Informed Judicial Decisionmaking: A Suggestion for a Judicial Office for Understanding Science and Technology

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INTRODUCTION

In the past few years, Congress has passed several acts that greatly increase federal agencies' responsibility for protecting public health and the environment.[1] Under these new mandates, agency rules and orders that involve complex scientific issues have proliferated, as have petitions for judicial review of these agency actions. The federal courts are being called upon more frequently to review issues of unresolved complex scientific or technological controversies at the forefront of scientific knowledge.[2] Most federal judges lack the expertise to understand and evaluate these unfamiliar technical arguments.[3] However, to ac-

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1. *See, e.g.*, Clean Air Act Amendments of 1970, Pub L. No. 91-604, 84 Stat. 1676 (1970); Occupational Safety and Health Act of 1970, Pub. L. No. 91-596, 84 Stat. 1590 (1970); Federal Water Pollution Control Act Amendments of 1972, Pub. L. No. 92-500, 86 Stat. 816 (1972); Toxic Substances Control Act, Pub. L. No. 94-469, 90 Stat. 2003 (1976).

2. Jasanoff & Nelkin, *Science, Technology and the Limits of Judicial Competence*, 214 SCIENCE 1211 (1981); *see, e.g.*, American Textile Mfg. v. Donovan, 452 U.S. 490 (1981). While courts are now involved in more matters involving science, Judge Leventhal, taking a broader view, noted that all judicial review of agency decisionmaking involves the court in technical matters within each agency's sphere of expertise. Leventhal, *Environmental Decisionmaking and the Role of the Courts*, 122 PA. L. REV. 509, 511 (1974). This observation suggests that useful insights for the judicial treatment of scientific controversies might be derived from an analysis of the judicial treatment of issues involving other specialized knowledge such as economics. However, such an analysis is not performed here.

3. Before courts reviewing agency action can engage in their traditional role of applying the law to the facts, they must first determine whether the agency acted reasonably in deciding which expert opinions to believe. While the sifting of contradictory evidence is not new to courts, such evidence has usually involved common human experience. Scien-

curately[4] review the issues, the federal courts cannot simply ignore scientific evidence, or exclude it until the scientific controversies have been resolved. Thus, there is a gap between what federal courts reviewing agency action should do and what they can do.

The difficulties in achieving accurate judicial review of scientific questions are exacerbated by the behavior of the typical antagonists: the regulated industries with an economic stake and the so-called public interest groups which view the court as their forum of last resort. The industry usually contends that regulations are too stringent and not supported by scientific evidence; the public interest group contends that regulations are too lenient and are based on underestimates of risks. Each side seeks out the experts with the most extreme opinions to support their views. Usually, although neither side can point to unequivocal technical evidence that conclusively supports its position, neither side is willing to acknowledge the limitations in its position. The parties' failure to help the court understand scientific issues suggests that the existing judicial review procedures are imperfect.[5]

This article proposes a modification to the existing process of judicial review of agency decisions. The proposed modification should improve the accuracy of review of those agency actions that affect the public health or the environment, and that are based upon uncertain or controversial scientific conclusions. Section I of this article argues that substantive judicial review of

tific controversy, however, is beyond ordinary experience or even well-educated understanding.

In his article *High Technology and the Courts: Nuclear Power and the Need for Institutional Reform*, 94 HARV. L. REV. 489, 494-95 (1981), Professor Yellin argues that the inherently hybrid legal and technical character of environmental controversies requires that environmental decisions be overseen by an institution competent to understand and evaluate the technical issues as well as the legal ones.

4. Accuracy in this context means consistent with established scientific principles and their applications. Where the applications are not generally accepted, the limits imposed on decisionmaking by uncertainty must be considered. Accuracy does not mean "rightness" because, by definition, rightness cannot be determined in an unresolved scientific controversy.

