, Agencies, and the Courts: Is Three a Crowd?*, 31 *ENVTL. L. REP.* 10,125, 10,125 (2001) (transcribing a panel discussion of law-firm partners and professors on judicial review of agency science).

3. *Compare Ethyl Corp. v. EPA*, 541 F.2d 1, 66 (D.C. Cir. 1976) (Bazelon, J., concurring) (advocating a particular kind of judicial deference to the scientific community regarding highly technical matters), *with id.* at 68–69 (Leventhal, J., concurring) (relying on generalist judges to acquire the technical background necessary to review scientific decisions but also arguing for a particular kind of deference).

4. *Id.* at 68 (Leventhal, J., concurring).

5. *See* Holly Doremus, *Scientific and Political Integrity in Environmental Policy*, 86 *TEXAS L. REV.* 1601, 1602 (2008) (describing how scientists who provide reference information to the EPA may have a variety of reasons to falsify their data and interpretations that are used in the regulatory process); Wendy E. Wagner, *The Science Charade in Toxic Risk Regulation*, 95 *COLUM. L. REV.* 1613, 1650–51 (1995) (arguing that agencies have "multiple political, legal, and institutional incentives to cloak policy judgments in the garb of science").

6. *See* Jason J. Czarnezki, *An Empirical Investigation of Judicial Decisionmaking*, *Statutory*

their most deferential when they review agency science is now crumbling under closer examination, and efforts to develop descriptive accounts of judicial review of agency science appear to be largely abandoned.<sup>7</sup> In a landmark article on judicial review of agency science written in 2011, Professor Meazell ultimately concedes defeat in making descriptive sense of the cases and moves the conversation about judicial review of science to a normative level.<sup>8</sup>

In this Article we take a fresh look at the case law in a renewed search for a key that might unlock some understanding of what courts are actually doing in their important but precarious task of reviewing challenges to agency science-intensive choices. In doing so, however, we heed the travails of others and take a different tack on the study of judicial review of agency science. Rather than consider a mix of cases drawn from different agencies and agency programs, we examine all of the opinions reviewing challenges to agency science in a single regulatory scheme. In selecting this regulatory scheme, moreover, we investigate one of the very best regulatory programs with respect to the agency's integration of science into policy program—the EPA's promulgation of national ambient air quality standards (NAAQS).<sup>9</sup> A relatively fixed (albeit malleable) statutory mandate, a respected scientific staff, and a variety of procedural innovations in the use of science all serve to situate the courts in a best-case position from the standpoint of the intersection of courts and agency science. Indeed, if this study of the courts' review of a best-case science-intensive regulatory program does not yield useful insights about judicial review, then we may be willing to join the scholarly ranks in concluding that the search for a deeper understanding of the judicial review of science may be futile after all.

Based on our examination of the courts' review of this sophisticated regulatory program, however, we identify a promising evolution in the judicial review of scientifically intensive decisions over time. Initially, in their review of the EPA's standard setting, the courts signaled that they would preside over science-intensive decisions, yet at the same time openly conceded that they lacked a framework for evaluating these technical

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*Interpretation, and the Chevron Doctrine in Environmental Law*, 79 U. COLO. L. REV. 767, 817–19 (2008) (highlighting the tendency of courts to defer to agencies when complicated science is involved); Devra Lee Davis, *The “Shotgun Wedding” of Science and Law: Risk Assessment and Judicial Review*, 10 COLUM. J. ENVTL. L. 67, 85–86, 90–92 (1985) (describing cases in which the court deferred to the scientific expertise of the agency and claiming that the depth of a court's review of a scientific record “seems more a function of that court's predilections than of the applicable standard of review”).

7. See, e.g., Emily Hammond Meazell, *Super Deference, the Science Obsession, and Judicial Review as Translation of Agency Science*, 109 MICH. L. REV. 733, 756 (2011) (dismissing the theoretical and practical foundations of judicial “super deference” to agency science).

8. *Id.*

9. See *infra* note 188 and accompanying text.

challenges meaningfully. Over the next two decades, while the courts took a variety of different approaches to their review of agency science, the EPA developed much more elaborate analytical approaches for conducting its analyses. Significantly, the Agency introduced an epistemic framework into the administrative record, i.e., a discussion of how it would weigh and implement the scientific evidence on hand. With this epistemic and analytical framework in hand, the courts now appear to be conducting judicial review with more coherence. The courts, in other words, hold the EPA accountable based on the Agency's own analytical processes, methods, and epistemic frames.

The Article is structured as follows. It begins by laying down a framework of accountability that provides a structure for exploring the courts' role. After providing a brief orientation to the NAAQS program under study, the Article then dedicates more than half of its length to tracing out the findings within the case law governing the EPA's NAAQS setting. The Article closes with a discussion of the implications of our findings for administrative law in particular and science and law more generally, particularly with respect to the role of generalist courts in science policy.

#### I. Accountability, Judicial Review, and Science-Intensive Decisions: A Backdrop

In the United States, judicial review is a critical means by which agencies are held accountable to the public for their decisions. In this Article, we take the existence of judicial review as a given.<sup>10</sup> In subjecting the agency to judicial review—a unique feature of administrative process—the agency is required to take all information, including the comments, seriously and to develop a rule that is grounded in this larger record and faithful to the statutory mandate.<sup>11</sup> Although the deferential standard of “arbitrary and capricious” established by the Administrative Procedure Act (APA) indicates that courts are not to second-guess agency fact-finding, even in this role the courts are expected to engage in the substance of challenges alleging that the agency has drifted from its administrative record.<sup>12</sup>

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10. But we note that others question this. See Keith Werhan, *Delegalizing Administrative Law*, 1996 U. ILL. L. REV. 423, 423 (maintaining that federal policy makers and the Supreme Court have been loosening controls and review of agency decision making).

11. Gordon G. Young, *Judicial Review of Informal Agency Action on the Fiftieth Anniversary of the APA: The Alleged Demise and Actual Status of Overton Park's Requirement of Judicial Review* “On the Record,” 10 ADMIN. L.J. AM. U. 179, 217 (1996) (stating that under judicial review of an agency's rule, the rule will be valid “as long as it was appropriately based on statutory authority, on the comments, and on any other materials the agency actually considered”).

12. *Citizens to Pres. Overton Park, Inc. v. Volpe*, 401 U.S. 402, 415–16, 420 (1971) (stating the first step of a court's review of agency action is to determine if the Secretary acted within their statutory authority, in which the administrative record plays an important role).

Unlike the role of courts in adjudicating disputes in other civil settings, in the administrative process courts are not in the business of crowning a victor but rather in using petitioners' challenges as a way to ensure the agency is not deviating from its administrative responsibilities as legally understood.<sup>13</sup> While petitioners may advance self-serving complaints against the agency's rule, the courts' role in administrative process is to determine whether the agency's decision lacks factual grounding or statutory authority in ways that compromise its legal validity.<sup>14</sup>

To better understand the role of courts in facilitating this accountability of agencies, we use Professor Anne Davies's work on accountability.<sup>15</sup> Professor Davies describes accountability processes as consisting of four steps—standard setting, obtaining of an account, judging of an account, and consequences—and this framework lends necessary structure to a study of judicial review.<sup>16</sup> The first step—standard setting—involves a process by which the court determines the yardstick by which it will judge a decision.<sup>17</sup> In reviewing agency fact-finding, such as challenges to an agency's scientific analysis, courts will typically apply the arbitrary and capricious standard as their yardstick for judging the agency's work.<sup>18</sup> The obtaining of an account typically occurs through the appellate process in which the petitioners supply the court with arguments of ways that the agency has deviated from its responsibilities under the applicable statute and so forth. See Table 1.

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13. See *Chevron, U.S.A., Inc. v. Natural Res. Def. Council, Inc.*, 467 U.S. 837, 843–45 (1984) (explaining the court's and agency's respective roles in statutory interpretation).

14. *Id.*

15. A.C.L. DAVIES, *ACCOUNTABILITY: A PUBLIC LAW ANALYSIS OF GOVERNMENT BY CONTRACT* 73 (2001).

16. *Id.* at 81.

17. *Id.* at 81–82.

18. 5 U.S.C. § 706(2)(a) (2012).

**Table 1: Judicial Review as a Four Step Accountability Process**

<b>4 Steps in Accountability (Davies)</b>	<b>Aspects of Judicial Review</b>
<b>Generating “Yardsticks” by Which to Hold a Decision Maker to Account</b>	Legal grounds of review as set out in 42 U.S.C. § 7607(b) and as related to the requirements as set out in 42 U.S.C. § 7409(b)(1)–(2) and as interpreted by judges in case law.
<b>The Process of Obtaining An Account</b>	Public adversarial process in which arguments are put by petitioners’ lawyers in their legal documents and are responded to by the EPA in light of the documentation that they have produced in rulemaking.
<b>Judging of an Account</b>	Assessing of petitioners’ arguments against legal grounds of review in a legal judgment.
<b>Consequences</b>	If arguments are successful then legal consequences follow (remand etc.).

Mapping the court’s role in this way underscores the fact that judicial review of agency science is deeply rooted in law and not in science. The court applies legal tests to judge fact-finding, including agency science. Moreover, this external lay inquiry is guided not by scientists interested in scientific integrity but by lawyers who represent interest groups that are dismayed at the implications of a rule. The arguments against the agency’s scientific analyses—albeit ultimately potentially correct—are fuelled by “analytical opportunism” funnelled into legal arguments.<sup>19</sup> None of this seems to be an effective structure for holding agencies accountable in their scientific analyses. And yet the basic goal—some form of external oversight—remains an important institutional one.

The crude and limited reach of judicial review, particularly with regard to science-intensive rules,<sup>20</sup> has led some institutional analysts to consider

19. ELIZABETH FISHER, RISK REGULATION AND ADMINISTRATIVE CONSTITUTIONALISM 121–22 (2007) (discussing the “analytical opportunism” problem, in which “nearly any flaw in methodology can now be used as a basis for arguing that the decision was arbitrary and capricious or not based on substantial evidence”); DAVID MICHAELS, DOUBT IS THEIR PRODUCT: HOW INDUSTRY’S ASSAULT ON SCIENCE THREATENS YOUR HEALTH 7–9 (2008) (describing the phenomenon in which scientific evidence or lack thereof is used to strategically manipulate legislation and regulation).

20. See, e.g., CARNEGIE COMM’N ON SCI., TECH., & GOV’T, RISK AND THE ENVIRONMENT: IMPROVING REGULATORY DECISION MAKING 56, 73–74 (1993) (noting that regulatory decision making is a particularly great challenge for science-based regulatory agencies and that resulting ambiguity can make interpretation difficult for the courts); Nicholas A. Ashford et al., *A Hard Look at Federal Regulation of Formaldehyde: A Departure from Reasoned Decisionmaking*, 7

different types of institutional mechanisms for ensuring administrative accountability. Professor Sid Shapiro, in particular, builds on a neglected body of work in public administration that establishes the viability of internal administrative structures and ideas of professionalism in acting as accountability processes that he argues may largely supplant the role of the courts in policing agency problems from an external vantage point.<sup>21</sup> Professor Shapiro thus argues that agencies develop their own “inside-out” mechanisms of accountability, such as norms of professionalism in civic service.<sup>22</sup> Seen through this framework, agencies set their own analytical standards and develop their own types of internal processes, such as soliciting review from science advisory boards, for judging their work.<sup>23</sup> Conveniently, the same accountability steps drawn from Davies’s framework can also be applied to the agency’s internal decision process as seen through this inside-out perspective. See Table 2.

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HARV. ENVTL. L. REV. 297, 298 (1983) (analyzing the distinction between judicial review in hard science and science-policy issues); Thomas O. McGarity, *Some Thoughts on “Deossifying” the Rulemaking Process*, 41 DUKE L.J. 1385, 1392 (1992) (explaining that rules promulgated by agencies regulating on “frontiers of scientific knowledge” may quickly be outdated by the time they make it to the courts (internal quotation marks omitted)); Richard J. Pierce, Jr., *Seven Ways to Deossify Agency Rulemaking*, 47 ADMIN. L. REV. 59, 59 (1995) (positing that recent changes in legal doctrines will change the agency rulemaking process).

21. Sidney Shapiro, Elizabeth Fisher & Wendy Wagner, *The Enlightenment of Administrative Law: Looking Inside the Agency for Legitimacy*, 47 WAKE FOREST L. REV. 463, 469–71 (2012); Sidney A. Shapiro & Ronald F. Wright, *The Future of the Administrative Presidency: Turning Administrative Law Inside-Out*, 65 U. MIAMI L. REV. 577, 589–90 (2011) (proposing an agency accountability model through which employees are influenced by internal agency controls to avoid self-interested behavior, rather than through external checks).

