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COPING WITH TECHNOLOGY THROUGH THE LEGAL PROCESS*

David L. Bazelon†

If, as Socrates said, it is a wise man who knows what he does not know, a discussion of “coping with technology through the legal process” should allow me to display uncommon wisdom—because technology, and science, are things about which I frankly know very little. I suggested recently that judges are, for the most part, “technically illiterate,”¹ and I certainly include myself in that category. But whatever our limitations, the judiciary is increasingly being asked to grapple with scientific and technological issues of great complexity. Some two-thirds of the D.C. Circuit’s caseload now involves review of action by federal administrative agencies; and more and more of such cases relate to matters on the frontiers of technology. What are the ecological effects of building a pipeline to bring oil across the Alaskan tundra?² How can society manage radioactive wastes from nuclear reactors, which remain toxic for two hundred centuries or more?³ Shall we ban DDT,⁴ or the

* An earlier version of this Article was presented as the Henry A. Carey Lecture on Civil Liberties at Cornell Law School on November 29, 1976.

† Chief Judge, United States Court of Appeals for the District of Columbia Circuit.

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

² *See Wilderness Society v. Morton*, 479 F.2d 842 (D.C. Cir.) (en banc), *cert. denied*, 411 U.S. 917 (1973).

³ *See Natural Resources Defense Council, Inc. v. United States Nuclear Reg. Comm’n*, 547 F.2d 633 (D.C. Cir. 1976), *cert. granted sub nom. Vermont Yankee Nuclear Power Corp. v. Natural Resources Defense Council, Inc.*, 97 S. Ct. 1098 (1977).

⁴ *See Environmental Defense Fund, Inc. v. Ruckelshaus*, 439 F.2d 584 (D.C. Cir. 1971).

Concorde SST,⁵ or lead in gasoline?⁶ These and many more such imponderables are now coming before our court, and the end is nowhere in sight.

My judicial experience in dealing with these cases has not, of course, given me any expertise in science or technology. It has, however, stirred many thoughts, about *who* should be making these decisions, about the procedures that should be followed in making them, and, more generally, about how society can come to terms with science and learn to cope with technological progress.

The idea that nonscientists can or should have anything to do with science is a relatively recent one, and one that may not be entirely welcome to the scientific community. Scientists have sometimes likened their profession to an autonomous, self-governing "republic."⁷ To qualify for citizenship in this republic, one's scientific credentials would have to be in order. And only its "citizens"—that is, only scientists—would be entitled to a voice in the way the scientific community is governed; only they could participate in the process of mutual criticism that keeps science valid. As Gerard Piel, the publisher of *Scientific American*, recently wrote, "A scientist can accept no authority but his own judgment and conscience"⁸

For a good many years, the rest of us, the nonscientists, really had no quibble with this view. Scientific and technological progress were seen as inevitable, and as inherently desirable. We were happy to leave the scientists alone—at least as long as science-based technology provided us with a never-ending stream of technological goodies.

Recently, however, we have begun to reexamine our relationship with the so-called "republic of science." Since World War II, government, science, and technology have become increasingly interdependent. The Manhattan Project, Sputnik, the Apollo program, and, most recently, the enactment of significant environmental legislation, are some of the familiar landmarks along this road towards increasing interdependence. The reasons for this

⁵ See *Environmental Defense Fund, Inc. v. Coleman*, No. 76-1105 (D.C. Cir. May 19, 1976) (unreported).

⁶ See *Ethyl Corp. v. EPA*, 541 F.2d 1 (D.C. Cir.) (en banc), cert. denied, 426 U.S. 941 (1976).

⁷ See Polanyi, *The Republic of Science: Its Political and Economic Theory*, 1 MINERVA 54 (1962); Weinberg, *Science and Trans-Science*, 10 MINERVA 209, 217-18 (1972).

⁸ Sinsheimer & Piel, *Inquiring into Inquiry: Two Opposing Views*, HASTINGS CENTER REPORT, August 1976, at 19.

new interdependence are also familiar. First, the costs of much modern research and development are so enormous that only the government has the resources to foot most of the bill; and when government pays for research, some governmental supervision of that research is inevitable.

More importantly, however, we are all becoming increasingly conscious of the extent to which many supposedly scientific or technical decisions involve painful value choices, and pose difficult policy problems. We have come to realize that virtually every technological innovation may carry unwanted consequences, and that technological progress may therefore cause, as well as solve, critical societal problems. We have even begun to ask whether there are certain subjects into which scientists should not inquire at all, because the process of investigation, or the knowledge to be acquired, may bring too many perils along with its promises.