5. The adversarial process itself has been criticized as inappropriate for environmental decisionmaking. For example, Judge Wright has suggested that agency adjudications of environmental issues lead to decisions inferior to those derived from agency rulemaking, which provides an opportunity for a clearer development of agency policy. Wright, *The Courts and the Rulemaking Process: The Limits of Judicial Review*, 59 CORNELL L. REV. 375 (1974). Also, Professor Yellin has argued that the adversary process detracts from the substantive quality of environmental decisions. *See* Yellin, *supra* note 3, at 507-08.

agency action is unavoidable. Section II describes deficiencies in the existing process of judicial review of agency decisions on unresolved scientific controversies. Section III discusses modifications to the existing procedures that have been suggested by commentators and judges. Section IV then describes the proposed Judicial Office for Understanding Science and Technology ("JOUST"). JOUST would be a two-tiered organization comprised of a large group of technical experts able to review and summarize technical material in the records of agency proceedings, and a small group of lawyer-scientists who could communicate with both judges and technical experts. JOUST would provide the technical support services essential to accurate judicial review of agency action in a manner usable by judges.

I. Unavoidability of Substantive Review

The Administrative Procedure Act determines the scope of judicial review of federal agency decisions in rulemaking and adjudication, unless the organic statute provides otherwise.[6] In reviewing formal agency actions, findings and conclusions made "on the record," a court is to set aside those "unsupported by substantial evidence" in the record.[7] In reviewing informal agency actions, findings and conclusions, a court is to set aside only those that are "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law."[8] Both standards of review require judicial deference to agency expertise. The greatest deference is due a decision that is both within an agency's area of expertise and at the frontiers of science.[9] Thus, in reviewing both adjudicatory and rulemaking decisions, courts have a limited role in reviewing technical issues. Courts have applied these highly deferential standards by claiming to eschew any significant review of the substance of an agency's decision, and by focusing instead on whether the agency complied with procedures and considered all relevant factors.[10] However, such an arid analysis does not provide an adequate or intellectually honest basis for decision.

6. 5 U.S.C. § 706 (1982).

7. *Id.* § 706(2)(E); *see* Davis, *Administrative Law Treatise* § 29.00-1 at 520.

8. 5 U.S.C. § 706(2)(A) (1982); *see* Davis, *supra* note 7.

9. Baltimore Gas & Electric Co. v. NRDC, — U.S. —, 103 S. Ct. 2246, 2256 (1983).

10. In Citizens to Preserve Overton Park v. Volpe, 401 U.S. 402 (1971), the Supreme Court instructed courts reviewing agency decisions to make a thorough, probing, in-depth review, to determine whether the agency considered the relevant factors, and whether the

Judicial avoidance of substantive review is irresponsible in view of the courts' influence on agency decisionmaking. As Judge Wald has candidly acknowledged, because judicial oversight of agency policymaking necessarily affects agency policy, judges should know something about the subject matter of the dispute they are called upon to resolve.[11] Judicial decisions provide better guidance to agencies when courts understand the technical issues well enough to convey the implications of their decisions to the professionals in the agencies.[12] The courts shirk their responsibility to oversee agency decisions when they hide behind a lack of technical knowledge to justify a mere procedural review.[13]

II. ASPECTS OF JUDICIAL DECISIONMAKING REQUIRING IMPROVEMENT

Judges and commentators have identified several deficiencies in the existing methods for transferring scientific information from scientists to the courts. The first two of the deficiencies discussed

agency had committed a clear error of judgment. *Id.* at 415-16. These determinations cannot be made solely on review of agency procedures. Rather, the court "must understand enough about the problem confronting the agency to comprehend the meaning of the evidence relied upon and the evidence discarded; the questions addressed by the agency and those bypassed; the choices open to the agency and those made." Ethyl Corp. v. EPA, 541 F.2d 1, 36 (D.C. Cir. 1975), *cert. denied*, 426 U.S. 941 (1976), *quoted in* Lead Industries Ass'n v. EPA, 647 F.2d 1130, 1145 (D.C. Cir. 1980) (per Wright, J.). While *Overton Park* seems to require substantive judicial review, it appears that some federal appellate judges still require no more than an elaborate procedural review. *See, e.g.*, International Harvester Co. v. Ruckelshaus, 478 F.2d 615 (D.C. Cir. 1973) (Bazelon, J., concurring); Industrial Union Dep't, AFL-CIO v. Hodgson, 499 F.2d 467, 474-75 & n.18 (D.C. Cir. 1974); Amoco Oil Co. v. EPA, 501 F.2d 722, 739-40 (D.C. Cir. 1974).