22. Shapiro & Wright, *supra* note 21, at 589–95.

23. Shapiro, Fisher & Wagner, *supra* note 21, at 499.

**Table 2: Outside-In and Inside-Out Accountability Processes**

	<b>Outside-In Accountability— Judicial Review</b>	<b>Inside-Out Accountability— Internal Agency Processes of Public Administration</b>
<b>Generating “Yardsticks” by Which to Hold a Decision Maker to Account</b>	Legal grounds of review as set out in 42 U.S.C. § 7607(b) and as related to the requirements as set out in 42 U.S.C. § 7409(b)(1)–(2) and as interpreted by judges in case law.	Asserting its interpretation of the statutory mandate.  Asserting an epistemic framework for a robust scientific explanation.
<b>The Process of Obtaining an Account</b>	Public adversarial process in which arguments are put by petitioners’ lawyers in their legal documents and are responded to by the EPA in light of the documentation that they have produced in rulemaking.	Conducting public review of scientific bases, especially external panel of experts.
<b>Judging of an Account</b>	Assessing of petitioners’ arguments against legal grounds of review in a legal judgment.	Issuing proposal of regulation and drafting responses to comments.
<b>Consequences</b>	If arguments are successful then legal consequences follow (remand etc.).	

At first blush, the duality of these perspectives on holding the agencies accountable only serves to divide further the science–law interface by making clear just how embedded each accountability process is in different disciplinary and institutional contexts. Judicial review is a form of legal accounting while, seen through the lens of public administration, the agency may be implementing a very different, more scientifically based system of decision making and accountability. External standards do not match those used internally and both are supposedly applied in isolation to enhance accountability processes.



## II. An Examination of the Courts' Review of Challenges to the EPA's NAAQS

Equipped with these two frameworks on administrative accountability, we now turn to the case law to discern how the courts and agencies are traversing these seemingly very different worlds of law and science in ensuring agency accountability in science-intensive decision making. Before delving into the findings, however, we offer a brief orientation to the Clean Air Act and the standards at issue.

### A. *Backdrop to the Clean Air Act and the NAAQS*

Judicial review of the EPA's ambient air quality standards offers one of the longest histories of judicial review of agency science, dating to the 1970s.<sup>24</sup> This body of judicial challenges forces courts to review some of the most intricate scientific decisions reached by agencies, each of which can have enormous social and economic impacts.<sup>25</sup> Moreover, since Congress requires the EPA to review the standards every five years to stay current with new scientific discoveries that shed light on public-health protection, the courts enjoy repeat encounters with agency standard setting.<sup>26</sup>

Passed in 1970, the Clean Air Act seeks to ensure that the EPA protects the public health by "allowing an adequate margin of safety" with regard to widespread pollutants found in outside air.<sup>27</sup> The requirement that the EPA set underlying national standards—the NAAQS—for the most common pollutants in ambient air lies at the heart of the act.<sup>28</sup> Because the

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24. See *supra* section II(C)(1).

25. See, e.g., U.S. ENVTL. PROT. AGENCY, SUMMARY OF THE UPDATED REGULATORY IMPACT ANALYSIS (RIA) FOR THE RECONSIDERATION OF THE 2008 OZONE NATIONAL AMBIENT AIR QUALITY STANDARD (NAAQS), at S1–4 (2009), available at [http://www.epa.gov/ttnecas1/regdata/RIAs/s1-supplemental\\_analysis\\_summary11-5-09.pdf](http://www.epa.gov/ttnecas1/regdata/RIAs/s1-supplemental_analysis_summary11-5-09.pdf), archived at <http://perma.cc/628Q-7E4U> (indicating a range of between about \$8 billion and more than \$20 billion in costs annually between an ozone standard of 0.070 ppm versus 0.075 ppm).

26. 42 U.S.C. § 7409(d)(1) (2012).

27. Clean Air Amendments of 1970, Pub. L. No. 91-604, § 109(2)(b)(1), 84 Stat. 1676, 1680 (codified at 42 U.S.C. at § 7409(b)(1)).

28. 42 U.S.C. § 7409(b)(1)–(2) defines both primary and secondary NAAQS:

(1) National primary ambient air quality standards, prescribed under subsection (a) of this section shall be ambient air quality standards the attainment and maintenance of which in the judgment of the Administrator, based on such criteria and allowing an adequate margin of safety, are requisite to protect the public health. Such primary standards may be revised in the same manner as promulgated.

(2) Any national secondary ambient air quality standard prescribed under subsection (a) of this section shall specify a level of air quality the attainment and maintenance of which in the judgment of the Administrator, based on such criteria, is requisite to protect the public welfare from any known or anticipated adverse effects associated with the presence of such air pollutant in the ambient air. Such secondary standards may be revised in the same manner as promulgated.

air quality of the entire nation is riding on the standards (as well as the compliance requirements for the millions of sources of pollution), a diverse set of interest groups closely follows the EPA's NAAQS process and participates vigorously in it.<sup>29</sup>

Several important features lying at the intersection of law, science, and public administration emerge from the design of this NAAQS program. First, the NAAQS effort is a legal-administrative framework pursuing a collective social goal through a standard-setting process that is "rooted in technical expertise and inquiry."<sup>30</sup> The EPA has significant scientific and administrative capabilities, and yet the task is a difficult one because the scientific-administrative and legal aspects of decision making do not easily relate to each other.<sup>31</sup> As a result, the EPA's supporting analyses for its standard setting, at least up until 2006, were infamously "encyclopedic" and unwieldy<sup>32</sup>—intimidating judges and alienating participants alike.

Second, like other environmental legislation at the time, the Clean Air Act was a departure from the conventional model of the administrative state built up around the legal processes of adjudication and "rulemaking" set out in the APA.<sup>33</sup> Instead, the administrative processes under the Clean Air Act that related to NAAQS were hybrid—processes that were a mix of different forms of conventional administrative procedures as well as including other scientific and participatory aspects.<sup>34</sup> Moreover, over time the scientific nature of decision making has led agencies and Congress, sometimes reacting to one another, to develop increasingly intricate processes for

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29. STEVEN P. CROLEY, REGULATION AND PUBLIC INTERESTS: THE POSSIBILITY OF GOOD REGULATORY GOVERNMENT 165–66, 169–70 (2008) (describing the diverse set of interest groups that attempted to exert influence on EPA decision making over the past several decades). Thus, unlike some other rulemaking areas, business and environmental interests are both well represented and engaged in the legal disputes.

30. Harold Leventhal, *Environmental Decision Making and the Role of the Courts*, 122 U. PA. L. REV. 509, 510 (1974).

31. Davis, *supra* note 6, at 68. See also Elizabeth Fisher, Pasky Pascual & Wendy Wagner, *Understanding Environmental Models in Their Legal and Regulatory Context*, 22 J. ENVTL. L. 251, 262–64 (2010).

32. NAAQS PROCESS REVIEW WORKGROUP, U.S. ENVTL. PROT. AGENCY, REVIEW OF THE PROCESS FOR SETTING NATIONAL AMBIENT AIR QUALITY STANDARDS, at E-1 (2006) [hereinafter NAAQS Memo], available at [http://www.epa.gov/ttn/naaqs/pdfs/naaqs\\_process\\_report\\_march2006.pdf](http://www.epa.gov/ttn/naaqs/pdfs/naaqs_process_report_march2006.pdf), archived at <http://perma.cc/VK38-5QWY>.

33. See, e.g., BRUCE A. ACKERMAN & WILLIAM T. HASSLER, CLEAN COAL/DIRTY AIR: OR HOW THE CLEAN AIR ACT BECAME A MULTIMILLION-DOLLAR BAIL-OUT FOR HIGH-SULFUR COAL PRODUCERS AND WHAT SHOULD BE DONE ABOUT IT 7–9 (1981) (describing how the Clean Air Act Amendments of 1970 targeted critiques of conventional New Deal administrative agencies).

34. 42 U.S.C. § 7409(d)(2) (2012) (mandating a unique regulatory process with explicit requirements regarding who participates in decision making, including an independent scientific review committee). An overview of the Clean Air Scientific Advisory Committee can be found at *EPA Clean Air Scientific Advisory Committee (CASAC)*, U.S. ENVTL. PROTECTION AGENCY, <http://yosemite.epa.gov/sab/sabpeople.nsf/WebCommittees/CASAC>, archived at <http://perma.cc/DKX6-P8K4>.

decision making. Thus, in the early years the EPA created an early predecessor of the Scientific Advisory Board<sup>35</sup> to aid in its decision making, including creating subcommittees in regards to particular NAAQS.<sup>36</sup> The 1977 Clean Air Act Amendments created the Clean Air Scientific Advisory Committee (CASAC), effectively mandating review by a scientific body of experts that is now a central part of the NAAQS process.<sup>37</sup> Between 2006 and 2009 the EPA reinforced the NAAQS process by, among other things, incorporating policy and science-intensive scoping exercises and developing an integrated science-policy report which frames the science-policy questions, a report that in itself is reviewed by both the public and CASAC.<sup>38</sup> Consistent with Professor Shapiro's inside-out theory, internal processes have become increasingly intricate and rigorous over time.<sup>39</sup>

Third, despite the scientific staff and "inside" processes of accountability, the EPA's regular reviews of the ambient standards decisions are often challenged in court with respect to the quality or accuracy of the Agency's scientific analysis.<sup>40</sup> The Clean Air Act itself sets out a framework for judicial review that regulates the record, the forum, and the grounds of judicial review.<sup>41</sup> These provisions not only regulate judicial review but reflect the symbolic importance placed by Congress on judicial review as an accountability process.<sup>42</sup> The courts are viewed as a critical mechanism for ensuring Agency accountability, despite the complicated and often highly scientific nature of the Agency's underlying analyses.<sup>43</sup>

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35. Congress formalized the creation of this board in 1978. *History of the SAB*, U.S. ENVTL. PROTECTION AGENCY, <http://yosemite.epa.gov/sab/sabproduct.nsf/WebBOARD/SABHistory>, archived at <http://perma.cc/6DAU-XCD5>.

36. *Committees and Membership*, U.S. ENVTL. PROTECTION AGENCY, <http://yosemite.epa.gov/sab/sabproduct.nsf/WebBOARD/CommitteesandMembership?OpenDocument>, archived at <http://perma.cc/FS5W-L5C7>.

37. Pub. L. No. 95-95, § 106(2)(A), 91 Stat. 685, 691 (1977) (codified as amended at 42 U.S.C. § 7409(d)(2)(A) (2012)) (mandating the creation of "an independent scientific review committee").

38. *More Information on the NAAQS Review Process*, U.S. ENVTL. PROTECTION AGENCY, <http://www.epa.gov/ttn/naaqs/review2.html>, archived at <http://perma.cc/U6M6-TR67>.

39. See Shapiro & Wright, *supra* note 21, at 578 (discussing some of the institutional and practical issues associated with inside-out accountability).

40. Davis, *supra* note 6, at 68–69 (explaining the inherent difficulty in judicial review of scientific analysis). See also Thomas O. McGarity, *Substantive and Procedural Discretion in Administrative Resolution of Science Policy Questions: Regulating Carcinogens in EPA and OSHA*, 67 GEO. L.J. 729, 796–808 (1979) (describing various challenges to the EPA's scientific analysis and varying approaches to judicial review).

41. 42 U.S.C. § 7607(b) (2012).

42. Emily Hammond & David L. Markell, *Administrative Proxies for Judicial Review: Building Legitimacy from the Inside-Out*, 37 HARV. ENVTL. L. REV. 313, 321–22 (2013) (discussing the legitimizing role of judicial review and its relation to Congress's demand for agency accountability and conformity with statutes).

43. *Id.*

*B. Investigation of Judicial Review of NAAQS: Methods*

In our investigation to better understand how the courts are carrying out their important responsibility of judicial review of agency science, we reviewed all of the cases (totalling fifteen) in which the substantive exercise of technical discretion in the setting of NAAQS had been challenged in court.<sup>44</sup> All of the cases, except one in the U.S. Supreme Court, were decided by the D.C. Circuit Court of Appeals over the last thirty-five years.<sup>45</sup> The grounds of challenge in the cases were numerous and often involved simultaneous challenges of substance, procedure, and statutory interpretation, yet consistent with our interest in the judicial review of agency science, we focused on challenges to the Agency's scientific analysis. Most of these arguments, although not all, concerned challenges under the arbitrary and capricious ground.<sup>46</sup>

Our first empirical effort to understand how the courts review agency science involved coding the type and nature of each science-intensive issue in each case. We developed a taxonomy of different types of science-based challenges to the Agency's air standards and a range of approaches the courts took in resolving each of the challenges.<sup>47</sup> We then coded cases based on this taxonomy in the hope of extracting larger patterns arising in the courts' review of these different types of technical challenges.<sup>48</sup> We also tracked the identity of the petitioner—industry, environmental group, or both. A relatively elaborate pilot effort using the coding scheme revealed no discernible patterns in the case law, however, and the coding method was abandoned. Our second empirical attempt involved reading the cases qualitatively with the help of a structured questionnaire. The results from this effort highlighted the great variation among cases; the courts often

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44. We excluded cases that only involved side issues relating to the NAAQS process.

45. The Clean Air Act confers exclusive judicial review of final agency actions to the U.S. Court of Appeals for the District of Columbia. 42 U.S.C. § 7607(b)(1). The one case decided by the Supreme Court was *Whitman v. Am. Trucking Ass'ns*, 531 U.S. 457 (2001).