Scientists are not entirely happy to find themselves the target of this scrutiny. When the National Science Foundation recently asked the directors of America's leading research institutions for their views on the current state of American science, one recurring response was an objection to excessive regulation of scientific activities, and to bureaucratic "meddling" in *their* domain.⁹ In the words of one participant in the study, "The ever increasing bureaucracy . . . will in the not too distant future completely eradicate our Nation's world position in research and technology."¹⁰

These complaints are not frivolous. Regulation is costly. Someone has to pay the salaries of the bureaucrats who are looking over the scientists' shoulders, and of the judges who are looking over the bureaucrats' shoulders. And, more importantly, of course, this kind of surveillance *can* impede or even stifle needed research.

The problem, though, is that science and technology are not now—if, indeed, they ever were—the exclusive domain of the scientists and engineers. While their expertise is essential for assessing the costs and benefits of particular innovations, it provides no special qualifications for determining how the balance between costs and benefits should be struck.

How can such decisions be made? When we know that drugs may cause disease as well as cure it, that powerful new pesticides

⁹ See NATIONAL SCIENCE BOARD, NATIONAL SCIENCE FOUNDATION, SCIENCE AT THE BICENTENNIAL: A REPORT FROM THE RESEARCH COMMUNITY 63-69 (1976).

¹⁰ *Id.* at 66 (response of Harold M. Agnew, Director of Los Alamos Scientific Laboratory).

may pollute our water, that devastating accidents may occur at nuclear power plants, and even that our use of spray deodorants may someday cause an increased incidence of skin tumors, how can we weigh the benefits against the risks? And when we know that our resources are limited, how do we decide how those resources should be allocated—whether for basic or applied research, for the treatment of kidney disease or cancer, for a mass immunization program against swine flu, for a major nutrition program, or for countless other worthy projects?

In primitive societies, painful choices of this sort are often made by the tribal witch doctor. When powerful interests clash, when the need to choose between cherished but conflicting values threatens to disrupt the society, the simplest path is decision by a shaman, or wizard, who claims special and miraculous insight. By externalizing the decision to the gods, the tribe avoids dangerous internal confrontations. Other ages have achieved the same escape from conflict through their own soothsayers, savants, and oracles. We, too, are not immune from the temptation to turn these decisions over to a shaman—although, instead of a mask and feathers, we might prefer to dress *our* witch doctors in white lab coats or black robes.

Questions of this sort pose difficult—if not impossible—problems for decisionmakers. The experts are likely to disagree about the underlying facts, which are usually both complex and uncertain; they are even more likely to disagree about the inferences to be drawn from those facts. Postponing a decision may sometimes provide the opportunity to reduce uncertainty. But a decision not to decide, or to delay deciding, is still a decision.¹¹ Both time and information can be costly resources.

Consider, for example, the ongoing controversy about fluorocarbon propellants in aerosol cans. Several years ago some scientists announced that the use of these propellants was gradually breaking down the ozone layer that surrounds the atmosphere and protects the earth from harmful ultraviolet radiation.¹² The result could be an increased incidence of skin cancer and possible climatic changes. Other scientists, however, came forward to chal-

¹¹ See, e.g., *Environmental Defense Fund, Inc. v. Hardin*, 428 F.2d 1093, 1099 (D.C. Cir. 1970).

¹² See generally NATIONAL RESEARCH COUNCIL, NATIONAL ACADEMY OF SCIENCES, HALOCARBONS: ENVIRONMENTAL EFFECTS OF CHLOROFUOROMETHANE RELEASE (1976); NATIONAL RESEARCH COUNCIL, NATIONAL ACADEMY OF SCIENCES, HALOCARBONS: EFFECTS ON STRATOSPHERIC OZONE (1976).

lence these findings. Consequently, although there were proposals to ban these propellants immediately, a decision on the matter was postponed to allow the National Academy of Sciences to conduct further studies in an effort to lessen doubts.¹³

The Academy's study found that continued use of fluorocarbons would, indeed, pose significant hazards;¹⁴ it proposed, however, a two-year delay in the regulation of fluorocarbons, in order to allow time for additional studies and a further reduction of uncertainty.¹⁵ I certainly cannot say whether regulation of these products should or should not have been delayed.¹⁶ The Academy evaluated the "penalties of delay," and concluded that they were slight.¹⁷ But whether the costs of delay in this case are great or small, the important point is that we always pay a price for the luxury of greater certainty. In the fluorocarbon case, for example, delaying regulation means that at least a little more ozone will be removed from the stratosphere; and equally importantly, money will have been spent on additional fluorocarbon studies that could have been spent for other purposes—say, to retrain workers in fluorocarbon plants. Alternatively, we could use that money to study the effects on the ozone layer of the nitrogen in fertilizers which, according to recent studies, may have a far more substantial impact than aerosol sprays.¹⁸

Even if all the scientific experts were in complete agreement about the magnitude of the risks posed by fluorocarbons—a *factual* issue—a difficult *value* choice would still remain; we would still have to choose between present, well-documented economic dislocation on the one hand, and future, probabilistic harm to human

¹³ See generally sources cited in note 12 *supra*.