Also, despite the apparent requirement in *Overton Park* that courts go beyond mere procedural review, lower courts seemed to prefer basing their decisions on procedural grounds. For example, in NRDC v. Nuclear Regulatory Commission, 547 F.2d 633 (D.C. Cir. 1976), the court remanded a rulemaking by the Nuclear Regulatory Commission, instructing the Commission to consider whether to import into its rulemaking process the more formal *procedure* suitable to adjudication. The court's stated purpose was to improve the quality of it decisionmaking without steeping itself in technical matters by assuring itself that the agency had fully considered the issue—that it had followed appropriate *procedures*. *Id.* at 657. However, a review of the opinion suggests that in fact the court remanded because it was not convinced by the expert testimony relied on by the Commission. *Id.* at 653. This extreme attempt to rely on procedures was reversed by the Supreme Court in Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519 (1978).

11. Wald, *Making Informed Decisions on the District of Columbia Circuit*, 50 GEO. WASH. L. REV. 135, 140 n.36 (1982).

12. Leventhal, *supra* note 2, at 541.

13. Professor Yellin has argued that purely procedural judicial review vitiates the usefulness of external oversight because it permits agencies to evade judicial scrutiny by basing their decisions on technical grounds. Yellin, *supra* note 3, at 553.

here are to be expected in a system where parties who do not have equal resources are adversaries; the second two are to be expected where judges are trained as generalists. However, these deficiencies are not inevitable. Each can be ameliorated by providing usable technical assistance to judges.

A. *Analysis of the Record*

It is assumed that each party in an appellate proceeding will do its utmost to extract from the record all support for its position. However, experience has shown that agencies whose rules are being reviewed do not always have the time or resources to effectively marshal the contents of the record to the reviewing court.[14] Occasionally a court has filled in for the agency to comb the record for material which supported and thereby "saved" a technical rule on review.[15] But clearly, courts have neither the time nor expertise to undertake such massive record searches on a regular basis. Moreover, a lay judge's search of the record will not be as effective as a search by a scientifically-trained eye. Thus, providing a court with the ability to digest a massive record quickly would improve the quality of substantive review.

B. *Disclosure of Uncertainties*

Appellate arguments are presented by lawyers who themselves may not fully appreciate the finer points of the technical controversy or who, because they are advocates, may not qualify or otherwise acknowledge the limitations on their side of the argument.[16] A similar problem arises when the agency proceeding is skewed by an unbalanced presentation of technical information. A lawyer is under no obligation to present expert opinion contrary to his client's position and, in many proceedings, intervenors do not have the financial resources to obtain the quantity and quality of expert opinions necessary to successfully rebut the expert testimony entered into the record by large corporations and trade associations. The reviewing court is then faced with an incomplete record, which frustrates consideration of all relevant scientific knowledge.[17]

14. *See* Wald, *supra* note 11, at 147.

15. *See, e.g.*, Sierra Club v. Costle, 657 F.2d 298 (D.C. Cir. 1981).

16. *See* Wald, *supra* note 11, at 147 & n.53.

17. *See* Wright, *supra* note 5, at 376. Such manipulations of the record lead to unfair results because adjudications are fair only if the facts are accurately found. *Id.* at 379. In

A separate problem arises when an agency is aware of conflicting evidence, but glosses over the existence of scientific uncertainty. Judge Bazelon has repeatedly stressed that an agency has a duty to publicly disclose scientific uncertainties if its decisions are to survive judicial review.[18] He recognizes that agencies are often loathe to disclose uncertainties because of the potential adverse effects, such as the public's loss of confidence in the basis of the agency's decisions.[19] He is apparently confident that an experienced court can detect agency attempts to hide uncertainty in quasi-scientific jargon.[20] But Judge Bazelon offers no mechanism for ensuring that a reviewing court will correctly discover an agency's attempt to conceal scientific uncertainty. Such a mechanism is crucial to the effectiveness of a court's scrutiny of an agency's decision.

An accurate assessment of the extent of scientific uncertainty is crucial to a court's accurate review of cases involving unresolved scientific controversies. Only by first identifying where an agency has had no choice but to proceed by assumption or policy choice can a reviewing court determine whether the agency has acted reasonably under the circumstances. Thus, courts need the capability to identify areas of scientific uncertainty and explain how the agency perceived and reacted to this uncertainty in reaching its decision.