46. See *supra* notes 12 and 18 and accompanying text. One challenge to the Agency's standard setting was based on the nondelegation doctrine of the Constitution, rather than the arbitrary and capricious clause of the APA. *Am. Trucking Ass'ns*, 531 U.S. at 474–76 (finding that a delegation of authority to the EPA was constitutional).

47. We identified challenges to the EPA's decision process and to the substantive features of its decision. The four types of substantive challenges were: the EPA *did/did not* balance the weight of evidence appropriately; the EPA *did/did not* consider relevant strand(s) of evidence; the EPA *did/did not* apply the appropriate inferential method; the EPA *did/did not* draw the appropriate inference from the method.

48. This loosely follows other empirical studies of judicial review. See, e.g., Peter H. Schuck & E. Donald Elliott, *To the Chevron Station: An Empirical Study of Federal Administrative Law*, 1990 DUKE L.J. 984, 989–90 (describing an analytical study of judicial review in 2,325 administrative-action cases, seeking to reveal broad, dynamic patterns of administrative law); Robert Glicksman & Christopher H. Schroeder, *EPA and the Courts: Twenty Years of Law and Politics*, LAW & CONTEMP. PROBS., Autumn 1991, at 249, 249 (examining “the relationship between EPA and the federal courts during the first twenty years of the Environmental Protection Agency”).

took very different approaches to reviewing the same standard in the same statutory setting.<sup>49</sup>

These two attempts at empirical analysis, focusing as they did on the minutiae of legal argument, made clear to us the court's task in judicial review is conceptually distinct from the Agency's task in developing a robust scientific basis for their NAAQS. In particular, due to the nature of the adversarial system, the role of the courts is to consider the arguments of petitioners and rule on them. The obtaining and judging of an account is thus ad hoc, primarily driven by the analytical opportunism of petitioners. It is also a process concerned with assessing agency action against legal yardsticks. The lack of any pattern in regards to the treatment of scientific arguments might therefore be inevitable.

But was the absence of a larger pattern truly inevitable? In relation to our second empirical attempt we found that the quality of the court's review—its articulated understanding of the nature of the challenges and its assessment of the Agency's reasoning—varied dramatically in different cases. In some cases, judgments were ad hoc in their treatment of arguments relating to scientific reasoning,<sup>50</sup> while in other cases judges revealed a greater grasp of what it meant for a decision to be scientifically robust.<sup>51</sup> More strikingly, these changes could be charted over time and corresponded to parallel advancements made by the Agency in its decision-making process.

In our third and final attempt to understand the judicial review of scientific challenges, the cases were reread with this evolution of judicial review in mind. As described in more detail below, although some cases fit the theory better than others we believe this evolutionary account provides the best-fitting characterization of courts' review of scientific challenges to the EPA's standards.

### C. Findings

Ultimately we conceptualize the approach taken by the courts in judicial review as evolving in three consecutive eras that track significant advances in the Agency's own process for developing the NAAQS. Using

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49. Compare *Am. Petroleum Inst. v. Costle*, 665 F.2d 1176, 1184, 1192 (D.C. Cir. 1981) (granting EPA substantial discretion on issues involving contested scientific judgment to the point of effectively taking a hands-off approach to arbitrary or capricious review), with *Mississippi v. EPA*, 744 F.3d 1334, 1348–53 (D.C. Cir. 2013) (scrutinizing carefully the EPA's use of scientific evidence in reaching an ozone standard and ultimately upholding the chosen standard as neither arbitrary nor capricious). In *Lead Industries*, the court appeared to adopt multiple, different standards of review. *Lead Indus. Ass'n v. EPA*, 647 F.2d 1130, 1145 (D.C. Cir. 1980) (citing the deferential arbitrary or capricious standard yet also discussing the need for the judiciary to “delve into the scientific literature” and make a “substantial inquiry” into the facts (internal quotation marks removed)).

50. See *infra* notes 112–19 and accompanying text.

51. See *infra* notes 150–65 and accompanying text.

these internal developments as category markers, we identified distinct themes emerging in each era of NAAQS promulgation.<sup>52</sup> Although our analysis focused on the court cases, we also reviewed some of the administrative records—including the Federal Register Notices, as well as the various staff papers and science reports—that the EPA used to develop the NAAQS, a rulemaking process that can take many years before the standards are ultimately challenged in court. We use the time periods demarcating each era only as a loose way to track the interactions of inside-out and outside-in accountability processes. While each case falling within an era does not necessarily epitomize the applicable theme, in most instances the cases do fit into the narrative relatively well.

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52. See *infra* Table 3.

**Table 3**

Judicial review of NAAQS has evolved over three chapters spanning fifteen cases in forty-five years before the D.C. Circuit Court of Appeals. The Clean Air Act requires two types of standards, one for public health (called primary) and another for public welfare (called secondary). Particulate Matter (PM) comes in two forms depending on particle size: coarse and fine.

<b>Eras</b>	<b>Court Cases</b>	<b>NAAQS</b>	<b>Conclusion</b>
<b><u>Era 1</u></b> <b>(1970–1980)</b>  <i>Identifying the Need for Yardsticks and Partnership</i>	<i>Kennecott Copper Corp. v. EPA</i> , 462 F.2d 846 (D.C. Cir. 1972).	SOx: secondary	Remand
<b><u>Era 2</u></b> <b>(1980–2010)</b>  <i>In Search of Workable Yardsticks</i>	<i>Lead Indus. Ass'n v. EPA</i> , 647 F.2d 1130, 1145–48 (D.C. Cir. 1980).	Pb: primary	Affirm
	<i>Am. Petroleum Inst. v. Costle</i> , 665 F.2d 1176, 1185 (D.C. Cir. 1981).	CO: primary	Affirm
	<i>Natural Res. Def. Council, Inc. v. EPA</i> , 902 F.2d 962 (D.C. Cir. 1990).	PM: primary	Affirm
	<i>Am. Lung Ass'n v. EPA</i> , 134 F.3d 388 (D.C. Cir. 1999).	SOx: primary	Remand
	<i>Am. Trucking Ass'ns v. EPA</i> , 175 F.3d 1027 (D.C. Cir. 1999) appealed to the Supreme Court in <i>Whitman v. Am. Trucking Ass'ns</i> , 531 U.S. 457 (2001).	PM: primary, fine	Unconstitu- tional
		PM: primary, coarse	Remand
	<i>Am. Trucking Ass'ns v. EPA</i> , 283 F.3d 355 (D.C. Cir. 2002).	PM: primary, fine	Affirm
	<i>Am. Farm Bureau Fed'n v. EPA</i> , 559 F.3d 512 (D.C. Cir. 2009).	PM: primary, fine	Remand

Eras	Court Cases	NAAQS	Conclusion
<b>Era 3</b> <b>(2010–2014)</b> <i>Developing Yardsticks for Scientific Robustness</i>	<i>Coal. of Battery Recyclers Ass'n v. EPA</i> , 604 F.3d 613 (D.C. Cir. 2010).	Pb: primary	Affirm
	<i>Nat'l Env'tl. Dev. Ass'n's Clean Air Project v. EPA</i> , 686 F.3d 803 (D.C. Cir. 2012).	SOx: primary	Affirm
	<i>Am. Petroleum Inst. v. EPA</i> , 684 F.3d 1342 (D.C. Cir. 2012).	NOx: primary	Affirm
	<i>Mississippi v. EPA</i> , 744 F.3d 1344 (D.C. Cir. 2013).	O3: primary	Affirm
		O3: secondary	Remand
	<i>Cmtys. for a Better Env't v. EPA</i> , 748 F.3d 333 (D.C. Cir. 2014).	CO: primary	Affirm
	<i>Ctr. for Biological Diversity v. EPA</i> , 749 F.3d 1079 (D.C. Cir. 2014).	NOx/SOx: secondary	Affirm
	<i>Nat'l Ass'n of Mfrs. v. EPA</i> , 750 F.3d 921 (D.C. Cir. 2014).	PM: primary	Affirm

Era 1 sets the stage for forty-five years of NAAQS review. The one case in this era underscores the wide-open terrain of judicial review of agency scientific decision making—there were no clear expectations on records, explanation, analyses, or scientific review. There were thus no explicit internal or external yardsticks by which to assess the quality of NAAQS science.

In Era 2 there were attempts to develop these yardsticks (and related accountability processes) both internally and externally. Internal processes for ensuring the scientific robustness of the NAAQS process began to be developed by the Agency. The first of these Agency process changes required scientific advisory board review of the EPA's analyses, a regularization mandated by Congress in the 1977 amendments to the Clean Air Act that replaced the EPA's less systematic use of these boards.<sup>53</sup>

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53. For a discussion of CASAC, the scientific advisory board created by the amendments, see SHEILA JASANOFF, *THE FIFTH BRANCH: SCIENCE ADVISERS AS POLICYMAKERS* 102–04 (1990). Note because of the time it takes between initiating a rule, passing it, and any challenge to it, the CASAC did not play a role in judicial-review reasoning until 1990. See, e.g., *Natural Res. Def.*



Externally, courts also began attempting to develop yardsticks by which to assess decision making, although these were not closely connected to the internal yardsticks being developed. Thus the treatment of scientific arguments by the court in this era was ad hoc.

In Era 3, the Agency made significant progress in developing yardsticks for its decision process and its substantive analysis. In particular, from 2006 onwards the EPA reinvented its scientific decision process and developed a more refined causal framework with which to weigh scientific evidence. The courts began deploying these Agency-generated yardsticks in assessing scientific challenges to the Agency's work and judging the reasonableness of the Agency's explanation.

As we have already noted, these eras correspond roughly to the changes occurring within the Agency's decision process, with the qualification that NAAQS can have a long lead time that predates adjustments to internal Agency processes. Overall, however, a temporal pattern appears between the EPA's development of more rigorous decision processes and the courts' bases for review. Specifically, as Agency analytical processes grow more robust, the courts use the Agency's improved framework in evaluating challenges to its scientific choices. While this may not lead to a cause-effect relationship between the courts' demands and the Agency's increased analytical sophistication, it does suggest at least the possibility of a partnership between courts and agencies that resembles the court-agency relationship originally imagined by Judge Leventhal more than forty years ago.<sup>54</sup>

The eras in the case law and agency processes are explained in more detail below.

*1. Era 1: Identifying the Need for Yardsticks and Partnership (1970–1980).*—When Congress passed the Clean Air Amendments on December 31, 1970, the EPA was barely a month into its existence.<sup>55</sup> Nevertheless, in mere weeks the Agency managed to propose standards for six criteria pollutants.<sup>56</sup> It did so by building on the criteria documents drafted in 1969 by advisory committees convened by the Secretary of

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Council, Inc. v. EPA, 902 F.2d 962, 997 (D.C. Cir. 1990).

54. Kennecott Copper Corp. v. EPA, 462 F.2d 846, 848–49 (D.C. Cir. 1972) (Leventhal, J.) (proclaiming that “judicial review rests on the premise that agency and court ‘together constitute a ‘partnership’ in furtherance of the public interest’” (quoting Greater Bos. Television Corp. v. FCC, 444 F.2d 841, 851 (D.C. Cir. 1970))).

55. Clean Air Amendments of 1970, Pub. L. No. 91-604, 84 Stat. 1676 (1970); Jack Lewis, *The Birth of EPA*, EPA J., Nov. 1985, at 6, 6.

56. National Primary and Secondary Ambient Air Quality Standards, Notice of Proposed Standards for Sulfur Oxides, Particulate Matter, Carbon Monoxide, Photochemical Oxidants, Hydrocarbons, and Nitrogen Oxides, 36 Fed. Reg. 1502, 1502 (Jan. 30, 1971) (to be codified at 42 C.F.R. pt. 410) [hereinafter National Primary and Secondary Ambient Air Quality Standards Notice].

Health, Education, and Welfare to include representatives from industry, universities, environmental NGOs, and governments at all levels.<sup>57</sup>

When the EPA finalized these NAAQS, it asserted that the standards were based on health alone, along with a margin of safety to account for uncertainty.<sup>58</sup> Its reference to the criteria documents was terse and cursory.<sup>59</sup> The NAAQS were subject to the adjusted informal rulemaking processes as set out in the Clean Air Act.<sup>60</sup>

Relying on the Clean Air Act's provisions for citizen suits and judicial review, the Kennecott Copper Corporation challenged the secondary standards for sulfur dioxides (SO<sub>x</sub>) as premised on a number of erroneous scientific errors.<sup>61</sup> Yet the sui generis nature of the NAAQS regime meant that courts had no standards for evaluating scientific challenges to the Agency's analysis or determining how to resolve an apparent battle of the experts.<sup>62</sup> The court needed to establish an approach to review.

