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SCIENCE AND TECHNOLOGY IN
JUDICIAL DECISION MAKING:
CREATING OPPORTUNITIES AND MEETING CHALLENGES

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FOREWORD

This country was founded with a conviction that science and government are necessarily intertwined. The Founders' dedication to empiricism is exemplified in the Constitution's delegation to Congress of the power to advance science and technology through the issuing of patents. In the words of a modern scholar, "the importance of science was elevated for the first time in history to a position of authoritatively providing answers to questions of public policy." [1] Of late, this American faith in science has collided with what Alexis de Tocqueville termed our "legal habit," a certain litigiousness inherent in our commitment to individual rights and privileges. The result has been increasing friction between science and the law.

Since World War II, the government's involvement in science and technology has grown enormously. One aspect of this growth has been the creation of institutions to support both the executive and the legislative branches when they are called upon to make decisions on S&T matters. Even though our "legal habit" means that many of the most significant issues involving science emerge initially in our courts, the judiciary has received little external assistance and support.

From the outset, the Carnegie Commission on Science, Technology, and Government recognized that unique and important issues are raised by judicial decision making that involves scientific matters and that the judiciary receives too little interdisciplinary advice on how to respond to the challenges posed by the increasing intersection of science and the courts. For this reason, we consider the work of this task force to be among the most important undertakings of the Commission.

As Chief Justice Rehnquist's 1992 year-end report on the federal judiciary makes clear, isolation from different perspectives harms the judiciary and, in turn, all of us. At this historic moment, open communication and closer cooperation between branches is essential if the judiciary is to discharge its responsibilities effectively. In the case of S&T issues in the courts, such cooperative efforts must also reach out to members of the science and technology community.

We are pleased that the Task Force has been able to undertake a variety of initiatives to facilitate the interbranch and interdisciplinary dialogue that is necessary to ensure better judicial decision making on S&T issues. The Federal Judicial Center project described in this report marks a new era of cooperation, one that we believe will demonstrate the utility and viability of efforts to assist the judiciary in its adjudication of S&T matters.

Our country's faith in science and its commitment to judicial resolution of disputes ensure that the judiciary will continue to be called upon to

decide questions on the frontiers of science; these questions will arise in cases that raise profound social, economic, and public policy concerns. The time has come to give the judiciary the support it needs to perform this difficult task.

We wish to thank the Task Force on Judicial and Regulatory Decision Making and particularly its chair, Helene Kaplan, for their outstanding work.

William T. Golden, Co-Chair

Joshua Lederberg, Co-Chair

PREFACE

This report of the Carnegie Commission on Science, Technology, and Government was prepared by its Task Force on Judicial and Regulatory Decision Making. The Commission was established in 1988 to assess the mechanisms by which each branch of government incorporates scientific and technological knowledge into its decisions and to propose improvements in process and organization. From its inception, the Commission recognized that the judiciary warranted special examination, and in early 1989 the Commission formed the Task Force to study this key aspect of governmental decision making. The Task Force appreciates the encouragement and support of its efforts by David A. Hamburg, President of Carnegie Corporation of New York, and of William T. Golden and Joshua Lederberg, co-chairs of the Commission.

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The Task Force held its first meeting in November 1989, and numerous subgroup, committee, and task force meetings have taken place since then. Its first initiative in 1989 was to assist the Federal Courts Study Committee, which had just been established by Congress with members appointed by the Chief Justice of the United States, to survey the state of the federal judiciary. The Federal Courts Study Committee's final report in 1990 reflected several important issues raised by the Task Force. Acting on that report, the Judicial Conference of the United States acknowledged

the increasing importance of economic, statistical, and natural and social scientific data in both routine and complex litigation and called upon the Federal Judicial Center to conduct a comprehensive examination of how courts handle complex scientific and technological issues.

Cooperative efforts, initiated by the Task Force with the Federal Judicial Center, culminated in a pilot project within the Federal Judicial Center to create a Science and Technology (S&T) Resource Center as an institutional base for examination of judicial management of S&T issues. The project will complete, disseminate, and maintain a S&T manual for federal judges; develop science and technology components for judicial education programs; identify needed research and planning to improve the judiciary's ability to handle S&T information; and engage the scientific and technical communities in these activities. The Task Force is deeply grateful to Judge William W. Schwarzer for his outstanding leadership of the Federal Judicial Center, which has made it possible for this important initiative to become a reality.