C. *Understanding Technical Details*

Technical controversy is frequently so far beyond the scope of any judge's training that it must be oversimplified to be understood. If issues are not oversimplified, judges must to some degree understand "arcane and technical details" before they can

Friends of the Earth v. United States Atomic Energy Commission, 485 F.2d 1031 (D.C. Cir. 1973), the court stated that because it lacked the technical competence to delve into the record, the agency had to provide the framework for the clash of expert views. To achieve that end, the agency was urged to consider seeking out opposing experts views to ensure that any scientific debate is not dominated by those with the economic resources to provide access to technical resources.

18. *See, e.g.*, Bazelon, *The Judiciary: What Role in Health Improvement?*, 211 SCIENCE 792 (1981).

19. Bazelon, Statement Delivered at Workshop on Impacts of Neuroscience, Office of Technology Assessment (July 27, 1983).

20. *See id.*

render accurate decisions.[21] Yet, oversimplification is undesirable because it increases the likelihood of error.

For example, a court's decision on an agency's approval of a proposal to spray potatoes with a newly-created organism would directly affect public health and the quality of the environment. To understand the potential health and environmental effects, a court would need to plunge into mathematical models and statistical data supporting arguments over whether the organism is harmful or could become harmful after release into the environment.[22]

Some of the information that judges need can be obtained from publicly available books and articles.[23] But premiums on judicial time render such self-education unreasonable. Clearly, a system that makes experts available to judges within the constraints of the *ex parte* rule would help fill the need for judicial comprehension of technical information.[24]

21. Wald, *supra* note 11, at 136.

22. Of course, a court would avoid such details if it takes a narrower view of its role and limits itself to a procedural review and determines only whether an agency carefully considered opposing points of view. Such a court would defer to agency judgment on whether an organism is harmful. *See supra* section I for argument against purely procedural review.

23. Wald, *supra* note 11, at 148.

24. *Id.* Due process, statutory provisions and judicial ethics limit the extent to which judges may receive information from outside the record. *See, e.g.*, United States v. Sciuto, 531 F.2d 842 (7th Cir. 1976); 28 U.S.C. § 455(b)(1) (1982) ("[Any judge] shall also disqualify himself—(1) where he has . . . personal knowledge of disputed evidentiary facts concerning the proceeding."); A.B.A. Code of Judicial Conduct Canon 3(A)(4) ("A judge should . . . neither initiate nor consider *ex parte* or other communications concerning a pending or impending proceeding.").

The type of *ex parte* contacts which are of concern here are direct communications, either oral or written, by experts who are not connected with the parties to a proceeding, but who have been asked to respond to specific inquiries regarding matters at issue in that proceeding. Such contacts are forbidden because they create the appearance of bias or prejudice or may actually result in bias or prejudice. *See, e.g.*, United States v. Sciuto, 531 F.2d 842 (7th Cir. 1976) (an *ex parte* communication in the form of a report by a probation officer was found to contain information prejudicial to an unbiased decision on whether to revoke parole); *cf.* United States v. Reserve Mining Co., 380 F. Supp. 11, 18 (D. Minn. 1974), *modified on other grounds*, 514 F.2d 492 (8th Cir. 1975) (trial court apparently eliminated any *ex parte* problems associated with the use of court-appointed experts by circulating their views to the parties for comments).

As Judge Wald points out, *supra* note 11, at 148, the *ex parte* constraints are somewhat inconsistent because they permit judges to seek out supplemental information not generated in response to a specific inquiry. Thus, Judge Wald properly pored over twelve books from the Library of Congress to try to understand how a hydroelectric dam works, but could not speak for five minutes with an uninvolved expert on the same subject. *Id.* Similarly, *ex parte* constraints would not preclude a science clerk from reading the existing liter-

D. *Understanding the Scientific Method*

In making decisions, an agency will accept the positions of some experts and reject the positions of others. Substantive judicial review of agency decisionmaking requires that the court be sufficiently familiar with scientific thought processes to be able to follow and evaluate an agency's analysis.[25] With such familiarity a reviewing court could assume that the agency's factual assertions were correct, and determine simply whether the analysis employed was internally consistent, logical, and a reasonable exercise of scientific judgment. The court would not need to probe deeply into the technical details of an agency's decision.