Rather than conclude that challenges to agency science were off-limits or beyond the competence of the court, the court made a critical move in this first case and demanded from the Agency a more enlightening explanation for its contested technical choices.<sup>63</sup> In remanding the case back to the Agency Administrator, the court did not find fault in the EPA's scientific analysis; rather it remanded the rule because the Agency had failed to provide any explanation for how the science related to its decision.<sup>64</sup> Writing for the court, Judge Leventhal noted that "[i]nherent in the responsibility entrusted to this court is a requirement that we be given sufficient [explanation from the EPA] . . . so that we may consider whether it embodies an abuse of discretion or error of law."<sup>65</sup>

Judge Leventhal also emphasized the need for the EPA to provide some form of record, observing that "[t]he provision for statutory judicial

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57. *Id.* (referencing National Air Pollution Control Administration (NAPCA) air pollution criteria documents as providing the basis for developing the proposed standards for the six criteria pollutants). *See also* R. SHEP MELNICK, REGULATION AND THE COURTS: THE CASE OF THE CLEAN AIR ACT 77 (1983) (citing a 1969 NAPCA guideline discussing state air quality standards in justification for the proposed criteria pollutants standards); Leonard A. Miller & Doyle J. Borchers, *Private Lawsuits and Air Pollution Control*, 56 A.B.A. J. 465, 467 (1970) (explaining NAPCA's role in developing criteria documents for air pollutants).

58. National Primary and Secondary Ambient Air Quality Standards Notice, *supra* note 56, at 1502.

59. *Id.*

60. *See id.* (stating that proposed rulemaking is governed by § 109 of the Clean Air Act); *Kennecott Copper Corp. v. EPA*, 462 F.2d 846, 847–48 (D.C. Cir. 1972) (noting that Congress provided for informal rulemaking in § 109 of the Clean Air Act).

61. *Kennecott Copper Corp.*, 462 F.2d at 846–47.

62. *See id.* at 848 (declining to rule on specific scientific arguments).

63. *Id.* at 849 (“The provision for statutory judicial review contemplates some disclosure of the basis of the agency's action.”).

64. *Id.* at 850.

65. *Id.* at 849.

review contemplates some disclosure of the basis of the agency's action."<sup>66</sup> At the time, the need for such a record was not required for informal rules.<sup>67</sup> Writing contemporaneously, an EPA attorney agreed with the court noting that procedural protections established in the APA during the 1940s were not keeping pace with the demands of modern administrative governance.<sup>68</sup> This lawyer argued that the APA's adjudicatory model for collecting information should be replaced by formal requirements for agencies to keep detailed records of a regulation's basis.<sup>69</sup> Likewise, Judge Bazelon argued for adjustments to rulemaking processes.<sup>70</sup> These debates are relatively well-known to administrative lawyers, but the important point is that Judge Leventhal was requiring a more rigorous account of a decision and more explicit articulation of the yardsticks on which the EPA's decision was based.

On remand, the EPA discovered a significant technical error underlying the disputed SOx standard at issue in *Kennecott Copper*.<sup>71</sup> The court's remand thus was not only justified but beneficial to force the Agency to conduct a more rigorous analysis. To avoid similarly embarrassing errors in the future, the Agency began instituting a number of procedural reforms.<sup>72</sup> Many of these reforms persist today, including steps to establish an administrative record of the information used to develop NAAQS and to make this record available to the public.<sup>73</sup> *Kennecott Copper* thus set an important positive tone for the development of a meaningful agency-court partnership.

2. *Era 2: In Search of Workable Yardsticks (1980–2009)*.—Yet while *Kennecott Copper* made clear the need for agencies to play a role in the development of yardsticks for assessing their scientific analyses, progress

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66. *Id.*

67. Judge Leventhal essentially concedes this fact. *Id.* at 850.

68. William F. Pedersen, Jr., *Formal Records and Informal Rulemaking*, 85 YALE L.J. 38, 39 (1975) (arguing that the procedures used in rulemaking have been outpaced by regulatory developments and that such procedures "provide neither a satisfactory framework for agency decisionmaking nor a structure to those decisions that would ease judicial review").

69. *Id.* (suggesting that rulemaking procedures "provide for compiling and organizing an administrative record while rulemaking is in process, with use of a discovery system to ensure that no material which properly should be included is left out").

70. David L. Bazelon, *Coping with Technology Through the Legal Process*, 62 CORNELL L. REV. 817, 823 (1977).

71. *Kennecott Copper Corp., Nev. Mines Div. v. Train*, 424 F. Supp. 1217, 1222 (D. Nev. 1976) (explaining that the SOx standard in the EPA's requirement was subsequently discovered infeasible), *rev'd sub nom. Kennecott Copper Corp., Nev. Mines Div. v. Costle*, 572 F.2d 1349 (9th Cir. 1978).

72. John Bachmann, *Will the Circle Be Unbroken: A History of the U.S. National Ambient Air Quality Standards*, 57 J. AIR & WASTE MGMT. ASS'N 652, 661–63 (2007) (cataloging major procedural reforms in environmental standards throughout the 1960s and 1970s).

73. *Id.* at 666, 677.

towards strengthening such a partnership was not smooth. As already discussed, the nature of the court–agency partnership was open to question, and throughout the 1970s there was an ongoing judicial<sup>74</sup> and extrajudicial discussion<sup>75</sup> in other related regulatory areas about what form judicial review of technical decision making should take. More specifically in the NAAQS context, although the EPA used the Scientific Advisory Board (SAB) to review its work it still developed massive administrative records and unwieldy technical analyses.<sup>76</sup> Courts at the same time increasingly threatened to take a “hard look” at the issues before them.<sup>77</sup>

The instability of this institutional arrangement is evident in the courts’ ad hoc treatment of petition arguments concerning the scientific robustness of a standard throughout Era 2. While the courts developed some focal points to discipline their review of scientific challenges, in their actual review of scientific challenges the courts varied widely. Even in cases decided within one year of each other—*Lead Industries Ass’n v. EPA*<sup>78</sup> and *American Petroleum Institute v. Costle*,<sup>79</sup> for example—the panels engaged in the scientific challenges at very different levels of detail. The resulting scattergun approach seen in Era 2 case law was of course driven by the analytical opportunism that the adversarial system encourages,<sup>80</sup> but was reinforced by the absence of yardsticks for the courts to judge decision making in this area.

The sense of drift also underscored in a much more concrete way the worry that questions about legal validity would not directly map onto questions of scientific validity; the judicial review ground of arbitrary and

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74. See, e.g., *Ethyl Corp. v. EPA*, 541 F.2d 1, 33–36 (D.C. Cir. 1976) (concluding that courts must not review agency action through an overly technical lens but rather exercise their “narrowly defined duty of holding agencies to certain minimal standards of rationality”); *Natural Res. Def. Council, Inc. v. Nuclear Regulatory Comm’n*, 547 F.2d 633, 646 (D.C. Cir. 1976) *rev’d sub nom.* *Vt. Yankee Nuclear Power Corp. v. Natural Res. Def. Council, Inc.*, 435 U.S. 519 (1978) (“Since a reviewing court is incapable of making a penetrating analysis of highly scientific or technical subject matter on its own, it must depend on the agency’s expertise . . .”).

75. See, e.g., David L. Bazelon, *Science and Uncertainty: A Jurist’s View*, 5 HARV. ENVTL. L. REV. 209, 211–12 (1981) (recognizing courts’ limitations in reviewing agency science and technology decisions that fall outside the general knowledge of most lawyers); J. Skelly Wright, *The Courts and the Rulemaking Process: The Limits of Judicial Review*, 59 CORNELL L. REV. 375, 392–93 (1974) (considering various proposed standards for judicial review, including the arbitrary and capricious test, substantive review, and the ad hoc approach); Richard B. Stewart, *Vermont Yankee and the Evolution of Administrative Procedure*, 91 HARV. L. REV. 1805, 1811 (1978) (arguing for the “hard look” approach to review of agency decisions).

76. See, e.g., *Lead Indus. Ass’n v. EPA*, 647 F.2d 1130, 1146 (D.C. Cir. 1980) (involving an EPA record described as “lengthy—approximately 10,000 pages—and . . . highly technical”).

77. FISHER, *supra* note 19, at 101–02 (explaining hard look review as requiring an agency to show that it had considered all relevant facts and expert opinions and had not been improperly influenced by outside interests).

78. 647 F.2d 1130 (D.C. Cir. 1980).

79. 665 F.2d 1176 (D.C. Cir. 1981).

80. Fisher, Pascual & Wagner, *supra* note 31, at 281.

capricious is not the same as a test of scientific robustness. Legal tests of validity are generated from judicial-review doctrines and legal interpretations of legislation (grounded in legal precedents concerning the approach to legislation).<sup>81</sup> Scientific tests of robustness will also be grounded on an understanding of the legislative mandate but will be primarily drawn from understandings of good scientific practice as understood in a wider scientific community. This disconnect became obvious in the diverse opinions that emerged in Era 2.

It is thus not surprising that in this era there was an emerging concern about whether judicial review was contributing to a more legitimate administrative process.<sup>82</sup> Courts were often seen as a hindrance or at least as clumsy interlopers involved in second-guessing agency expertise.<sup>83</sup> And the courts themselves seemed uneasy about serving as overseers without a corresponding legal framework for understanding how to evaluate challenges to agency science.

The first case decided during this second era was the lengthy *Lead Industries*, in which the court upheld the Agency's lead standard against a full-bore attack mounted by industry.<sup>84</sup> Industry petitioners put forward a range of different arguments concerning the scientific robustness of the decision, including that there had been restricted engagement with scientific materials;<sup>85</sup> that there were not adequate adverse health effects from lead exposure;<sup>86</sup> that the approach to adopting a margin of safety was not valid;<sup>87</sup> that the choice of air-lead to blood-lead ratio was arbitrary and capricious;<sup>88</sup> that the changes in method for calculating lead standards were unreasonable;<sup>89</sup> and that the exclusion of insoluble particles from the lead standards was arbitrary and capricious,<sup>90</sup> as well as a range of procedural arguments concerning how scientific evidence and testimony had been deployed.<sup>91</sup>

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81. Most obviously *Chevron U.S.A., Inc. v. Natural Res. Def. Council, Inc.*, 467 U.S. 837, 845 (1984), illustrates this point, but for how the doctrine can be understood in inside-out terms see Sidney Shapiro & Elizabeth Fisher, *Chevron and the Legitimacy of "Expert" Public Administration*, 22 WM. & MARY BILL RTS. J. 465, 482 (2013).

82. See, e.g., McGarity, *supra* note 20, at 1400–01 (1992) (sounding the alarm about the “genuine danger of judicial overreach[]” in reviewing agency determinations); CARNEGIE COMM'N ON SCI., TECH., & GOV'T, *supra* note 20, at 109 (arguing that the state of judicial review causes some agencies to feel compelled to develop massive and costly records).

83. See McGarity, *supra* note 20, at 1412 (recognizing that substantive judicial review prompts agencies to “look[] over their shoulders” when assembling the record).

84. *Lead Indus. Ass'n v. EPA*, 647 F.2d 1130, 1184 (D.C. Cir. 1980).

85. *Id.* at 1171–72.

86. *Id.* at 1151–52, 1156.

87. *Id.* at 1161–62.

88. *Id.* at 1162–63.

89. *Id.* at 1164.

90. *Id.* at 1165–66.

91. *Id.* at 1169–72.

Two things are important to note about these arguments. The first is that some of the arguments were directly related to questions regarding how the statutory mandate for NAAQS was interpreted. Indeed, one of the most important facets of the *Lead Industries* case was its affirmation of the Agency's interpretation of the statute as mandating that it set standards to protect sensitive populations.<sup>92</sup> As we shall see below, the Supreme Court in *American Trucking*<sup>93</sup> further reinforced the relationship between the Agency's mandate and the substantive exercise of discretion.<sup>94</sup>

The second striking feature of these different arguments was that they raise questions about the scientific robustness of the Agency's decision, effectively pushing the court to rule on questions of scientific reasonableness. The court discussed its role in such circumstances at length, but that discussion did little to delineate that role. Thus, the court stressed that: "The 'arbitrary and capricious' standard of review is *highly deferential*, and presumes agency action to be valid"<sup>95</sup> and that "[w]e must look at the decision not as the chemist, biologist or statistician that we are qualified neither by training nor experience to be, but as a reviewing court exercising our narrowly defined duty of holding agencies to certain *minimal standards of rationality*."<sup>96</sup> But they also noted that "the court must undertake a 'substantial inquiry' into the facts, one that is 'searching and careful.'"<sup>97</sup> These statements do not easily sit together. Review must be simultaneously searching and deferential. Courts are not scientists but must uphold minimal standards of rationality. More importantly, these general statements provide little in the way of guidance for courts in dealing with the panoply of arguments put before them.

Indeed, faced with a number of scientific challenges to the Agency's analysis, the court in *Lead Industries* placed considerable weight on the fact that the EPA had used a rigorous analytical process that incorporated both public and expert review at several stages in the analysis.<sup>98</sup> By the time the EPA promulgated lead standards, much of the evidence in the record had already been reviewed by the public, particularly at public meetings held by

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92. *Id.* at 1152–54.

93. *Whitman v. Am. Trucking Ass'ns*, 531 U.S. 457 (2001).