¹⁴ See NATIONAL RESEARCH COUNCIL, NATIONAL ACADEMY OF SCIENCES, HALOCARBONS: ENVIRONMENTAL EFFECTS OF CHLOROFLUOROMETHANE RELEASE, *supra* note 12, at 1-3 to 1-6.

¹⁵ See *id.* at 1-8 to 1-9.

¹⁶ The Food and Drug Administration (FDA), the Environmental Protection Agency (EPA), and the Consumer Product Safety Commission (CPSC), as well as several states, began efforts to regulate fluorocarbons shortly after the Academy's report was issued. See *F.D.A. Urges a Curb on Fluorocarbons*, N.Y. Times, Oct. 16, 1976, at 6, col. 1; *Agency [EPA] Plans Crackdown on Fluorocarbon Gases*, N.Y. Times, Oct. 20, 1976, at 26, col. 6; *Fluorocarbon Sprays Curb Backed* [by CPSC], N.Y. Times, Nov. 23, 1976, at 21, col. 5; *Michigan Votes to Ban Some Aerosol Sprays*, N.Y. Times, Dec. 11, 1976, at 24, col. 1.

On May 13, 1977, the three agencies jointly published proposed regulations to ban most manufacture and use of fluorocarbons. See 42 Fed. Reg. 24,535-50; see also *id.* at 24,255 (cosmetic ingredient labeling established by FDA for seven fluorocarbon propellants).

¹⁷ NATIONAL RESEARCH COUNCIL, NATIONAL ACADEMY OF SCIENCES, HALOCARBONS: ENVIRONMENTAL EFFECTS OF CHLOROFLUOROMETHANE RELEASE, *supra* note 12, at 1-7.

¹⁸ See, e.g., *Will Fertilizers Harm Ozone as Much as SST's?*, 195 SCIENCE 658 (1977); Johnson, *The Fertilizer-Ozone Connection*, 195 SCIENCE 1280 (1977) (letter to the editor).

health on the other. Who should make that choice? The fluoro-carbon manufacturers? The scientific community? Congress? The Food and Drug Administration? And if the information about nitrogen in fertilizers is correct, we might have to make a still more painful choice. Removing those fertilizers from the market might cause mass starvation around the world. How do we balance more skin cancer against more starvation? And how do we compare a certain and immediate reduction in agricultural production with the possible future reduction that might accompany climatic changes? How should such choices be made? And who should bear their cost?

Amidst this swirling uncertainty, one thing seems very clear. Courts are *not* the agency either to resolve the factual disputes, or to make the painful value choices. The problem is not just that these scientific issues are complicated; courts have long grappled with complicated issues in reviewing actions by the FCC, SEC, ICC, CAB, and scores of other governmental regulatory agencies. These more traditional administrative matters, however, involve issues with which all judges have at least a speaking familiarity; but I daresay that almost none have the knowledge and training to assess the merits of competing scientific arguments. And this is hardly a task for on-the-job training.

It follows that, where administrative decisions on scientific issues are concerned, it makes no sense to rely upon the courts to evaluate the agency's scientific and technological determinations; and there is perhaps even less reason for the courts to substitute their own value preferences for those of the agency, to which the legislature has presumably delegated the decisional power and responsibility.¹⁹

¹⁹ For several years my colleagues on the D.C. Circuit and I have engaged in a lively debate, in opinions and articles, about the standards that should govern judicial review of administrative action in scientific areas. See, for example, the five separate opinions in *Ethyl Corp. v. EPA*, 541 F.2d 1 (D.C. Cir.) (en banc), *cert. denied*, 426 U.S. 941 (1976), in which our court upheld regulations issued by the EPA Administrator requiring annual reductions in the lead content of leaded gasoline. Although I joined Judge Wright's opinion for the court, I wrote separately (in an opinion joined by Judge McGowan) to reiterate my view that, in cases of great technological complexity, the best way for courts to guard against unreasonable or erroneous administrative decisions is not for the judges themselves to scrutinize the technical merits of each decision. Rather, it is to establish a decision-making process that assures a reasoned decision that can be held up to the scrutiny of the scientific community and the public.

541 F.2d at 66 (concurring opinion, Bazelon, C.J.), *quoting* *International Harvester Co. v. Ruckelshaus*, 478 F.2d 615, 652 (D.C. Cir. 1973) (opinion concurring in result, Bazelon,

What courts and judges can do, however—and do well when conscious of their role and limitations—is scrutinize and monitor the decisionmaking process to make sure that it is thorough, complete, and rational; that all relevant information has been considered; and that insofar as possible, those who will be affected by a decision have had an opportunity to participate in it. The agencies themselves will usually be in the best position to determine which particular procedures, or combinations of procedures, are best suited to a particular issue. But whatever procedures are used, the important thing is that the agency generate a record in which the factual issues are fully developed.