To perform this limited kind of review, it would be sufficient for a court to obtain general advice on the scientific method employed from anyone trained as a scientist, even one not expert in the technical matters at issue.[26] Thus, law clerks with technical backgrounds, or technical clerks, could provide a judge with advice on the overall coherence of an agency's scientific analysis. Such an arrangement would not violate the *ex parte* constraints. However, some judges have expressed concern that such "kept expertise" could unduly influence judges who would have no basis for questioning a technical clerk's judgment in the same fashion as they question a legal clerk's judgment.[27] Another danger from relying on technical clerks is that judges may tend to rely on the clerks instead of on the parties. Such a result would undermine the foundation of the adversary system.[28] Thus, judges must be able to obtain technical advice without being unduly influenced, or becoming excessively dependent on the advisor.

ature bearing on an issue for decision because a clerk is an extension of the judge's eyes and ears. Thus, a clerk could be asked specifically to learn enough about a subject in order to explain the information in the record on that subject to the judge. A consultant, on the other hand, could not be asked to bring his expertise to bear on a record because his response would have been generated from a specific inquiry.

25. Wald, *supra* note 11, at 145 n.51.

26. Appreciation for the scientific method, like appreciation for the legal method of thought and analysis, cannot be learned in a quick crash course but must be developed through extensive experience. Thus, a judge could not simply take a course on the scientific method and expect to become expert in it any more than a geologist could take a course in the legal method and thereby become expert in it.

27. Wald, *supra* note 11, at 152 & n.81.

28. *Id.* at 152-53.

III. Suggested Modifications

Observers have suggested various methods for improving the accuracy of substantive judicial review. The alternatives range from minor modifications that would enhance the technical competence of the courts to major departures such as using an alternative forum like a science court.

The technical competence of a court could be enhanced by the use of "science clerks" in addition to law clerks.[29] Although such clerks could not be expert in all areas of science and technology that come before the court, they could have sufficient familiarity with the scientific method to be able to follow and evaluate the analytical processes used by the agency in reaching its decision.[30] As discussed earlier, the potential danger of using such clerks is that their mastery of technical material could lead to the clerk's becoming master of the judge in technical matters, thereby unduly influencing the judge's decisions.[31]

A more precisely targeted level of technical expertise could be provided to the court by consultants expert in the particular scientific issues involved in each case.[32] These consultants would be hired by the court on a case-by-case basis. But this alternative may raise *ex parte* problems, as consultants may inadvertently introduce extra-record material.[33]

A more radical departure from traditional review would be to refer scientific issues to a technically-trained special master.[34] This alternative would result in a bifurcated proceeding in which the technical issues are reviewed first. The master's findings would then be used by the court in reveiwing the agency's action. A danger with using special masters at the appellate level is that masters might be tempted to rely on their expertise to second-guess agency decisionmakers.[35] Judges may be unable to detect

29. For example, the Court of Appeals for the Federal Circuit, which incorporated the former Court of Customs and Patent Appeals, has technical assistants who serve all the judges.

30. Wald, *supra* note 11, at 145 n.51.

31. Leventhal, *supra* note 2, at 553; *see supra* notes 27 and 28 and accompanying text.

32. For example, in United States v. Reserve Mining Co., 380 F. Supp. 11 (D. Minn. 1974), an action by the federal government and the State of Minnesota to enjoin the Reserve Mining Company from continuing to discharge taconite tailings into Lake Superior, the court appointed expert witnesses to assist it in the evaluation of scientific testimony regarding the diseases related to asbestos in the taconite tailings.

33. Wald, *supra* note 11, at 148; Leventhal, *supra* note 2, at 551-52. *See supra* note 24.

34. Yellin, *supra* note 3, at 555-56.

35. Leventhal, *supra* note 2, at 518.

such second-guessing. Even if they can, close judicial scrutiny of findings undermines the original purpose of using special masters—to eliminate the need for judges to consider technical issues in detail.