94. *Id.* at 475–76. See also Elizabeth Fisher, Case Note, *Risk Regulation and the Rule of Law: Searching for 'Intelligible Principles' in the Administrative State*, 3 ENVTL. L. REV. 139, 141 (2001) (describing *American Trucking* as "a prime example" of the inherent difficulty of reconciling legislative regulations and administrative actions).

95. *Lead Indus.*, 647 F.2d at 1145 (emphasis added).

96. *Id.* at 1146 (emphasis added) (quoting *Ethyl Corp. v. EPA*, 541 F.2d 1, 36–37 (D.C. Cir. 1976)).

97. *Id.* at 1145 (quoting *Citizens to Pres. Overton Park, Inc. v. Volpe*, 401 U.S. 402, 415–16 (1971)).

98. *Id.* at 1137, 1160 (finding that the "Lead Criteria Document was the culmination of a process of rigorous scientific and public review" and a sufficient basis to support the EPA's action).

the Agency's SAB, a group of outside experts convened by the EPA in the 1970s to provide guidance on science matters.<sup>99</sup> In *Lead Industries*, the Court noted that the document had gone through several iterations before the SAB finally agreed that the science was sound and that another meeting to review the draft was unnecessary.<sup>100</sup> It approvingly described the lead criteria document as a “product of a process that allowed the rigorous scientific and public review that are essential to the preparation of a document ‘accurately reflect[ing] the latest scientific knowledge . . . .’”<sup>101</sup> Congress in fact had already recognized the valuable role that expert review played in both ensuring the rigor and providing an imprimatur of reliability for agency science policy. In 1977 (although not in effect at the time the standard challenged in *Lead Industries* was promulgated), Congress required that the EPA's analyses supporting its ambient air standards be reviewed by CASAC.<sup>102</sup> In standards promulgated after 1977, CASAC review is a regular and mandatory feature of the EPA's standard setting.<sup>103</sup> The EPA reviews studies generated by the scientific community and it prepares documents to summarize its conclusions; each of these documents undergoes review by CASAC and by the general public.<sup>104</sup> The Agency then uses the record generated by this process to propose and—following the public comment period required by the APA—to finalize standards.<sup>105</sup>

The courts deciding cases throughout the remainder of Era 2 regularly used CASAC review as a benchmark in assessing scientific challenges to the Agency's analysis. Yet during this period the courts also signalled that gaining CASAC's approval of a final standard, while important, was not dispositive. As Table 4 shows, the courts during this period referenced favorable CASAC review only in about half of the cases affirming NAAQS.<sup>106</sup> Indeed, even when the standards did not conform to CASAC's suggestions, the courts upheld them in all but one case (*American Farm*,<sup>107</sup> discussed below) because the EPA provided reasonable explanations for its decisions.<sup>108</sup>

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99. *Id.* at 1137–38.

100. *Id.* at 1137.

101. *Id.* at 1157 (alteration in original) (quoting 42 U.S.C. § 7408(a)(2)).

102. JASANOFF, *supra* note 53, at 102–04.

103. *EPA Clean Air Scientific Advisory Committee (CASAC)*, *supra* note 34.

104. U.S. ENVTL. PROT. AGENCY, INTEGRATED SCIENCE ASSESSMENT FOR PARTICULATE MATTER: FIRST EXTERNAL REVIEW DRAFT 1-8 (2008).

105. *Process of Reviewing the National Ambient Air Quality Standards*, U.S. ENVTL. PROTECTION AGENCY, <http://www.epa.gov/ttn/naaqs/review.html>, archived at <http://perma.cc/U784-4T24>.

106. *See supra* Table 3.

107. *Am. Farm Bureau Fed'n v. EPA*, 559 F.3d 512 (D.C. Cir. 2009) (per curiam).

108. *See infra* notes 128–30 and accompanying text.

**Table 4**

Concurrence with an external panel of experts has not been dispositive of the Court's decision on NAAQS.

	<b>Remanded</b>	<b>Affirmed</b>
<b>No mention of CASAC or its predecessor, SAB</b>	<p><i>Kennecott Copper Corp. v. EPA</i>, 462 F.2d 846 (D.C. Cir. 1972).</p> <p><i>Am. Lung Ass'n v. EPA</i>, 134 F.3d 388 (D.C. Cir. 1999).</p> <p><i>Am. Trucking Ass'ns v. EPA</i>, 175 F.3d 1027 (D.C. Cir. 1999). (PM: coarse)</p> <p><i>Mississippi v. EPA</i>, 744 F.3d 1344 (D.C. Cir. 2013). (O3: secondary)</p>	<p><i>Natural Res. Def. Council, Inc. v. EPA</i>, 902 F.2d 962 (D.C. Cir. 1990).</p> <p><i>Nat'l Ass'n of Mfrs. v. EPA</i>, 750 F.3d 921 (D.C. Cir. 2014).</p> <p><i>Nat'l Envtl. Dev. Ass'n's Clean Air Project v. EPA</i>, 686 F.3d 803 (D.C. Cir. 2012).</p> <p><i>Am. Petroleum Inst. v. Costle</i>, 665 F.2d 1176, 1185 (D.C. Cir. 1981).</p> <p><i>Am. Petroleum Inst. v. EPA</i>, 684 F.3d 1342 (D.C. Cir. 2012).</p>
<b>EPA's standard disagreed with CASAC et al.</b>	<p><i>Am. Farm Bureau Fed'n v. EPA</i>, 559 F.3d 512 (D.C. Cir. 2009).</p>	<p><i>Mississippi v. EPA</i>, 744 F.3d 1344 (D.C. Cir. 2013) (O3: primary)</p> <p><i>Cmtys. for a Better Env't v. EPA</i>, 748 F.3d 333 (D.C. Cir. 2014). (CO: secondary)</p>
<b>EPA's standard agreed with CASAC et al.</b>		<p><i>Lead Indus. Ass'n v. EPA</i>, 647 F.2d 1130, 1145–48 (D.C. Cir. 1980).</p> <p><i>Am. Trucking Ass'ns v. EPA</i>, 283 F.3d 355 (D.C. Cir. 2002).</p> <p><i>Cmtys. for a Better Env't v. EPA</i>, 748 F.3d 333 (D.C. Cir. 2014). (CO: primary)</p> <p><i>Ctr. for Biological Diversity v. EPA</i>, 749 F.3d 1079 (D.C. Cir. 2014).</p> <p><i>Coal. of Battery Recyclers Ass'n v. EPA</i>, 604 F.3d 613 (D.C. Cir. 2010).</p>



This situation is not surprising. While CASAC and other procedural reforms were reinforcing inside-out accountability processes in regards to the obtaining of an account and judging it, they were not directly concerned with articulating yardsticks of scientific robustness. Nor was judicial review. In case after case, petitioners argued that the EPA had cherry-picked or interpreted studies in a way that predisposed the results toward supporting its standards.<sup>109</sup> When affirming these standards, many (but not all) courts generally affirmed the agency choices.<sup>110</sup> And in their affirmance the courts generally cited one or more of the following reasons: CASAC's supporting opinion, the EPA's scientific expertise, or the Agency's discretion in setting a margin of safety.<sup>111</sup> Although it is not clear whether these factors carried much weight in practice given the presumption of reasonableness, the courts often invoked one or more of them as justification for affirming the Agency's choice.<sup>112</sup>

*American Petroleum Institute v. Costle* (the *API* case), a case that followed *Lead Industries* by one year, provides a particularly good example of a hands-off presumption of robustness in review of the Agency's proffered scientific explanation in light of petitioner's comments that effectively amounted to no meaningful review at all.<sup>113</sup> In considering

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109. *E.g.*, *Nat'l Env'tl. Dev. Ass'n's Clean Air Project v. EPA*, 686 F.3d 803, 811 (D.C. Cir. 2012) (describing petitioner's argument that the EPA should not have relied on epidemiological studies with confounding factors); *Am. Petroleum Inst. v. EPA*, 684 F.3d 1342, 1349 (D.C. Cir. 2012) (noting API's position that the EPA inappropriately discounted the results of the Goodman study); *Coal. of Battery Recyclers Ass'n v. EPA*, 604 F.3d 613, 618 (D.C. Cir. 2010) (recounting petitioner's contention that the EPA should not have used studies showing relationship between blood lead level and IQ loss); *Natural Res. Def. Council, Inc. v. EPA*, 902 F.2d 962, 969 (D.C. Cir. 1990) (describing petitioner's argument that the EPA should have relied more on the Lawther and London mortality studies and less on the Six Cities study).

110. *E.g.*, *Nat'l Env'tl. Dev. Ass'n's Clean Air Project*, 686 F.3d at 812 (refusing to find arbitrary the EPA's decision to give special weight to studies conducted using multipollutant regression models); *Am. Petroleum Inst.*, 684 F.3d at 1350 (determining that the EPA's treatment of the Goodman study did not fall below the arbitrary and capricious standard); *Coal. of Battery Recyclers*, 604 F.3d at 617 (finding the EPA's reliance on particular studies relating blood-lead level and IQ to be neither arbitrary nor capricious); *Natural Res. Def. Council*, 902 F.2d at 970, 976 (upholding the Administrator's choice not to rely heavily on the Lawther and London mortality studies and denying each of the claims presented against the EPA).

111. *See, e.g.*, *Am. Trucking Ass'ns v. EPA*, 283 F.3d 355, 370 (D.C. Cir. 2002) (relying in part on CASAC's supportive opinion to find for the EPA); *Am. Petroleum Inst. v. Costle*, 665 F.2d 1176, 1187 (D.C. Cir. 1981) (finding the Administrator's selection of a margin of safety was rational); *Lead Indus. Ass'n v. EPA*, 647 F.2d 1130, 1146 (D.C. Cir. 1980) (stating that the court will not "second-guess the Agency's expert decisionmaker" on scientific and technical matters).

112. *E.g.*, *Am. Petroleum Inst.*, 665 F.2d at 1185 (D.C. Cir. 1981) ("The proper function of the court is not to weigh the evidence anew and make technical judgments; our role is limited to determining if the [EPA] made a rational judgment."); *Natural Res. Def. Council*, 902 F.2d at 971 ("[Petitioner] essentially asks this court to give different weight to the studies than did the [EPA]. We must decline. It is simply not the court's role to 'second-guess the scientific judgments of the EPA.'") (citation omitted).

113. *Am. Petroleum Inst.*, 665 F.2d at 1187 (refusing to reverse where the EPA conclusion as to an adequate margin of safety was based on a reasoned analysis and evidence of risk).

industry and environmental challenges to the EPA's revised ozone standard setting a less protective standard under President Carter, the court not only credited each of the EPA's explanations as presumptively reasonable but concluded that the resultant battle of the experts between the EPA and petitioners demonstrated that the issue remained scientifically uncertain.<sup>114</sup> In the wake of that uncertainty, the EPA enjoyed ample space within which to make policy choices. Put another way, for each scientific challenge that the EPA could parry with a credible counter explanation, the Agency would be rewarded with essentially *carte blanche* to set the standard within an unbounded range of scientific uncertainty. In *API* at least, this discretion was so substantial that the EPA was able to weaken its protective ozone standard in ways that went against the recommendations of its scientific advisors as well as the mandate it had earlier interpreted as requiring it to err on the side of safety.<sup>115</sup> Indeed, in *API* even some irregularities in the EPA's decision process—including not submitting an analysis to the science advisory board—were not sufficiently material to lead to a remand of the standard.<sup>116</sup>

Likewise, a similar *ad hoc* approach can be seen in *Natural Resources Defense Council v. EPA*,<sup>117</sup> where the court once again articulated the tension in its role. On the one hand the court stated it “will not demand rigorous step-by-step proof of cause and effect,” but on the other it noted that it “must, nevertheless, carefully review the record to ascertain that the agency has made a reasoned decision based on reasonable extrapolations from some reliable evidence.”<sup>118</sup> The court upheld the standard against a range of arguments that went to the scientific robustness of the standard, but in doing so there was little in the way of articulation of the yardsticks it was using.<sup>119</sup>

Over time, the wide latitude to the agencies with respect to judging the robustness of their explanations became more obvious. In particular, it became clear there was little in the way of substantive yardsticks by which to judge decisions. In *American Lung Ass'n v. EPA*<sup>120</sup> a subtle shift could

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114. *Id.* at 1186–87.

115. *Id.* at 1186 (refuting suggestions that the EPA abandoned its statutory charge to protect public health by characterizing the EPA's actions as reasonable in light of the scientific information). It is worth noting that the opinion was written by Judge Robb but was joined by Judge Mikva and Judge Wald (who dissented in part on the factual question of whether the National Resources Defense Council had waived its objection regarding postcomment White House review). On balance, the panel seems relatively sympathetic to the environmental petitioners' claims. *Id.* at 1181, 1192.

116. *Id.* at 1188–89.

117. 902 F.2d 962 (D.C. Cir. 1990).

118. *Id.* at 968 (citations omitted) (internal quotation marks omitted).

119. *Id.* at 970–71 (upholding the EPA's standard on the grounds that it was not unreasonable, arbitrary, or capricious without further articulation of what these measures involve).