By articulating both their factual determinations and their value preferences, and by attempting to separate the one from the other, administrators make possible effective professional peer review, as well as legislative and public oversight. With respect to scientific, factual determinations, decisionmakers should disclose where and why the experts disagree as well as where they concur, and where the information is sketchy as well as complete. Other experts who are steeped in the subject matter—in academe, in government, in industry—can then evaluate the agency's factual determinations, bring new data to light, or challenge gaps in reasoning. And if individuals or groups differ with the agency's value choices, they can make their views known in the various public forums. When the reasons for decisions are fully disclosed, there

C.J.). "Because substantive review of mathematical and scientific evidence by technically illiterate judges is dangerously unreliable" (541 F.2d at 67), I have long urged that courts concentrate their efforts on strengthening administrative procedures:

When 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.

Id., quoting *Environmental Defense Fund, Inc. v. Ruckelshaus*, 439 F.2d 584, 598 (D.C. Cir. 1971) (Bazelon, C.J.). See *Natural Resources Defense Council, Inc. v. United States Nuclear Reg. Comm'n*, 547 F.2d 633, 645-46 (D.C. Cir. 1976) (Bazelon, C.J.), *id.* at 655-57 (separate statement, Bazelon, C.J.), *cert. granted sub nom. Vermont Yankee Nuclear Power Corp. v. Natural Resources Defense Council, Inc.*, 97 S. Ct. 1098 (1977). *But see Ethyl Corp. v. EPA*, 541 F.2d 1, 34-36 (D.C. Cir.) (Wright, J.), *id.* at 68-69 (concurring statement, Leventhal, J.), *cert. denied*, 426 U.S. 941 (1976); *Natural Resources Defense Council, Inc. v. United States Nuclear Reg. Comm'n*, 547 F.2d 633, 660-61 & n.8 (D.C. Cir. 1976) (statement concurring in result, Tamm, J.), *cert. granted sub nom. Vermont Yankee Nuclear Power Corp. v. Natural Resources Defense Council, Inc.*, 97 S. Ct. 1098 (1977). See generally Bazelon, *The Impact of the Courts on Public Administration*, 52 IND. L.J. 101 (1976); Leventhal, *Environmental Decisionmaking and the Role of the Courts*, 122 U. PA. L. REV. 509 (1974); Wright, *The Courts and the Rulemaking Process: The Limits of Judicial Review*, 59 CORNELL L. REV. 375 (1974).

is a genuine opportunity to seek reconsideration in light of new knowledge or changing values.

Necessarily, action may have to be taken in the face of uncertainty, before all the information is available. But awareness of our ignorance puts us ever on the lookout for better and more certain information. And it gives reason to hope that erroneous decisions will not be set in concrete.

I have long urged that even society's most technical decisions must be ventilated in a public forum with public input and participation. Recently, there have been encouraging indications that others may have come to the same conclusion. For example, former Secretary of Transportation William Coleman made his decision to permit Concorde SST landings in New York and Washington only after an elaborate series of hearings, with wide-ranging public participation; and he accompanied his decision with a lengthy document, setting forth in detail the reasons for the decision, and the evidence on which it was based.²⁰ The Secretary's statement does not attempt to make the decision look easier than it actually was—it points out where the evidence was shaky, and acknowledges the hard value choices made. In devising the procedures by which he reached this decision, the Secretary displayed a sensitivity to the values of open decisionmaking and a willingness perhaps to go beyond the bare minimum required by the National Environmental Policy Act²¹ and the Administrative Procedure Act.²² As he said, "A decision that 'cannot be explained' is very likely to be an arbitrary decision."²³ Similarly, the decision of Dr. Donald Fredrickson, the Director of the National Institutes of Health, to issue guidelines for research involving recombinant DNA followed two years of intensive discussion, consultation, and hearings, with substantial public participation;²⁴ and the guidelines were accompanied by an Environmental Impact Statement, which

²⁰ See U.S. DEP'T OF TRANSPORTATION, THE SECRETARY'S DECISION ON CONCORDE SUPERSONIC TRANSPORT (1976). See also the statement of William T. Coleman, Jr., Secretary of Transportation, before the Subcommittee on Government Activities and Transportation, House Committee on Government Operations, on the Concorde SST, Friday, Dec. 12, 1975.

²¹ 42 U.S.C. §§ 4321, 4331-4335, 4341-4347 (1970 & Supp. V 1975).

²² 5 U.S.C. §§ 551-559 (1970 & Supp. V 1975).

²³ U.S. DEP'T OF TRANSPORTATION, THE SECRETARY'S DECISION ON CONCORDE SUPERSONIC TRANSPORT, *supra* note 20, at 7.