The Task Force has also undertaken cooperative activities with the scientific community. These include an ongoing project with the Federal Judicial Center to prepare model protocols for judges that seek to disaggregate the complex issues surrounding scientific or technical evidence. In addition, the Task Force is providing assistance to other interdisciplinary efforts to examine and improve judicial decision making with regard to S&T issues: the ABA/AAAS National Conference of Lawyers and Scientists' examination of the issues surrounding court-appointed S&T experts; the Brookings Institution's plans to convene an Interbranch Symposium on Risk Management in 1993; and the RAND Institute for Civil Justice's preparation of a model of mass tort litigation.

In December 1992, the Commission filed an amicus curiae brief in a case before the Supreme Court of the United States. This brief, which builds on the work of the Task Force, concerns the standards for admissibility of S&T expert testimony. It proposes an integrated approach to scientific evidence that acknowledges and respects both the special expertise of science and

the judge's responsibility to declare law. None of the judicial members of the Commission or the Task Force participated in any way in the decision to file a brief or in crafting the argument to present to the Court.

The brief and this final report were drafted principally by Margaret A. Berger, Senior Consultant to the Task Force. Her comprehensive knowledge of the issues and extensive practical experience have been of invaluable assistance to the Task Force throughout its deliberations. The Task Force also wishes to acknowledge with appreciation the editing of the manuscript by Jeannette L. Aspden and the fine contribution to this report of John Bender, Elizabeth H. Esty, Mark Schaefer, and others from within and outside the Commission. Finally, the Task Force expresses its gratitude to Commission staff members David Z. Beckler and Steven G. Gallagher, whose ideas, unfailing commitment, and energy were indispensable to the success of the Task Force.

This report was endorsed by the Task Force and adopted by the Commission at its meeting on November 30, 1992.

1.0 EXECUTIVE SUMMARY: BACKGROUND, FINDINGS, AND RECOMMENDATIONS

The courts' ability to handle complex science-rich cases has recently been called into question, with widespread allegations that the judicial system is increasingly unable to manage and adjudicate science and technology (S&T) issues. Critics have objected that judges cannot make appropriate decisions because they lack technical training, that jurors do not comprehend the complexity of the evidence they are supposed to analyze, and that the expert witnesses on whom the system relies are mercenaries whose biased testimony frequently produces erroneous and inconsistent determinations. If these claims go unanswered, or are not dealt with, confidence in the judiciary will be undermined as the public becomes convinced that the courts as now constituted are incapable of correctly resolving some of the most pressing legal issues of our day. There may be calls to replace the current system with new institutions and procedures

that appear to be more suited to the demands of science and technology.

From the beginning of its work, therefore, the Task Force recognized the importance of obtaining as much information as possible about the handling of S&T issues by our courts. Its focus was primarily on the federal judiciary because of the advantages of studying and interacting with one system rather than fifty, and because many of the most pressing problems raised by science-rich cases are readily apparent in the federal courts, which have often been the forums of choice for toxic tort litigation involving such substances as Agent Orange, asbestos, the Dalkon Shield, and Bendectin. The Task Force has, however, also discussed these issues with state judicial systems through such organizations as the State Justice Institute and the National Center for State Courts.

We hope that the activities of the Task Force will counter the current uneasiness about judicial decision making with regard to scientific and technological issues. Our investigations have shown that, although there are problems with the handling of complex S&T issues, these difficulties are manageable within the present adversarial process. Indeed, many of the criticisms directed at the operation of our court system arise -- quite understandably -- from misperceptions about the differing methodologies and goals of science and law, and from the consequent failure to comprehend the diverse roles and expertise of "judge," "juror," and "scientist."

SCIENTIFIC "FACTS" AND THE JUDICIAL SYSTEM

Scientists view their work as a body of working assumptions, of contingent and sometimes competing claims. Even when core insights are validated over time, the details of these hypotheses are subject to revision and refinement as a result of open criticism within the scientific communities. Scientists regard this gradual evolution of their theories through empirical testing as the pathway to "truth." In the legal system, however, all of the players are forced to make decisions at a particular moment in time, while this scientific process is going on. Given the indeterminacy of science, how can the judicial system make the best use of a scientific

"fact"? This question is at the core of the Task Force's efforts.

RECENT DEVELOPMENTS

Recent developments in both law and science have conspired to bring increasingly complex scientific issues before the courts for resolution. In particular, the dramatic growth in toxic torts and environmental litigation has put new pressure on the legal system, which is simultaneously being asked to adjudicate issues on the cutting edge of science and to develop theories of substantive law. This pressure is intense because of the large numbers of people that are involved and the profound social, economic, and public policy concerns that these new legal claims raise. The research of scientists working at the frontiers of human knowledge has become relevant in routine criminal cases; DNA testing, for example, has brought sophisticated science into the courtroom.