120. 134 F.3d 388 (D.C. Cir. 1998).

begin to be seen in light of this concern. The court in that case stated that “[j]udicial deference to decisions of administrative agencies like EPA rests on the fundamental premise that agencies *engage in reasoned decision-making*.”<sup>121</sup> The court found in this case that the Agency had not established it had done so.<sup>122</sup> Likewise, in *American Trucking Ass’ns v. EPA*<sup>123</sup> a majority of the D.C. Circuit ruled that the EPA’s PM primary standard effectuated an unconstitutional delegation of legislative authority.<sup>124</sup> This litigation was not directly about the scientific robustness of the decision. The EPA had openly conceded that PM causes adverse health effects at any concentration above zero but had set nonzero standards because of scientific uncertainty.<sup>125</sup>

The majority in the D.C. Circuit noted that:

EPA frequently defends a decision not to set a standard at a lower level on the basis that there is greater uncertainty that health effects exist at lower levels than the level of the standard. . . . But the increasing-uncertainty argument is helpful only if some principle reveals how much uncertainty is too much. None does.<sup>126</sup>

The Supreme Court disagreed with the lower court’s constitutional ruling and remanded the case to the D.C. Circuit for consideration of the substantive challenges to the standard.<sup>127</sup>

That court upheld the standard on remand, but in doing so articulated a stronger vision of what was expected of the EPA in terms of establishing the scientific robustness of their decision—a vision that not only considers CASAC recommendations but also an understanding of the type of yardsticks by which decisions may be judged.<sup>128</sup> The court stated:

[w]hen EPA proposes to issue new or revise existing NAAQS, it must “set forth or summarize and provide a reference to any pertinent findings, recommendations, and comments by [CASAC].” If the proposed rule “differs in any important respect from any of

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121. *Id.* at 392 (emphasis added).

122. *Id.* at 392–93.

123. 175 F.3d 1027 (D.C. Cir. 1999) (per curiam), *aff’d in part, rev’d in part sub nom.* *Whitman v. Am. Trucking Ass’ns*, 531 U.S. 457 (2001).

124. *Id.* at 1033.

125. *Id.* at 1034.

126. *Id.* at 1036.

127. *Am. Trucking Ass’ns*, 531 U.S. at 472; *Am. Trucking Ass’ns v. EPA*, 283 F.3d 355, 357–59 (D.C. Cir. 2002). Note that the judgment of the court was delivered by Judge Tatel, who gave the minority judgment in the first *American Trucking Associations* in the D.C. Circuit. 175 F.3d at 1057.

128. *Am. Trucking Ass’ns*, 283 F.3d at 358–59, 380 (elaborating on the statutory and procedural requirements of EPA decision making and ultimately finding the EPA’s actions proper).

[CASAC's] recommendations," the Agency must provide "an explanation of the reasons for such differences."<sup>129</sup>

Likewise, they noted:

Our task is the limited one of ascertaining that the choices made by the [EPA] Administrator were reasonable and supported by the record. That the evidence in the record may also support other conclusions, even those that are inconsistent with the Administrator's, does not prevent us from concluding that [her] decisions were rational and supported by the record.<sup>130</sup>

3. *Era 3: Developing Yardsticks for Scientific Robustness.*—The Era 2 cases reveal that over the nearly thirty years of judicial review, the courts were increasingly recognizing the importance of having yardsticks by which to assess the scientific robustness of a decision. Yet those yardsticks had still not fully emerged. The court could state the need for reasoned decision making, but the nature of that decision making was still amorphous.

*American Farm Bureau Federation v. EPA* marked the end of Era 2 and the transition to a new and more finely tuned agency–judicial partnership, the beginning of Era 3, which ushered in more meaningful judicial oversight of the Agency's explanations and decision processes. In ruling that the EPA did not reasonably explain why a study on the effects of short-term PM exposure on children's health was excluded in setting the primary annual standard for fine PM,<sup>131</sup> the court demonstrated that it was prepared to police the substance of the Agency's explanation that previously had been in practice treated as off-limits. As petitioners noted, both CASAC and the Agency's own staff papers had recommended a more stringent standard that was based in part on the excluded study.<sup>132</sup> Despite these recommendations, Administrator Stephen Johnson concluded that given the "uncertainties that remain in interpreting the available epidemiologic studies," there was insufficient evidence for the more stringent standard.<sup>133</sup> Unsatisfied with this conclusory statement from a political official that conflicted with the scientific staff and advisors, the court remanded for a more adequate explanation.<sup>134</sup>

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129. *Id.* at 358 (alterations in original) (citations omitted).

130. *Id.* at 362 (alterations in original) (quoting *Lead Indus. Ass'n v. EPA*, 647 F.2d 1130, 1160 (D.C. Cir. 1980)) (internal quotation marks omitted).

131. *Am. Farm Bureau Fed'n v. EPA*, 559 F.3d 512, 522 (D.C. Cir. 2009) (per curiam).

132. *Id.* at 520–21.

133. National Ambient Air Quality Standards for Particulate Matter, 71 Fed. Reg. 61,144, 61,172 (Oct. 17, 2006) (to be codified at 40 C.F.R. pt. 50).

134. *Am. Farm Bureau Fed'n*, 559 F.3d at 520, 528 (finding the EPA's explanations of its action inadequate while noting the defect was curable).

By the time the case was decided, the EPA had already been hard at work shoring up its analytical decision processes. Besieged by litigation challenging the timeliness of their air-standard reviews, as well as criticisms about the generally impenetrable and encyclopedic nature of the Agency's scientific analyses, the EPA produced a revised NAAQS process in 2006.<sup>135</sup> Rather than combine the scientific and policy analysis into a single, enormous criteria document that conflated the research, uncertainties, and assumptions together, the new process was broken into discrete analytical steps.<sup>136</sup> Each step—the scoping, the literature review, the modeling and risk assessment, and the policy assessment which identifies alternative options—was marked by a staff-authored report that is subjected to both public comment and CASAC review.<sup>137</sup>

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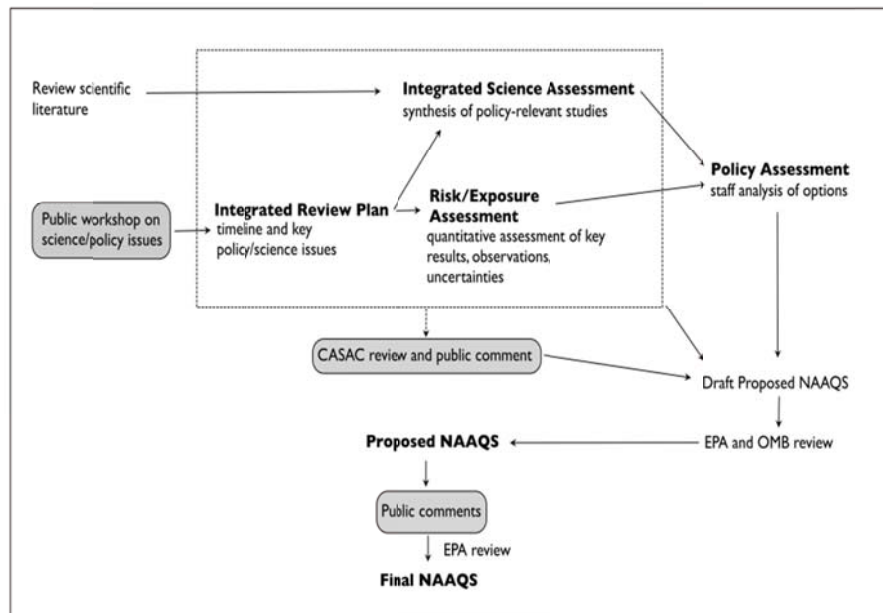
135. NAAQS MEMO, *supra* note 32, at E-2 to -3.

136. *Id.* at 21–22.

137. *Id.* at 24–28. This approach in many ways follows some of the recommendations made by Professor Elliott based on his experience as General Counsel of the EPA. See E. Donald Elliott, *Strengthening Science's Voice at EPA*, LAW & CONTEMP. PROBS., Autumn 2003, at 45, 51, 57–58 (advocating for the modification of the rule that courts “do not go behind an agency's written decision to inquire into the mental processes of decisionmakers” and for the empowerment of scientists to make policy recommendations).

**Figure 1: NAAQS Review Process**

Shaded boxes are those parts of the process in which public participation is actively sought by the EPA. Bold text refers to all public documents that ultimately constitute the administrative record for court review. Note that all procedures preceding the Federal Register Notice of the proposed NAAQS have been initiated by the EPA; these go beyond any statutory directives.<sup>138</sup>



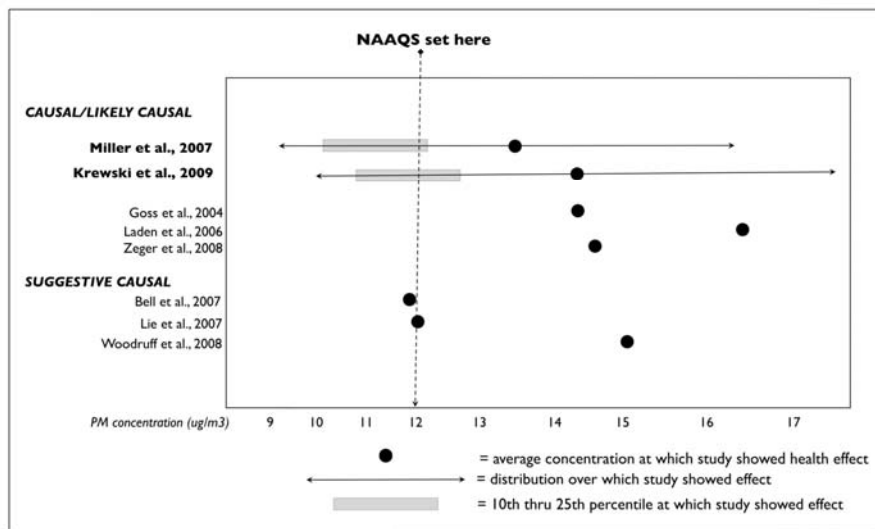
Around this same time, the EPA also produced a more rigorous epistemic framework against which its scientific robustness could be assessed. These principles are summarized in Figure 2, adapted from the Agency's promulgation of PM standards in 2013.<sup>139</sup>

138. Adapted from Memorandum from Lisa Jackson, Adm'r, Env'tl. Prot. Agency, to Elizabeth Craig, Acting Assistant Adm'r for Air and Radiation, Env'tl. Prot. Agency, and Lek Kadeli, Acting Assistant Adm'r for Research and Dev., Env'tl. Prot. Agency (May 21, 2009), available at <http://www.epa.gov/ttn/naaqs/pdfs/NAAQSReviewProcessMemo52109.pdf>, archived at <http://perma.cc/FSA2-QQ96>.

139. U.S. ENVTL. PROT. AGENCY, POLICY ASSESSMENT FOR THE REVIEW OF THE PARTICULATE MATTER NATIONAL AMBIENT AIR QUALITY STANDARDS 2-80 fig. 2-8 (2011) [hereinafter EPA POLICY ASSESSMENT].

**Figure 2: The EPA's Framework for Scientific Robustness**

The EPA uses a tiered system to evaluate the strength of causality embodied in a study. Within these studies, there are some that by nature of their design are particularly probative (in bold below). Looking across studies, the EPA develops a distribution of the levels at which a pollutant shows adverse health effects. To apply a margin of safety, the Agency selects a standard at the lower end of these distributions, e.g. at the 10th to 25th percentiles of each distribution.



First, to select and weigh evidence culled from multiple studies the EPA developed a “causal framework” based on the voluminous work on causality done by other agencies and by the greater scientific community.<sup>140</sup> The Agency’s discussion of this framework—a tiered system for evaluating the strength of evidence for a causal relationship—clarifies the trade-offs among certainty, weight of evidence, and utility.<sup>141</sup> The EPA places the greatest weight on the most certain evidence of causality, which typically comes from controlled human-exposure studies that rule out all causal factors other than the pollutant.<sup>142</sup> However, these studies may not extend to the real world where a heterogeneous population is exposed by multiple routes to a complex mix of air pollutants.<sup>143</sup> Therefore, the EPA must rely

140. U.S. ENVTL. PROT. AGENCY, INTEGRATED SCIENCE ASSESSMENT FOR PARTICULATE MATTER 1-13 to -14 (2009) [hereinafter INTEGRATED SCIENCE ASSESSMENT].

141. *Id.* at 1-19 to -23.

142. *Id.* at 1-21.