²⁴ See Decision of the Director, National Institutes of Health, to Release Guidelines for Research on Recombinant DNA Molecules, 41 Fed. Reg. 27,902, 27,903 (1976). The guidelines themselves are reported at 41 Fed. Reg. 27,911 (1976).

assessed their pros and cons, and weighed them against possible alternatives.²⁵

These issues are highly controversial, and many will disagree with the decisions that were actually reached. But by articulating those decisions clearly, these officials have helped to make intelligent public debate possible. For example, Secretary Coleman acknowledged the possibility that even limited Concorde flights might produce a slight increase in the number of nonfatal cases of skin cancer every year, but he concluded that the benefits of the flights were worth that risk.²⁶ This is the kind of painful trade-off that decisionmakers are sometimes tempted to cover up. But these trade-offs are being made in the public's name, and the public—the "ultimate guinea pig"—has a right, and a duty, to know about them. As Justice Frankfurter once said, in a passage quoted by Secretary Coleman, "the processes of government are essentially educational."²⁷ To serve this educational function, government must fully inform the public about what's being done, and why.

We can never be sure that open decisionmaking will actually produce *better* decisions; in the long run, however, I believe that it will. Even though openness by itself cannot help a decisionmaker resolve uncertainties, it is the best technique we have for making sure that he is both aware of those uncertainties, and has actually addressed them.

This kind of openness is in everyone's best interests, *including the decisionmakers'*—and the examples I have cited lead me to hope that there may be a growing awareness of this fact. When the issues are controversial, any decision may fail to satisfy large portions of the community. But those who are dissatisfied with a particular decision will be more likely to acquiesce in it if they perceive that their views and interests were given a fair hearing. If the decisionmaker has frankly laid the competing considerations on the table, so that the public knows the worst as well as the best, he is unlikely to find himself accused of high-handedness, deceit, or cover-up. We simply cannot afford to deal with these vital issues in a manner that invites public cynicism and distrust.

²⁵ See NATIONAL INSTITUTES OF HEALTH, DRAFT ENVIRONMENTAL IMPACT STATEMENT: GUIDELINES FOR RESEARCH INVOLVING RECOMBINANT DNA MOLECULES (Aug. 19, 1976).

²⁶ U.S. DEP'T OF TRANSPORTATION, THE SECRETARY'S DECISION ON CONCORDE SUPERSONIC TRANSPORT, *supra* note 20, at 57-58. The calculations upon which the Secretary relied indicated that "over a 30 year period of continuous operations, the proposed Concorde flights could add an average of around 200 new cases of nonmelanomic skin cancer to the approximately 250,000 already experienced per year in the United States." *Id.* at 37.

²⁷ Statement of William T. Coleman, Jr., *supra* note 20, at 6.

As I have suggested, Secretary Coleman and Dr. Fredrickson displayed considerable creativity in devising procedures to deal with the Concorde and DNA decisions. The question is whether we should rely on the creativity of individual, enlightened administrators—or whether, instead, we should consider some sort of wide-ranging institutional reform, to improve the way we make our critical scientific and technological choices. The problem, of course, is that any kind of across-the-board solution might deprive decisionmakers of the flexibility to experiment with different kinds of procedures for different kinds of issues.

A number of reforms have been suggested, with the goal of making our factual decisions more accurate and objective, and our value choices more fair. Probably the most widely publicized suggestion has been that we create a "Science Court," to resolve technical, factual disputes.²⁸ As I understand it, this "court"—which might be a permanent institution, or simply an ad hoc board of inquiry—would consist of a panel of scientist/judges, who would attempt to resolve *factual* disputes argued before them by expert proponents of the opposing scientific positions.²⁹ The Court would not itself make any policy decisions or value choices; instead, it would present its findings on "the current state of technical knowledge" to the responsible political agency, which would then make the ultimate decisions.³⁰

In the words of its proponents, the goal of the Science Court is to reduce "the extension of authority beyond competence,"³¹ and that is a goal I wholeheartedly support. Scientists *are* uniquely

²⁸ Dr. Arthur Kantrowitz, Chairman of the Avco Everett Research Laboratory, Inc., has actively advocated the creation of such a court for more than a decade. See, for example, Dr. Kantrowitz's statement delivered March 16, 1967, before the Subcommittee on Government Research, Senate Committee on Government Operations, reprinted in 113 CONG. REC. 15,256 (1967); Kantrowitz, *Controlling Technology Democratically*, 63 AM. SCIENTIST 505 (1975).

The Science Court concept has attracted considerable support, especially in recent years. At a Science Court colloquium held in September 1976, sponsored by the Commerce Department, the National Science Foundation, and the American Association for the Advancement of Science, a proposed "experiment" to test the efficacy of a Science Court was endorsed by, among others, the Secretary of Commerce, the Science Adviser to the President, and the Administrator of the Environmental Protection Agency. See *Science Court: High Officials Back Test of Controversial Concept*, 194 SCIENCE 167 (1976).