An extreme version of this approach is the use of a science court to resolve technical issues that affect a large number of cases.[36] Judge Leventhal has suggested that special interest groups would subject such special courts to intense pressure that would result in politicization of the choice of judges.[37] This criticism, however, hardly appears unique to special courts, nor has it operated to diminish the effectiveness of special courts like the Tax Court. However, the promoters of a science court have not been able to disassociate it from the frightening prospect of "official science" like Lysenkoism in the Soviet Union or the Catholic Church's repudiation of Galileo.

Unfortunately, there appears to be an inadequate data base to assess the efficacy of these alternatives.[38]

IV. A MODEST PROPOSAL

Any proposal to improve judicial review of agency decisions on scientific issues must take into account judges' general lack of scientific training. Proposals that increase judicial access to technical advisors such as science clerks and consultants may not lead judges to additional understanding of technical issues. Nor does the mere availability of technical expertise enhance a judge's ability to communicate to the technically-trained personnel the aspects of an agency's decision which are of interest to the court.

36. The concept of a science court has received substantial consideration. *See, e.g.*, Proceedings of the Colloquium on the Science Court, held at Leesburg, Va. on September 19, 1976, U.S. Dep't of Commerce, National Technical Information Service, PB-261, 305 (1977); Martin, *Procedures for Decisionmaking Under Condition of Scientific Uncertainty: The Science Court Proposal*, 16 HARV. J. ON LEGIS. 443 (1979). Essentially, while a science court would be convened to address a scientific issue raised in a particular case, once the science court had spoken to that issue its views would be referred to in any other case involving that issue.

37. Leventhal, *supra* note 2, at 517.

38. One potential source for such data is the adjudicatory proceedings before the technical agencies. For example, on occasion, the Nuclear Regulatory Commission, in determining whether to review an inferior board's decision, has heard from experts within the constraints of the *ex parte* rule as applied to formal agency adjudications. In re Public Service Co. of New Hampshire, 12 NRC 295, 296 (1980) (CLI-80-33) (Seabrook Station, Units 1 and 2). However, the Commission did not indicate whether it found helpful the presentations by the experts.

Technical assistance may be ineffective if the gap between courts and scientists cannot be bridged.

A human bridge between courts and scientists could be created by establishing a Judicial Office for Understanding Science and Technology ("JOUST"). Just as the executive branch has the Office of Science and Technology Policy,[39] and Congress has the Office of Technology Assessment,[40] the judiciary would have JOUST to aid the courts in reviewing technically-oriented cases. JOUST would be a two-tier organization comprised of a cadre of individuals trained in both law and science or technology,[41] and a group of technical experts. The cadre of lawyer-scientists, or "legal-scientific facilitators"[42] would act as two-way translators between the courts and JOUST's technical experts. A court would not rely on the facilitators for either legal or technical expertise, but rather for their ability to understand both lawyers and scientists. The court could communicate with these individuals by using familiar legal terms to explain the significance of the technical information it required. For example, the court could explain that it required an analysis of the record on the issues of whether a particular technical decision was supported by substantial evidence and whether a particular technical finding was properly determined to be legally immaterial. The facilitators would turn to the appropriate experts and, in precise terms, explain exactly what technical information in the record is sought. Once that information was obtained from the technical experts, the facilitators would return to the court with the information digested in the form most usable by the judges.

39. The Office of Science and Technology Policy is part of the Executive Office of the President. 42 U.S.C. § 6611 (1982). It provides the President with scientific, engineering and technical analyses and judgments on major plans, policies and programs of the federal government.

40. 2 U.S.C. § 472(a) (1982). The Office of Technology Assessment helps Congress anticipate and plan for the consequences of the uses of technology. It provides information about the impacts of technological applications and identifies policy alternatives for technology-related issues. *Id.* § 472(c).

41. Such individuals appear to be what Judge Leventhal had in mind when he stated that the court needed help from individuals who were hybrids between special masters and scientific law clerks. Leventhal, *supra* note 2, at 550.

42. Judge Wald suggested this characterization of the dually-trained individuals. Letter from Judge Wald, Court of Appeals for the District of Columbia Circuit, dated November 15, 1984.