143. *Id.* at 1-15 to -16.

on epidemiologic studies which—by their experimental design, analytical adjustments for possible confounding factors, and reproducibility—suggest a causal relationship is likely, notwithstanding significant uncertainties.<sup>144</sup>

A second analytical milestone was the EPA's development of a more rigorous method for weighing the collective studies and evaluating uncertainty.<sup>145</sup> Whatever biological and physical reality might underlie the NAAQS, it is shrouded within uncertainties.<sup>146</sup> Therefore, the Agency relies on a distribution of study results, rather than a single point estimate.<sup>147</sup> This type of analytical work does not override the uncertainty, but it creates a more detailed picture of the bounds and distribution of existing evidence with respect to the proposed standard. Acknowledging that there is no single, correct way to choose a level of acceptable uncertainty, the Agency proposed that the 10th to 25th percentiles in the distribution was a reasonable range within which to exercise its mandate to set a margin of safety.<sup>148</sup>

These developments exemplify the strengthening of inside-out accountability processes governing the scientific robustness of the NAAQS process and the more explicit articulation by the EPA of the yardsticks that it is using to assess that robustness. These processes and yardsticks, while internal to the Agency, have not been developed in isolation but rather developed against the background of scientific practice. The Agency is not just viewing these inside-out accountability processes as ways to defend the decision against review but rather as ways of aligning its internal practices with science writ large.

The case law arising in the wake of the EPA's rejuvenation of its process and development of yardsticks yields opinions that are considerably more nuanced, often tracking the Agency's own analytical advancements in explicating assumptions and methods of analyses. Although some of these opinions continue to vary in rigor and explication, in general they take a new, more engaged turn in their review of challenges to the EPA's scientific analysis. And while the judicial demand for more complete

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144. *Id.* at 1-16, 1-21.

145. EPA POLICY ASSESSMENT, *supra* note 139, at 2-78 to -81 (summarizing how the EPA uses evidence-based considerations to inform the standard-setting process).

146. *E.g.*, National Ambient Air Quality Standards for Particulate Matter, 78 Fed. Reg. 3086, 3174 (Jan. 15, 2013) (to be codified at 40 C.F.R. pts. 50, 51, 52, 53, 58) (noting the large uncertainty in the extent to which changing the PM standard would have an effect on public health).

147. EPA POLICY ASSESSMENT, *supra* note 139, at 2-79 to -80 (demonstrating how distributional statistics are used in the NAAQS standards review process).

148. *Id.* It bears highlighting that this epistemic framework for robustness adopted by the EPA was itself the product of scientific review. As such, it reflects many discussions within the scientific community about appropriate methods to reach robust inferences. INTEGRATED SCIENCE ASSESSMENT, *supra* note 140, at 1-8 to -9 (discussing the extensive scientific research used to develop the EPA's methodology).



explanations is not necessarily the primary cause of the Agency's analytical progress, the role of the courts is likely a contributing factor leading to the Agency's enhanced decision processes.

There are several examples of the courts utilizing the Agency's own analytical yardsticks in the course of conducting their review. When the EPA's proposed PM revised standard was challenged in *National Ass'n of Manufacturers v. EPA*<sup>149</sup> in 2014, for example, the court was presented with a record that explained the body of evidence in this clearer fashion and that had been subjected to multiple rounds of peer review and public comment.<sup>150</sup> Due to this clear record, the court was able to quickly dispense with arguments by petitioners that the EPA "applied inconsistent peer-review standards and afforded disproportionate weight to certain studies . . . ."<sup>151</sup> After making note of the fact that the EPA had "considered a broad array of scientific sources, as well as the views of EPA staff and the Clean Air Scientific Advisory Committee," the court then concluded that the petitioners had not identified "any way in which EPA jumped the rails of reasonableness."<sup>152</sup> Rather, the "EPA offered reasoned explanations for how it approached and weighed the evidence, and why the scientific evidence supported revision of the NAAQS."<sup>153</sup>

*Mississippi v. EPA*,<sup>154</sup> decided in 2013, makes even more direct use of the EPA's analytical yardsticks. Petitioners challenged the revised primary and secondary ozone standards on a range of grounds including that the Agency relied on "inadequate and distorted science."<sup>155</sup> In affirming the Agency's primary standard,<sup>156</sup> the court noted with approval the EPA's careful and deliberative process for making the decision.<sup>157</sup> In particular, the court noted that the EPA had "*reasonably* explained how the scientific evidence had *in fact* changed since the 1997 review."<sup>158</sup> The court recognized that there may be a difference of opinion in how scientific evidence should be interpreted but noted that "any such disagreements must come from those who are qualified to evaluate the science, not us."<sup>159</sup> The focus of the court's review is on "evaluat[ing] the rationality of EPA's

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149. 750 F.3d 921 (D.C. Cir. 2014).

150. *Id.* at 924.

151. *Id.*

152. *Id.*

153. *Id.*

154. 744 F.3d 1334 (D.C. Cir. 2013).

155. *Id.* at 1342.

156. Note that the secondary standard was remanded for further explanation. *Id.* at 1362.

157. *Id.* at 1344 (finding it "quite clear" that the EPA's actions were proper).

158. *Id.* at 1343 (emphasis added).

159. *Id.* at 1345.

decision” and that evaluation is aided by the internal yardsticks and processes that the EPA has developed.<sup>160</sup>

Thus, even though the EPA’s standard did not ultimately follow CASAC’s recommendation for an even more stringent standard,<sup>161</sup> the EPA had solicited a great deal of expert advice, including CASAC, and used rigorous analytical processes.<sup>162</sup> The fact that the EPA’s ultimate decision diverged from CASAC’s recommendation and produced a weaker standard, the court concluded, did not suggest scientific flaws in the Agency’s analysis but rather revealed underlying uncertainties for which the EPA was granted considerable policy discretion to explain and characterize based on the science.<sup>163</sup>

What is particularly interesting about the judgment is its focus on reasoned explanation and the role that CASAC plays in ensuring that reasoned explanation. Thus, the court noted that: “Congress also required EPA to take CASAC’s expert scientific recommendations into account in promulgating NAAQS. Although EPA is not bound by CASAC’s recommendations, it must fully explain its reasons for any departure from them”<sup>164</sup> and that “to the extent that CASAC has exercised scientific judgment, EPA must respond in kind.”<sup>165</sup> More specifically,

Congress intended that CASAC’s expert scientific analysis aid not only EPA in promulgating NAAQS but also the courts in reviewing EPA’s decisions. . . . In order to enable judicial review and to satisfy its statutory obligation to explain its reasons for departing from CASAC, EPA must be precise in describing the basis for its disagreement with CASAC.<sup>166</sup>

Thus, CASAC is not just playing a “process role” and review by CASAC is not a way for the EPA to defend itself in judicial review. Rather, CASAC and the other processes that the EPA has developed are inside-out accountability processes that generate yardsticks by which to judge decisions and accounts that relate to those yardsticks. The focus is upon reasonable explanation measured against a set of scientific yardsticks developed in light of the statutory mandate.

The emphasis on reasoned explanation can be seen in other recent decisions.<sup>167</sup> Thus, in *Communities for a Better Environment v. EPA*<sup>168</sup>

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160. *Id.* at 1348.

161. *Id.* at 1356.

162. *Id.* at 1344.

163. *Id.* at 1356 (determining that the EPA’s acknowledgement of the limits of epidemiological studies satisfied the minimal standards of rationality).

164. *Id.* at 1354.

165. *Id.* at 1358.

166. *Id.* at 1355.

167. *E.g.*, *Ctr. for Biological Diversity v. EPA*, 749 F.3d 1079, 1087 (D.C. Cir. 2014) (“When EPA selects a standard during a rulemaking, it must exercise ‘reasoned’ decisionmaking.”)

petitioners put forward a number of different arguments about the scientific reasoning underpinning the EPA's decision to retain the 1971 standard for carbon monoxide and also to continue not to have a secondary standard.<sup>169</sup> Again, one of the arguments was that the EPA had "ignored" the advice of CASAC but the court found that because CASAC's "recommendation permitted the option of retaining the current primary standards, it cannot be said that EPA departed from the Committee's recommendations."<sup>170</sup>

These Era 3 opinions stand in contrast to the sense of drift that preoccupies the courts in Era 2. While some judicial panels deciding cases during this last phase engage more deeply and vigorously with scientific challenges than other panels,<sup>171</sup> the case law as a whole suggests a new-found ability of the courts to consider esoteric challenges to science on the merits using the agency's own analytical yardsticks.

### III. Implications for Science and the Law

Rather than a "shotgun wedding" between law and science or an overzealous judge playing amateur scientist,<sup>172</sup> our study reveals the possibility of a much more constructive institutional relationship between law and science in the NAAQS process. Generalist courts presiding over expert battles—at least when operating at their best—may actually improve the rigor of science-intensive decisions by insisting on agency-generated yardsticks while in turn benefitting from those improved yardsticks in reviewing agency action. The symbiosis we uncover does not necessarily suggest judicial review is, on balance, a net positive within the larger administrative law landscape, even for the EPA's NAAQS-setting process; perhaps the Agency's advances would have occurred without the courts or may have been even more expeditious or complete if judicial review were removed from the Agency's external constraints, for example. Yet our findings do suggest a more positive contribution of judicial review to an area of agency practice—the integration of science into regulation—where the prevailing view has been that the courts are likely to do more harm than

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(quoting *Am. Farm Bureau Fed'n v. EPA*, 559 F.3d 512, 530 (D.C. Cir. 2009) (per curiam)).

168. 748 F.3d 333 (D.C. Cir. 2014).

169. *Id.* at 336–37.

170. *Id.* at 337.

171. For example, the opinion affirming the EPA's rule in *Nat'l Env'tl. Dev. Ass'n's Clean Air Project v. EPA*, 686 F.3d 803, 809–13 (D.C. Cir. 2012), involves a much less intensive (and impressive) engagement of the court with the underlying technical issues. The opinion, viewed in isolation, is more characteristic of Era 2 judicial review than Era 3 because of the court's hands-off and generally superficial (if not incoherent) treatment of the scientific challenges at issue.

172. *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 601 (1993) (Rehnquist, C.J., concurring in part and dissenting in part) (questioning the authority of judges "to become amateur scientists" when determining the admissibility of expert testimony); Davis, *supra* note 6, at 68 (arguing that forcing agencies "to resolve scientific questions to which the scientific community has only incomplete answers" results in a "shotgun wedding" of law and science).

good. In this final Part we highlight three more specific implications of our study for science and law studies in general and administrative law in particular.

A. *Multifaceted Partnership*

Science-intensive rules involve science and policy questions that are inextricably linked and—precisely because of that feature—elude conventional methods for ensuring institutional accountability.<sup>173</sup> Complex scientific analyses may conceal deceptive, ends-oriented decisions that have been camouflaged from public view under scientific rhetoric and other devices.<sup>174</sup> Or conversely, science-intensive regulatory decisions may be opaque to the public precisely because they are complex, even though they can carry significant public implications.<sup>175</sup> Both types of slippages underscore the need for accountability that engages meaningfully in all aspects of the decision, including agency explanations that purport to be based on science.

In the judicial review of NAAQS, we believe that the EPA and courts, working in parallel, ultimately developed an institutional approach capable of overcoming these accountability challenges endemic in science policy. Specifically, in reviewing the Agency's scientific analysis in the NAAQS decisions, the courts prodded the EPA to be more coherent in its decision process. The EPA, over time, formulated more rigorous analytical methods or yardsticks as well as an articulated epistemic framework within which to implement these methods. The court then used these methods as the basis for reviewing challenges in future cases.<sup>176</sup> Currently, the courts may even be engaging in a hard look at agency decisions, but that hard look focuses

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173. JASANOFF, *supra* note 53, at 7–8 (explaining how science may not provide concrete answers to the questions posed by regulators and leaves space for discretion based on the regulator's judgment, but that even better science does not always lead to reductions in policy conflicts).

174. *See generally* THOMAS O. MCGARITY & WENDY E. WAGNER, BENDING SCIENCE: HOW SPECIAL INTERESTS CORRUPT PUBLIC HEALTH RESEARCH 2 (2008) (arguing that the problem of bending science has spread from courts and legislatures to the scientific community itself, as well as illustrating the ways in which “outside advocates can corrupt [and distort] legitimate scientific processes”).

175. WENDY WAGNER, SCIENCE IN REGULATION: A STUDY OF AGENCY DECISIONMAKING APPROACHES 12 (2013) (positing that it may be difficult for the nonscientific public to understand “where the science leaves off and the policy choices begin”). *See also* 1 NAT'L SCI. BD., SCIENCE AND ENGINEERING INDICATORS 2004, at 7-3, 7-15 to -17 (2004) (reporting low levels of basic scientific knowledge among Americans and the difficulty of meaningfully communicating scientific concepts to the public).

176. The positive role that a rigorous agency analytical process plays with respect to judicial review is similar to a proposal made by Professor Elliott in 2003 for modifying judicial review to take better account of the agency's decision process in reviewing agency rules, including the role and views of agency scientists on the final proposal. Elliott, *supra* note 137, at 51 (proposing that courts should consider “whether the particular decision is grounded on science or policy” and should not “ignore the debates between [scientists and politicians] that go on inside agencies”).

not on reviewing substantive agency judgments but rather on ensuring the agencies' fidelity to a rigorous, analytical, staged decision-making process that the agency itself produced.<sup>177</sup>

The strength of this apparent institutional teamwork was in fact foreshadowed at the very beginning—in the 1970s—by Judge Leventhal and Judge Bazelon, the bookends on judicial review of agency science. Judge Bazelon proposed that “[w]hen administrators provide a framework for principled decision-making, the result will be to diminish the importance of judicial review by enhancing the integrity of the administrative process, and to improve the quality of judicial review in those cases where judicial review is sought.”<sup>178</sup> Judge Leventhal conceived of the courts' role in administrative process to be one of institutional collaborator rather than simply judicial policing, with the resultant judicial “review combining effective supervision, judicial restraint and administrative flexibility.”<sup>179</sup> Our analysis shows that this codependant partnership imagined by both judges may be emerging in the courts' review of the EPA's NAAQS, which is marked by both inside-out and outside-in accountability processes.