²⁹ See Task Force of the Presidential Advisory Group on Anticipated Advances in Science and Technology, *The Science Court Experiment: An Interim Report*, 193 SCIENCE 653, 653 (1976).

³⁰ *Id.*

³¹ *Id.*

competent to address scientific/factual issues—science *is* elitist.³² But, as I have already suggested, their special competence does not extend to value choices; with respect to those choices, the opinions of scientists are entitled to no greater weight than those of the rest of us.

While I thus support the goals of the Science Court proposal, I find some of its features troubling. First, I fear that a lengthy adversary proceeding, limited solely to factual issues, might well exaggerate the importance of those issues, and might tend to diminish the importance of the underlying value choices. A factual decision by a Science Court, surrounded by all the mystique of both science and the law, might well have enormous, and unwarranted, political impact.

Moreover, it is not entirely clear to me that all disputes among experts either could or should be “resolved.” Experts usually disagree not so much about the objectively verifiable facts, but about the inferences that can be drawn from those facts. And they disagree precisely because it is impossible to say with certainty which of those inferences are “correct.”

Consider, for example, the discussion of the possibility of catastrophic accidents at nuclear reactors. Most experts agree that the likelihood of such an accident is pretty low, but they disagree about just how low. And there is no experiment we can conduct to determine which experts are right—it is just not practical to construct 1,000 reactors and monitor them for 10,000 years, to determine how safe reactors really are. Physicist Alvin Weinberg has called such questions “trans-scientific”;³³ and while it *is* appropriate for scientists to address these questions—they do involve facts rather than values—the scientific method simply cannot provide definitive answers. A Science Court might choose not to address such issues at all;³⁴ in that case, its usefulness would be limited to a fairly small category of controversial scientific issues. If it *did* try to resolve such essentially unresolvable issues, however, it is hard

³² Dr. Philip Handler, President of the National Academy of Sciences, recently noted that the Academy is an inherently “elitist organization” whose only “special asset” is the technical expertise of its members. See *Handler Defends Academy Elitism*, 191 *SCIENCE* 543 (1976). See generally Handler, *A Rebuttal: The Need for a Sufficient Scientific Base for Government Regulation*, 43 *GEO. WASH. L. REV.* 808 (1975).

³³ Weinberg, *supra* note 7, at 219.

³⁴ The “Interim Report” of the presidential task force on the Science Court seems to suggest that the Court will avoid questions of this sort. See Task Force of the Presidential Advisory Group on Anticipated Advances in Science and Technology, *The Science Court Experiment: An Interim Report*, *supra* note 29, at 654.

to see how it could do much more than affix a "seal of approval" to a majority or "establishment" point of view—and that might simply discourage dissent.

Finally, I fear that the kind of adjudicatory procedures contemplated by the Science Court idea might prove to be very time-consuming. Of course, no one is fonder of adjudicatory procedures than judges—but we are acutely conscious of just how costly they can be.³⁵

Having expressed all these misgivings, I must reiterate that I fully support the goals of the Science Court idea; and I think that Dr. Arthur Kantrowitz and the other backers of the proposal have performed a great public service, simply by forcing us all to think and talk about these issues.

On the other hand, I object strongly to some of the other proposals that have been advanced, ostensibly to improve the way courts handle technical/factual disputes. It has been suggested that instead of creating scientist/judges and Science Courts, perhaps we should merely try to upgrade the courts and the judges that we already have. We could, for example, attempt some sort of systematic instruction of the judiciary in the ways of science; or we could appoint expert science advisers, to sit at the right hand of a judge when he is considering a case with scientific overtones.³⁶ Both of these proposals strike me as very harmful. When science has become so complex and specialized that even scientists in one field have difficulty understanding their colleagues in related specialties, we can hardly hope to succeed in raising the judiciary's scientific consciousness. The most likely result of such a program would simply be to encourage judges to wade in, where previously they would have feared to tread. The science adviser idea suffers from the same flaw; and it also runs the risk of creating surrogate judges, who would be making all the real decisions, while we judges are simply left to wear the black robes. In highly controversial areas, where the experts disagree, it would be dangerous indeed to allow one expert with one point of view to have special access to the judge's ear.

Improving the way we make our value choices may prove even more difficult than improving the way we resolve factual dis-

³⁵ Administrative agencies are similarly aware of how costly and time-consuming adjudicative procedures can be. In one celebrated case, it took the FDA nine years to determine just how many peanuts there should be in peanut butter. See W. GELLHORN & C. BYSE, *ADMINISTRATIVE LAW: CASES AND COMMENTS* 733-34 (6th ed. 1974).