A. *JOUST's Tasks*

Upon request by a federal appellate judge, JOUST's members would prepare technical memoranda just as law clerks prepare legal memoranda. These memoranda would not only summarize the state of science at issue as revealed by the record, but would also focus on the potential trouble areas such as an agency's attempt to sidestep uncertainties, failure to deal with unfavorable evidence in the record or failure to marshal the evidence in the record adequately to support its case.[43]

After reading the briefs and technical memoranda, the court could request JOUST to address remaining difficulties the judges might have with the arguments and record. By the time of oral argument, the court should have developed a feel for the technical as well as the legal issues that require probing. Of course, problems may remain after argument and a post-argument supplement, like a post-argument legal memorandum, may be deemed necessary.[44] But early involvement of an office like JOUST would reduce significantly the number of instances in which such an extraordinary measure would be required.

Thus, through technical memoranda and conferences with judges, JOUST would: (1) characterize the nature of the controversy as presented on the record; (2) extract from the record material to provide a tutorial on the central scientific or technical

43. Reliance on the record will usually provide an adequate basis for an accurate decision because the record often contains several scientific papers which include discussions of assumptions and limitations on methodology. In the past, accurate decisions have not been hampered by the lack of such information but, rather, by the advocates' reluctance to present it to the court or just plain failure to appreciate its significance. *See supra* notes 14 & 16 and accompanying text.

44. Judge Wald has proposed a modest modification to the court's review procedures. She suggested that the court's review of the substance of the agency decisionmaking could be improved by a post-argument dialogue which would help the court understand the technical issues in a case. Wald, *supra* note 11 at 153. This appears to be an oral version of Judge Leventhal's proposal for post-argument supplementation by counsel after oral argument. Leventhal, *supra* note 2, at 545-46. Such a dialogue would give the parties an opportunity to explain and analyze those parts of the record troubling to the court but not adequately addressed in the parties' briefs. While such a dialogue could be initiated before argument, it has been Judge Wald's experience that difficulties with the technical aspects of a case often arise in the course of decision writing. Wald, *supra* note 11, at 153. Thus, Judge Wald would seek parties' help at an earlier stage than would Judge Leventhal who proposed that the parties be asked to comment on the technical accuracy of draft opinions. Leventhal, *supra* note 2, at 546. While this experience cannot be gainsaid, it appears that oral argument itself can be made more fruitful if judges are apprised beforehand of the technical as well as the legal issues. To the extent that technical issues can be resolved at oral argument, resort to post-argument procedures could be minimized.

matters at issue; (3) analyze the record to identify and summarize the material which supports each party's position; (4) review the record for scientific uncertainties unavoidable to the decision; (5) summarize the opposing opinions presented in the record on those uncertainties; (6) state whether and how the agency dealt with those uncertainties; (7) describe the logic of agency analysis; (8) determine whether arguments have been based on facially reasonable concepts that an expert recognizes as irrelevant; (9) determine whether the agency's decision reflects a balanced treatment of record material or a reliance on distorting selections; (10) determine whether conclusions are based on unscientific reasoning or standards of proof; (11) complete any calculations or analysis which follow straightforwardly from record material; and (12) provide any material which may be judicially noticed.[45]

B. *Benefits Provided by JOUST*

JOUST's activities would go a long way toward addressing the criticisms of the review process. First, the facilitators could analyze a record efficiently when the parties fail to do so. Second, by providing tutorials and being available for discussions with the judges, the facilitators would be able to help judges understand the technical controversies in a case better than they could by relying on the parties' oversimplifications. Third, the facilitators could give judges a basis for evaluating expert testimony by pinpointing for the judges how the different assumptions made in the record by the different experts led them to their respective conclusions, and how those conclusions would be affected by changes in their assumptions. Fourth, by providing independent summaries and analyses of the records, facilitators would compensate for any advocate's failure to appreciate the finer points of the technical controversy or failure to acknowledge the limits on the arguments in his favor. Attempts to skew a record by padding it with expert opinion on one side of a problem can be counteracted somewhat through judicial notice of significant studies with

45. Fed. R. Evid. 201 permits judicial notice of adjudicative facts that are matters of "common knowledge." As applied to scientific issues, the concept of notice could take into account the expertise of the parties. For example, when a party is an expert agency, "common knowledge" could include seminal works with which the agency could reasonably be expected to be familiar. *See* Ives Laboratories, Inc. v. Darby Drug Co., 638 F.2d 538, 544 n.8 (7th Cir. 1981) (judicial notice under the Federal Rules of Evidence may be taken during an appeal).

which experts in that field could reasonably be expected to be knowledgeable. The facilitators would screen any technical documents proposed by the technical experts for the court's consideration for compliance with the criteria for notice.