From the standpoint of administrative law, the courts' role in judicial review of science policy is a multifaceted one that involves resolving questions of procedure, substance, and statutory interpretation using a variety of different metrics. As a result, efforts to isolate an underlying test that captures the courts' review of reviewing scientific challenges—such as superdeference, translator, or other models—miss the apparent dynamism occurring in the course of judicial review.<sup>180</sup>

Even more importantly, the evidence of a court–agency partnership, at least in the NAAQS cases, hinges at bottom on the agency's development of meaningful yardsticks by which administrative decision makers can be held to account. Just as Professor Davies's model underscores the critical step of articulating standards for judging,<sup>181</sup> so the NAAQS case study reveals that it was only when the more elaborate analytical yardsticks emerged from the EPA that the more constructive relationship between the agency and the court began to bear fruit. In the eras that preceded these

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177. See *supra* section II(C)(3). Professor Emily Hammond Meazell also reaches this conclusion. See Meazell, *supra* note 7, at 772–74.

178. *Ethyl Corp. v. EPA*, 541 F.2d 1, 67 (D.C. Cir. 1976) (Bazelon, C.J., concurring) (quoting *Env'tl. Def. Fund, Inc. v. Ruckelshaus*, 439 F.2d 584, 598 (D.C. Cir. 1971) (Bazelon, C.J.)).

179. Leventhal, *supra* note 30, at 540. See also *Kennecott Copper Corp. v. EPA*, 462 F.2d 846, 848–49 (D.C. Cir. 1972) (Leventhal, J.) (reiterating the “partnership” between courts and agencies); *Greater Bos. Television Corp. v. FCC*, 444 F.2d 841, 851–52 (D.C. Cir. 1970) (Leventhal, J.) (stressing the collaborative partnership of courts and agencies in the furtherance of the public interest).

180. This is well illustrated by the struggles we had in our earlier approaches to empirically charting the case law.

181. See *supra* notes 14–17 and accompanying text.

yardsticks, confusion and incoherence in the case law overshadowed the possibility of an underlying collaborative partnership.

Extrapolating our findings beyond the confines of administrative law, we believe that one predictor of a productive relationship between science and law—at least when lay decision makers are asked to resolve battles of the experts—is the articulation of analytical yardsticks that are developed by those experts who are charged with integrating scientific information into their decisions. Regardless of how those yardsticks may be deployed—and we expect that would vary considerably in different settings—our study suggests that without them, the relationship between generalist decision makers and expert analysts is likely to flounder.<sup>182</sup> Our study also suggests, albeit more preliminarily, that the legal system in isolation may not be successful in producing meaningful standards for reviewing science on its own; most emerge from those staff working at the coalface of science policy.

#### *B. The Court–Agency Partnership in a Wider Scientific Context*

Perhaps of even greater interest to science-law studies is the fact that although we have described judicial review of the ambient air standards as a partnership between courts and agencies, a third partner in these transactions is the greater scientific community. In the NAAQS process, the EPA serves as a mediator between the court and the scientific views of this community, its phalanx of scientists and lawyers coordinating a view of scientific robustness to satisfy the two domains of science and law. At each of four analytical steps of its revised NAAQS process, the EPA not only solicits public comment (which includes scientists as members of the public or working for affected groups) but also solicits iterative review from its independent science advisors housed in CASAC.<sup>183</sup> Beyond that, the EPA relies on independent scientists to help it write its review of the scientific literature and develop its scoping plan.<sup>184</sup> The EPA even retains the scientific convention of attribution and authorship in each of its regulatory reports—listing by name and contribution individual scientists inside and outside the agency as well as those scientists, by name, who provided peer review or other input.<sup>185</sup>

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182. This conclusion is consistent with our conclusion in an earlier article that the making visible of inference methods is an important step in ensuring accountable decisions. See our earlier arguments in Pasky Pascual, Wendy Wagner & Elizabeth Fisher, *Making Method Visible: Improving the Quality of Science-Based Regulation*, 2 MICH. J. ENVTL. & ADMIN. L. 429, 470–71 (2013).

183. See NAAQS MEMO, *supra* note 32, at 6–8 (detailing the NAAQS review process and highlighting the steps where public and scientific comments are solicited); *supra* Figure 1.

184. *E.g.*, WAGNER, *supra* note 175, at 40–47 (discussing the EPA’s use of the Science Advisory Panel and equivalent peer-review bodies in its review of pesticide registrations).

185. *E.g.*, *id.* at 36, 45.

Thus, while the scientific practices occurring within the Agency have a distinctly regulatory science nature,<sup>186</sup> they are not operating in isolation from scientific norms operating in the wider scientific community. Indeed, the process ultimately developed by the EPA was authored by agency scientists and in and of itself was subjected to CASAC and public review.<sup>187</sup> Perhaps because it is so interlinked in design and in operation with a diverse set of scientists from multiple disciplines and institutions, the process is touted in National Academies of Sciences reports as the exemplar for science-policy decision making.<sup>188</sup>

Ultimately, this hard-wired relationship between the Agency's internally generated yardsticks and input and scrutiny from a diverse set of scientists may be among the most important findings of all. The NAAQS yardsticks for science-policy decision making work precisely because they are embedded in a larger scientific culture.<sup>189</sup> And this vital feature may also explain why the Agency's internally generated yardsticks appear to have been accepted by the courts. Indeed, perhaps the judicial acceptance of Agency-recommended yardsticks would not have been so seamless if the Agency had developed their own internal logics without any evidence of their underlying scientific viability or scientific or public acceptance.

### C. *The Court–Agency Partnership Within the Larger Political World*

Just as the court–agency partnership can serve to mediate the larger scientific community throughout the agency's process, so too can this process help mediate the role of politics in the course of a science-intensive decision process.<sup>190</sup> In fact, both of the remands during Era 3 occurred

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186. JASANOFF, *supra* note 53, at 93–95 (discussing the EPA's need for experts who are "science statesmen" with "the deepest understanding of regulatory science, especially in the context of the EPA's own extremely complex research and policy agenda").

187. The stages of the NAAQS reform, including public and CASAC review (and revisions based on that input), are detailed with links to each document on the EPA's website. U.S. ENVTL. PROT. AGENCY, *supra* note 34.

188. *E.g.*, NAT'L RESEARCH COUNCIL OF THE NAT'L ACADS., REVIEW OF THE ENVIRONMENTAL PROTECTION AGENCY'S DRAFT IRIS ASSESSMENT OF FORMALDEHYDE 156 (2011) (discussing the importance of systematic, comprehensive, evidence-based reviews in public-health decision making). *See also* WAGNER, *supra* note 175, at 29 (describing the NAAQS process as "exemplary").

189. Such a finding also underscores the dangers embodied in congressional gestures, such as a recent bill passed by the House, that limit the ability of independent scientists to serve on science advisory boards for the EPA. Cristina Marcos, *House Passes Bill to Reform EPA Science Panel*, HILL, Nov. 18, 2014, <http://thehill.com/blogs/floor-action/house/224615-house-passes-bill-to-reform-epa-science-panel>, archived at <http://perma.cc/RYK9-ZU2L>. While conflicts of interest are important to manage, excluding scientists from serving as science advisors simply because they have done work on an issue moves in precisely the opposite direction from features of the NAAQS process that make it particularly successful.

190. In their essay on *Massachusetts v. EPA*, 549 U.S. 497 (2007), Professors Freeman and Vermeule identify a line of cases that they attribute to the courts' impatience with "executive override of expert judgments" in ways that "appear to disregard established professional or

because the EPA did not explain its decision within the context of the analytical yardsticks, and the EPA's failure in this regard occurred because of eleventh-hour political intervention—in one case by the EPA Administrator<sup>191</sup> and in another coming from the White House Office of Information and Regulatory Affairs.<sup>192</sup> In remanding the EPA's standards, neither opinion references these politically motivated interventions into the decision process, even though the briefs were replete with suggestions and in some cases documentation of it.<sup>193</sup> The court's opinions in both cases rest instead on the much more comfortable judicial conclusion that the Agency's ultimate explanation for its challenged standard lacked support when set against the yardsticks and larger record.<sup>194</sup>

In contrast, in at least one earlier Era 2 case—*API*, decided in 1981—the court acknowledged petitioners' arguments that eleventh-hour political interventions in the EPA's standard process by the White House were partly to blame for some of the procedural irregularities and scientific problems alleged in its standard setting.<sup>195</sup> Yet perhaps in part because the court lacked yardsticks to determine the importance of these irregularities, the court affirmed the Agency's standard nonetheless.<sup>196</sup>

Based on these snapshots emerging in the cases, it appears that one motivation for developing yardsticks and disciplining internal processes may arise from agency staff's own efforts to ensure the outcomes of the regulatory process in fact carry the imprimatur of an accountable public process that is not compromised by invisible political tinkering. Seen in this way, agency staff may develop robust yardsticks not only to survive judicial review, but also to make it easier for the courts to identify and remand a standard when the process is compromised. In such a case, moreover, only an external process like judicial review can identify and

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bureaucratic practices and procedures." Jody Freeman & Adrian Vermeule, *Massachusetts v. EPA: From Politics to Expertise*, 2007 SUP. CT. REV. 51, 93–94.

191. *Am. Farm Bureau Fed'n v. EPA*, 559 F.3d 512, 520 (D.C. Cir. 2009) (per curiam) (finding the EPA's explanation of the choice of standard insufficient in view of risks flagged by CASAC).

192. *Mississippi v. EPA*, 744 F.3d 1334, 1362 (D.C. Cir. 2013) (remanding EPA's secondary NAAQS for reconsideration because the EPA did not provide adequate explanation).

193. *E.g.*, Final Opening Brief of State Petitioners and State Amici at 16, *Am. Farm Bureau Fed'n v. EPA*, 559 F.3d 512 (D.C. Cir. 2009) (No. 06-1410), 2008 WL 2609199, at \*16 (arguing that the Administrator "erroneously disregarded epidemiological studies that both CASAC and EPA staff concluded were relevant"); Opening Brief of American Lung Association, Environmental Defense, and National Parks Conservation Association at 12, *Am. Farm Bureau Fed'n v. EPA*, 559 F.3d 512 (D.C. Cir. 2009) (No. 06-1410), 2008 WL 2556682, at \*12–13 (repeatedly documenting how EPA ignored the record, the Staff Papers, and CASAC in setting the PM10 standard).

194. *See supra* section II(C)(3).

195. *Am. Petroleum Inst. v. Costle*, 665 F.2d 1176, 1187 (D.C. Cir. 1981).

196. *Id.* at 1192 (affirming the EPA's standards while noting their production was "not a model of regulatory action").



reprimand these covert political interventions; the agency's own internal mechanisms are likely to prove too weak.

Our last science and law finding drawn from the NAAQS process thus posits that when the science-policy decisions involve high-stakes participants, the need for external oversight of a rigorous, science-policy deliberative process is likely of critical import. While the form that oversight takes is up for debate, the fact that there is some external forum to referee disputes outside the confines of the professionalized and deliberative decision making may be vital to preserve the integrity of the science-intensive decision making, which could be very much under attack from high-stakes interests and powerful political actors. Ensuring some form of external oversight will thus not only help bolster the legitimacy of the process when things run well, but will help spotlight and potentially (but not necessarily) deter problems when the process is corrupted. With respect to administrative law more specifically, this finding also suggests that inside-out accountability mechanisms may not be sustainable in the long term without some method of external or outside-in check on that professionalized analysis, even when they are developed in ways that are responsive to input from the larger public.

### Conclusion

In answering the question, “What does and should a reviewing court do when it considers a challenge to technical administrative decision-making?”<sup>197</sup> there has been a tendency on the part of lawyers and legal scholars to understand it as a legal riddle, resolvable through the coherent application of a specific judicial-review doctrine. This Article has shown the misguided nature of this approach. Not only is such review multifaceted, but it cannot be fostered without the development of analytical yardsticks by expert agencies that in turn draw on the wider and diverse scientific and public communities. Through this larger collaborative effort, the agency develops analytical yardsticks—methods governing their decision—that not only discipline and enhance internal processes but also provide the court with a structure against which to judge agency decisions. The judging is not done by deploying legal tests for “what is science” or “is this science good,” but rather by internalizing the agency's own publicly vetted yardsticks governing its analytical process.

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197. *Ethyl Corp. v. EPA*, 541 F.2d 1, 68 (D.C. Cir. 1976) (Leventhal, J., concurring).