The growing prominence of science in the courtroom has exacerbated criticism of the courts' management and adjudication of S&T issues. Some allege that "junk science" is flooding the courtroom through the testimony of "experts," whose primary qualification is their willingness to testify in support of their client's position. As a result of these and similar concerns, there have been calls to remove certain categories of cases from the judicial system altogether. While some commentators believe that current legal procedures must be overhauled to deal with these abuses, others go even further in suggesting that the courts, dependent as they are on lay judges and juries, are incapable of properly resolving issues that turn on abstruse principles of epidemiology, toxicology, or statistics. Still others claim that the volume of litigation, as for instance in the cases arising from the use of asbestos, threatens the traditional model of individualized decision making. Given our judicial resources, it may be impossible to treat each case separately.

Our examination of the cases leads to the conclusion that, although such dissatisfaction does exist, many of the concerns expressed are greatly

exaggerated. On the basis of reported decisions, it does not appear that the federal courts are being inundated with fringe science. Reported cases, of course, represent only the tip of the iceberg. The vast majority of cases terminate without opinion and without a trial, and there are few data available on how problems in handling S&T issues might have had an impact on settlements or discontinued suits. Misperceptions may become reality if settlements are driven by concerns about the courts' ability to reach consistent results. The Task Force's work to date and its recommendations, which seek to improve the system's ability to handle scientific evidence, should lead to better adjudications.

IMPROVING THE SYSTEM: NEW PROCEDURAL AND EVIDENTIARY MECHANISMS, EDUCATION,
AND INSTITUTIONAL SUPPORT

Science is entering the courtroom more and more every day, and we believe that the courts' ability to handle S&T issues can be improved. Many of the tools to assist the judiciary already exist -- it remains to encourage and assist judges to use them. Greater understanding of process, both the process of science and the process of managing complex evidence, is key to this endeavor. Accordingly, judicial education and the creation and dissemination of an S&T reference manual for judges are the twin pillars of our process recommendations.

The lack of institutional support for the judiciary must also be addressed when assessing ways to improve the courts' ability to resolve S&T issues. Unique among the branches of government, the judiciary has no ready recourse to outside assistance in its attempts to understand issues of science and technology. The Task Force believes that this situation can be ameliorated by creating more extensive and formal institutional ties between the S&T and judicial communities. These institutional recommendations, designed with the needs of the adversarial system in mind, should encourage increased dialogue between judges and scientists, to help scientists gain an understanding of the legal system and to assist judges in their understanding of the objectives and process of science.

THE FEDERAL JUDICIARY -- OPPORTUNITY FOR INNOVATION

This is a particularly opportune moment to undertake an examination of judicial decision making on S&T matters in the federal judiciary and to suggest improvements. A sizable group of judges will undoubtedly be taking office within the year, so it is important to have S&T educational materials ready for incorporation into the initial judicial educational materials those new appointees will receive.

At the same time, new kinds of S&T cases are entering the courts in large numbers before science has adequately explored the issues involved. Recent developments, such as the FDA review of silicone implants, the allegations about repetitive stress injury, and the concern that cellular phones may cause brain tumors underscore the potential for the sudden emergence of new categories of mass tort cases. And any new mass tort boom is likely to fuel further public discontent with the judiciary's role in adjudicating S&T matters. Wisdom counsels action now.

MAJOR FINDINGS OF THE TASK FORCE

The Task Force's efforts to study the courts, which are discussed in more detail below, have yielded some new insights into the judicial system's treatment of S&T issues. In the course of its investigation, the Task Force considered the data that are currently available, reviewed the literature of legal commentators, held discussions with members of the legal and scientific communities, and commissioned new studies. In order to appreciate the rationale for the recommendations which follow, it is useful to review the Task Force's major findings:

Litigation Process

- Although disparities abound in the way judges handle S&T issues, there is much less divergence in the actual results of cases. There is no one correct way of handling S&T evidence.

- Federal judges have adequate authority under the present Federal Rules of Civil Procedure and of Evidence to manage S&T issues effectively, and the rules of many state judicial systems are modeled on the federal rules.
- Increased attention to S&T issues at the pretrial stage makes cases more amenable to disposition by summary judgment, facilitates settlement, and leads to more focused, speedier trials.
- Expert testimony can be made more comprehensible to jurors.
- Judges and jurors may need information or assistance in handling S&T information that the parties cannot furnish because of insufficient expertise, mismatched resources, or excessive partisanship.
- Trial courts need guidance from appellate courts on the legal standards that control S&T issues.