The use of dually-trained facilitators would also reduce the problems of undue influence of experts over judges, judical reliance on experts instead of on the parties, and the tendency of experts to second-guess the parties.[46] Although, like the experts, the facilitators would have technical training, their legal training, which would usually have occurred more recently than their technical training, would have created in them an appreciation for the strictures of the legal system. By virtue of their legal training, the facilitators should understand their role as subordinate to the judge's and therefore, consciously attempt to act accordingly. Moreover, their nontechnical positions and lack of recent scientific or technical experience will cause the facilitators to see themselves no longer as experts on the cutting edge of technology but more as scientific or technological generalists. Thus, the facilitators' training and their perception of their role would combine to reduce the tendency to substitute their technical knowledge for that of the parties or the parties' experts. By acting as buffers between the judges and the technical experts, the facilitators would prevent the technical experts from unduly influencing the judges.

Finally, the facilitators would ensure that the technical experts confine themselves to the record by the following procedure. Every statement, clarification or identification of uncertainty by an expert would have to refer to the record. The facilitators would check these citations and determine whether the experts

46. Some readers of earlier drafts of this article have expressed skepticism that JOUST could avoid the danger of experts unduly influencing judges. My belief that this danger can be avoided by interposing dually-trained facilitators between the experts and the courts is based on personal experience at the Nuclear Regulatory Commission.

One of the functions of the five Commissioners is to review the decisions made by their inferior boards, the Atomic Safety and Licensing Board, and the Atomic Safety and Licensing Appeal Board. In reviewing contested technical issues, the Commission relies for technical advice on its Office of Policy Evaluation, which is comprised principally of experts in nuclear technology. The Commission's Office of the General Counsel, which has lawyer-scientists on its staff, acts as an intermediary to ensure that 1) all advice to the Commission is based on the record compiled below; 2) the views of the parties are accurately represented; 3) the technical advice addresses the technical aspects of the legal issues before the Commission; and 4) the Commission's decision is not unduly influenced by the views of its technical advisors.

had accurately reported their contents or had distorted them based on the experts' private knowledge. If the latter were true, the facilitators could ask the experts to review and refine their reports or the facilitators could themselves revise the reports to be consistent with the record. To allay fears of *ex parte* contacts, JOUST's reports to the court could be circulated to the parties for comment.

C. *Administering JOUST*

JOUST would serve the entire federal judiciary. And in this age of electronic mail and picture phones, JOUST could serve the geographically dispersed judicial system from a single office. JOUST could be limited to the facilitators, who would contract for technical services. There should be no trouble finding enough qualified facilitators from among the federal agencies and law firms, especially patent law firms. Alternatively, JOUST could be self-contained with a staff of experts drawn from all the major fields of science and engineering. The case load in the federal courts appears to be more than large enough to keep such a staff active.

To determine whether JOUST would work, and to identify and correct unforeseen difficulties, a pilot program could be tried for a specific area of science or technology. Increasing concern over the disposal of hazardous chemicals suggests that the carcinogenic or teratogenic effects of a family of chemicals would provide suitable issue for a trial run. The key individual would be the lawyer-scientist who could communicate with experts on chemistry, biochemistry, oncology, development, epidemiology and statistics. At the end of a two to three year trial period, judges who used JOUST's services would decide whether JOUST had been helpful. If so, the office could be expanded efficiently by adding persons whose dual training includes the disciplines affecting the greatest number of cases.

Conclusion

There is no doubt that JOUST will require fine tuning before it runs smoothly. But, as the number of cases involving unresolved scientific controversy increases, a mechanism must be created to address the existing system's inadequacies. JOUST is responsive to judicial needs, yet does not require a radical change in current

procedures. In addition, it can be implemented on a small or large scale. Its time has clearly come.