³⁶ See, e.g., Leventhal, *supra* note 19, at 546-54.

putes. I have long advocated broadened public participation in the administrative process as a technique for ensuring that, insofar as possible, the decisions that are made reflect the divergent interests in our society. But as Professor Richard Stewart has recently pointed out, "interest representation" is no panacea.³⁷ Various proposals have been made to broaden representation in agency proceedings, by, for example, funding public interest intervenors.³⁸ I fully support the goal of these proposals, and I think that they are worth a try. But we have to remember that any scheme of this sort raises extraordinarily difficult problems. Who should be represented? Who is entitled to speak for the public interest, and who is entitled to public funds to do so? How do we guard against subsidizing the most vocal representatives of the public interest, instead of the most worthy? And how do we assess the risk that increasing the number of participants in a particular proceeding may simply prolong the decisionmaking process, without necessarily improving, or even changing, the eventual result?

These are valid concerns. But I am not sure that we have much choice. In democratic societies, elected legislatures traditionally make the hard value choices. Indeed, this is precisely what legislatures are designed to do. Increasingly, however, our legislatures have delegated these value choices to administrative agencies—institutions that cannot resolve value conflicts through the relatively simple expedient of a show of hands. I believe that if we are going to ask unelected administrators to make our vital "legislative policy judgments,"³⁹ some sort of "interest representation" is an absolutely essential safeguard.

An alternative, of course, would be to give these decisions back to the legislators. While this has some appeal in theory, I fear that it is not very practical to expect a relative handful of legislators somehow to keep tabs on all the wide-ranging and complex activities in which the government is involved today. For a good many years the courts tried, through the "non-delegation doctrine," to impose some limitations on legislative delegations of responsibility. That doctrine has now been largely abandoned, be-

³⁷ See Stewart, *The Reformation of American Administrative Law*, 88 HARV. L. REV. 1667, 1686 (1975).

³⁸ See, e.g., Cramton, *The Why, Where and How of Broadened Public Participation in the Administrative Process*, 60 GEO. L.J. 525 (1972); Gellhorn, *Public Participation in Administrative Proceedings*, 81 YALE L.J. 359 (1972); Note, *Federal Agency Assistance to Impecunious Intervenors*, 88 HARV. L. REV. 1815 (1975).

³⁹ See *Ethyl Corp. v. EPA*, 541 F.2d 1, 26 (D. C. Cir.) (en banc) (Wright, J.), *id.* at 66 (concurring opinion, Bazelon, C.J.), *cert. denied*, 426 U.S. 941 (1976).

cause it simply didn't work, and I see little likelihood that it will be revived.

Of course, legislatures *can* become more involved in scientific and technological disputes whenever they wish to do so. For example, largely as a result of the issuance by the National Institutes of Health of guidelines on recombinant DNA research,⁴⁰ that issue is now being debated in the halls of various state and local legislatures.⁴¹ At its best, the involvement of local legislatures can ensure that local interests are adequately considered when national policies are being formulated. The other side of the coin, of course, is that such involvement may become a device whereby important national policies are deflected by parochial concerns.

Still another alternative is to go one step further and let the voters themselves resolve these value conflicts, by means of referenda. The nuclear power controversy has recently caused a resurgence of interest in this approach. On election day last year, six states conducted initiatives sponsored by opponents of the expansion of nuclear power; California conducted a similar initiative last June.⁴² The pro-nuclear forces frequently lament the state of public ignorance about this subject, and express concern that the public will be swept away by anti-nuclear hysteria.⁴³ Interestingly, however, all seven of the anti-nuclear initiatives were defeated at the polls, by overwhelming margins.⁴⁴

A number of reasons have been advanced to explain these defeats, including the disproportion in campaign funds available

⁴⁰ See note 24 and accompanying text *supra*.

⁴¹ The most prominent example has been the Cambridge, Massachusetts City Council, which debated the issue for some eight months, and only recently rejected a proposal by the mayor of Cambridge to ban such research altogether within the Cambridge city limits—*i.e.*, at Harvard and MIT. Although the Council voted to allow the research to go forward, it required that the research be conducted under safeguards slightly more strict than those contained in the NIH guidelines. See *Gene-Splicing: Cambridge Citizens OK Research but Want More Safety*, 195 SCIENCE 268 (1977); *DNA: Laws, Patents, and a Proselyte*, 195 SCIENCE 762 (1977).

The enactment of federal legislation regulating recombinant DNA research has also been suggested, to supplement the voluntary NIH guidelines. See *Califano, Rejecting Ban, Backs Curbs on Genetic Study*, Washington Post, Mar. 17, 1977, at A14; *Gene Splicing: Congress Starts Framing Law for Research*, 196 SCIENCE 39 (1977).

⁴² See *Nuclear Initiatives: Two Sides Disagree on Meaning of Defeat*, 194 SCIENCE 811, 811 (1976).