Judicial Education

- Because judges have little time available for judicial education, the challenge in designing an educational program is to produce materials on complex S&T issues to which a judge can turn when handling an analogous problem in an upcoming case. Thus, the ease with which judges can gain access to educational materials is as important as the quality of the materials.
- Appellate and trial judges and state and federal judges have differing educational needs that require different educational methods.
- Science education programs, like all judicial education programs,

are most effective if they are interactive, utilizing conversation, dialogue, and debate. Producing good-quality judicial S&T education programs requires the collaboration of lawyers who understand science and scientists who understand the needs of the courts.

- The financial resources of the state and federal judiciaries are severely limited. While private foundations have funded the development of innovative education programs, they tend to withdraw support once the pilot program is completed. Funding for continuation even of those programs that have proven to be effective is rarely available.

RECOMMENDATIONS

- Judges should take an active role in managing the presentation of science and technology issues in litigation whenever appropriate.

Many tools are available to state and federal judges to manage the presentation of S&T issues in litigation. The judicial reference manual and protocols, which are being developed by the Task Force in collaboration with the Federal Judicial Center, are two key elements of the effort to facilitate greater use of these tools.

The reference manual outlines the wide range of techniques that judges have used to manage S&T issues in litigation. It focuses on process and on the encouragement of judicial control. The manual presents judges with a range of options available to resolve a given issue and refers judges to S&T cases where those options have been used; it does not suggest substantive outcomes on contested science and technology issues.

Using the protocols, which are being developed jointly with members of the S&T community, will enable judges to identify and employ techniques that will permit quicker and more effective rulings on challenges to expert

testimony, whether those challenges are based on the qualifications of experts, the validity of the theory on which the expert is relying, the reliability of the data underlying the theory, or the sufficiency of the expert's opinion to sustain a verdict.

In order to ensure that these tools continue to be useful, they must be updated systematically to reflect the most current scientific and legal developments. They will be even more valuable if references to state law are incorporated.

- Scientific and technical issues should be integrated into traditional judicial education programs, "modules" should be developed that can be appended to existing programs, and intensive programs should be supported.

Judicial education programs play an important role in introducing judges to scientific methodology, which is an essential element in reducing misunderstandings about S&T evidence and in increasing judicial willingness to take an active role in managing that evidence. Because of the severe time constraints faced by judges, education about scientific methodology should be integrated into traditional judicial education programs. Existing judicial education programs should be expanded to include S&T "modules." For instance, a videotape could be produced that illustrates DNA analysis. Existing programs devoted exclusively to S&T issues should be identified, and others should be developed. These programs offer the greatest opportunity to give judges extensive, hands-on experience in dealing with the difficult S&T issues they may encounter in court.

- Institutional linkages between the judicial and scientific communities should be developed.

Sustained improvement of judicial decision making on matters of science and technology requires the establishment of institutional ties to encourage greater dialogue and cooperation between the judicial and scientific communities.

- The federal and state judiciaries should create S&T resource centers to provide judges with access to the collective experience of their colleagues in case management techniques for S&T issues and to educate judges on scientific methodology. Each resource center would also act as a clearinghouse for substantive scientific information compiled by the scientific community, monitor the impact of S&T issues on the courts, and serve as a bridge for cooperation with the scientific community. Each resource center should provide empirical data on the impact of S&T issues in various types of cases and use the results of that research to assist in long-range planning for the treatment of S&T issues in the judiciary.

- The scientific community should create a resource center as a counterpart to the proposed judicial S&T resource centers in order to facilitate cooperation among the professional societies and to explore the benefits of continued interaction between the judicial and scientific communities.

- A judicial S&T education clearinghouse should be established to collect and distribute curricula and other materials on science education for judges. An advisory committee of leading experts from various scientific disciplines, judicial educators, and representatives of the judiciary should be established to consider what judges need to know about science. It should also collaborate with academic communities in the fields of law and science to improve S&T programs and materials. The judicial S&T education clearinghouse should "package" high-quality science education programs for easy use and access.

- An independent nongovernmental Science and Justice Council of lawyers, scientists, and others outside the judiciary should be established to monitor changes that may have an impact on the

ability of the courts to manage and adjudicate S&T issues; it should also initiate improvements in the courts' access to and understanding of S&T information, including judicial education and communication between the judicial and scientific communities.

A continuing examination of the interaction between science and the courts is essential to efforts to improve judicial decision making concerning S&T issues. An interdisciplinary "Science and Justice Council" similar in mission to the Task Force should be created to continue the initiatives that the Task Force has begun.

Located outside existing institutions, the Council would be able to offer more strategic and long-range criticism and suggestions than existing groups with defined roles. The Science and Justice Council should also monitor changes in law, in science, and in society generally that may have an impact on the ability of courts to handle S&T issues.

Some judges are frustrated by their inability to obtain timely, nonadversarial explanations of the scientific and technical matters at issue in a case. Unlike the judiciary, when faced with unclear S&T information, Congress can consult the Office of Technology Assessment, and the Executive can consult the Office of Science and Technology Policy. The Council should undertake further study on the host of issues raised by the Task Force's proposal to create an institutional support mechanism for the judiciary, the form that such an advisory institution should take, sources of compensation for those providing assessments to the court, and permissible use of the information generated for the court.

Other areas that the Council might explore include data collection and alternatives to judicial resolution. Long-range efforts to improve the quality of judicial decision making with regard to S&T issues are hampered by the lack of adequate data about the incidence and management of scientific issues in the courts. Information is also necessary for appropriate allocation of judicial resources. In addition, little empirical

information is currently available about the costs of handling S&T issues. And further study of how the judicial system copes with S&T issues and a comparison with administrative schemes such as the National Childhood Vaccine Injury Act would provide valuable information about the desirability and feasibility of pursuing the use of alternative forums.

We live in an ever-changing world to which a dynamic judicial system must be responsive. Unless reliable data are obtained so that changes can be anticipated, monitored, and evaluated, the ability of the courts to handle complex scientific and technological issues is compromised. The kinds of cases in which S&T issues occur are often those of the utmost social significance, and the decisions in them have major consequences for many people's lives. The way in which our society in general and the judiciary in particular will respond to the S&T issues of the future is of concern to many different constituencies whose views can best be heard, evaluated, and integrated at meetings of a broad-based heterogeneous group that is free of formal political ties. The Task Force believes, therefore, that it is important that an independent group, like the proposed Science and Justice Council, be created to monitor and develop further the recommendations outlined in this report.

CONCLUSION -- A NOTE OF OPTIMISM

Unlike some recent critics, we end our survey of science in the courts on a note of optimism. The Task Force found that numerous innovative, highly motivated, and highly skilled judges and lawyers are working hard to improve judicial decision making with regard to S&T issues. That many problems remain is hardly remarkable, considering the magnitude of the legal and scientific issues that are presented to American courts for resolution. While the difficulty and novelty of the questions these cases pose preclude an instantaneous magical cure, we observe that the legal system is actively pursuing solutions.

Nevertheless, the Task Force believes that the handling of S&T evidence

would be improved if more data were available on how the system works, if information about successful innovations were more widely disseminated, if judges were given more educational and institutional support, and if scientists, judges, and lawyers had greater opportunities to communicate with each other. At the moment, the parallel paths of scientists and lawyers usually obey the rules of Euclidian geometry -- they do not intersect -- even though both disciplines not infrequently ponder the same subjects. And when their paths do cross, the result is often misunderstanding, rather than constructive communication. At the very least, we hope that the Task Force's work will provide a starting point for a more fruitful interaction between the worlds of science and the law.

2.0 IDENTIFYING THE ISSUES

When science and technology enter the courtroom, they bring with them various problems. This chapter identifies and describes these difficulties; it also chronicles some of the principal steps that the Task Force took that culminated in the recommendations set out in Chapter 5.0. This report reflects the efforts of people actively engaged in the legal system, scientists from a variety of disciplines, policymakers and academics in a number of different fields. In its endeavor to improve judicial decision making with regard to scientific questions, the Task Force has also enlisted the assistance of federal governmental agencies such as the Federal Courts Study Committee and the Federal Judicial Center and has worked with state judicial systems through organizations such as the State Justice Institute and the National Center for State Courts.

Although this report refers to the judicial and scientific communities as if each were a discrete and homogeneous group of professionals, they are actually quite diverse and internally disparate (see Box 1). Much of the most vocal recent criticism and concern has been directed at the judicial system's response to evidence developed in the scientific community, but technological issues also cause problems for the courts. Engineers are among the most frequently encountered expert witnesses; they appear in a wide variety of cases such as construction disputes, product liability

actions, and complex environmental litigation. Not surprisingly, the ever-increasing use of computers and electronic media is giving rise to many new issues in lawsuits. Future developments in bioengineer