⁴³ See *Natural Resources Defense Council, Inc. v. United States Nuclear Reg. Comm'n*, 547 F.2d 633, 655 & n.62 (D.C. Cir. 1976) (Bazelon, C.J.), *cert. granted sub nom. Vermont Yankee Nuclear Power Corp. v. Natural Resources Defense Council, Inc.*, 97 S. Ct. 1098 (1977).

⁴⁴ See *Nuclear Initiatives: Two Sides Disagree on Meaning of Defeat*, *supra* note 42, at 811.

to the pro- and anti-nuclear factions.⁴⁵ But I suspect that one reason these initiatives failed was that their sponsors were guilty of the same sin of which they had often accused government and industry leaders—namely, they failed to level with the people. All these initiatives presented the voters with only one side of the equation—they asked the voters to cut back on nuclear power, but they did not make clear what the consequences of a cut-back would be. In Colorado, the *Straight Creek Journal*—a kind of counter-culture newspaper—came out *against* the initiative, because, it said, the initiative's sponsors had failed to address the "existential dilemma" of the energy crisis—that is, they had failed to compare the costs and hazards of nuclear power with those associated with alternative energy sources.⁴⁶

Unfortunately, much of the above discussion will also not be very helpful in dealing with that "existential dilemma." The decisionmaking mechanisms I have described are admirably suited to dealing with relatively narrow, discrete issues—the "cases" and "controversies" of which judges are so fond. But neither the courts, nor the agencies, are equipped to do what the energy crisis demands—namely, develop broad national policies, and articulate national goals. And without a national energy policy to chart the course, there is really no way to measure the wisdom or fairness of various individual decisions affecting the energy problem.

The energy crisis is obviously not the only problem that calls for the articulation of national goals; but it does provide an especially stark example. Our society—and perhaps all of civilization—rests on the ready availability of cheap oil. But it now appears that at some point in the foreseeable future, that pillar is going to be knocked out from under us. During the next thirty to fifty years, we will almost certainly be forced to phase out our present reliance on gas and oil and turn instead to alternate sources of energy, such as coal, solar energy, fusion, and nuclear breeder reactors.⁴⁷

That transition will produce vast changes in our way of life, and may well be accompanied by serious economic and social dislocation. Some believe it could strain our democratic institutions to the breaking point, or even produce an international holocaust. But it is a transition that we simply cannot avoid, and probably

⁴⁵ *Id.*

⁴⁶ Quoted in *id.*

⁴⁷ See, e.g., NATIONAL RESEARCH COUNCIL, NATIONAL ACADEMY OF SCIENCES, INTERIM REPORT OF THE NATIONAL RESEARCH COUNCIL COMMITTEE ON NUCLEAR AND ALTERNATIVE ENERGY SYSTEMS 4-6 (1977).

cannot even postpone for very long. The best that we can hope for is to make the transition without chaos and with as little disruption as possible.

In order to do that, *somebody* will have to make the hard choices about what level of energy consumption we should maintain, and which fuels, or combinations of fuels, we should rely upon. And equally importantly, *somebody* will have to undertake the massive, concerted effort necessary to convince a skeptical public of what's ahead, what needs to be done, and what painful choices simply have to be made.⁴⁸

Under our system that "somebody" must, of course, be our political leadership. Courts see only the cases that are brought before them and must therefore focus their attention on the rights and wrongs of those particular cases. They simply cannot engage in the kind of balancing act that is required to set priorities and allocate national resources. And administrative agencies, with their narrowly-defined jurisdictions, are no better able to provide the kind of broad perspective these decisions require.

There are, of course, enormous political barriers to dealing forthrightly with the energy crisis—or with any of the other problems discussed above. Whether the issue is our energy policy for the next fifty years, or the safety of a single pesticide, open decisionmaking procedures may be both inefficient, and embarrassing for those involved. Legislators who ask their constituents to make major sacrifices may end up sacrificing their own careers. The pressures to decide in secret, or to cover up the real grounds for decision, may be very great indeed. But even though those pressures may sometimes arise from understandable motives, it is vital in a democracy that they be resisted at all costs. Otherwise, no matter how wise and judicious the decisions reached may be, they will never be truly accepted by those who will be affected by them. As the great philosopher John Stuart Mill wrote,

[E]ven if the received opinion be not only true, but the whole truth; unless it is suffered to be, and actually is, vigorously and earnestly contested, it will, by most of those who receive it, be held in the manner of a prejudice, with little comprehension or feeling of its rational grounds.⁴⁹

⁴⁸ The remarks in the text were written prior to President Carter's announcement of his proposed energy program. The announcement and accompanying material are set forth in 13 WEEKLY COMP. OF PRES. DOC. 560-65, 566-83, 588-93 (Apr. 25, 1977). While I do not wish to express any views on the merits of specific components of the President's program, I believe that his clear enunciation of the need for a "comprehensive national energy policy" (*id.* at 566) is a vitally important step in the right direction.

⁴⁹ J.S. MILL, ON LIBERTY 95 (London 1859).