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Introduction

This report is a summary of the first meeting of the Science, Technology, and Law Panel of The National Academies, convened on March 16-17, 2000, at the Beckman Center in Irvine, California. The Science, Technology, and Law (STL) Program was established to monitor and explore the growing number of areas in which the processes of legal decision making utilize or impinge on the work of scientists and engineers. One of the major activities of the STL Program is convening a distinguished panel of individuals drawn from both the science and engineering and legal communities. The purpose of the Panel's first meeting was to share information about a number of areas in which science and law interact so that all the members of the Panel, with their different backgrounds, would be in a better position to determine the Panel's future agenda.

The principles of science and law developed over the centuries in response to their differing objects of interest. Science, engineering, and technology seek knowledge through an open-ended search for expanded understanding, whose "truths" are subject to revision. Law, too, conducts an open-ended search for expanded understanding; however, it demands definite findings of fact at given points in time. When these two disciplines meet in the courtroom the differences between the two cultures are magnified. For example, the legal tradition of adversarial proceedings contrasts with the cooperative ethic of science. Even the search for truth does not serve the same aims and may not be subject to the same constraints and requirements. Simply stated, science, engineering, and

technology[1] aim to understand, predict, modify, and control aspects of the natural and manufactured world, while the law seeks current truth about scientific and other facts of cases in order to serve the much different goal of justice between parties (as well as other societal goals).

In today's high-technology society the two professions are increasingly often forced to interact in legal disputes involving patents, product liability, environmental torts, regulatory proceedings, and criminal cases. Further, law and science encounter each other in the laboratory through a number of federal actions governing intellectual property, research misconduct, access to research data, and conflicts of interest. The fact-finding agendas of the two disciplines now frequently have begun to overlap, if not merge. Because there is a general lack of understanding of each culture, these interactions often lead to a cognitive friction that is both disturbing and costly to society.

As was noted throughout the meeting, scientists tend to be leery of lawyers and the legal process, preferring not to venture into the courtroom. Lawyers are often frustrated by a scientific community that believes that its methods and procedures are above legal scrutiny and questioning. Lawyers and scientists may seldom speak the same language, but it should be possible for each to develop a better understanding of the principles and methods of the other's profession. Bridging this divide will be a challenge for the STL program as it attempts to build a better understanding between the two communities.

RECENT DEVELOPMENTS

Several events in the past decade have significantly increased the tension at the interface of science and law. First, scientific and technical evidence is more frequently presented in litigation and has become more complex. Judges indicate that the number of cases involving scientific and technical information has increased significantly. Such proceedings often attempt to resolve issues that scientists and engineers view as within their domain (for example, whether or not breast implants cause autoimmune disease). The recent *Daubert*, *Joiner*, and *Kumho* decisions of the Supreme Court[2] demand an active "gatekeeping" role for judges in assessing expert testimony, requiring them to take account of professional practices outside the courtroom.

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[1]Throughout this report, science will be used to include science, engineering, and technology.

[2]*Daubert* v. *Merrell Dow Pharmaceuticals,* 509 U.S. 579 (1993); *General Electric Co.* v. *Joiner*, 522 U.S. 136 (1997); *Kumho Tire Co.* v. *Carmichael,* 199 S. Ct. 1167 (1999).

Second, health, safety, and environmental regulations are more frequently based on epidemiology, ecological modeling, and other statistical methodologies, and are intended to address risks that incorporate assumptions that may be difficult to verify. Parties affected by such regulations often challenge the scientific foundations of these rules, opening up for public review the internal process of the underlying science.

Third, the legal doctrines defining intellectual property have become increasingly prominent in the past two decades. New industries have arisen to exploit fundamental science, most notably in molecular biology. These advances have presented new challenges to the patent system. In response to the Bayh-Dole and Stevenson-Wydler Acts and related measures to encourage nonprofit institutions to transfer technology to industry, academic institutions and other nonprofit research organizations also have grown more interested in patenting new knowledge. The number of patents is rising rapidly; approximately 160,000 were granted in 1999, up from 100,000 a decade earlier (Barton, 2000). Federal courts are called upon to rule on a number of highly sophisticated scientific and technical issues in patent infringement cases.

Finally, in a number of ways legal decisions are a part of every scientist's and engineer's daily existence. Laws and regulations governing intellectual property, access to research data, research misconduct, and grants and contracts are a few examples. Just as science and engineering are increasingly present in the courtroom, legal decisions are having a more prevalent affect on how scientists and engineers conduct their research and design activities.

FORMATION OF THE SCIENCE, TECHNOLOGY, AND LAW PROGRAM

For several years The National Academies explored the notion of a new program to study the interactions of science, technology, and law. Serious discussion dates from spring 1996, when Supreme Court Associate Justice Stephen G. Breyer discussed the idea in an informal dinner with leaders of The National Academies. That discussion led to a day-long symposium in November 1997, at which a group of knowledgeable scientists, engineers, judges, lawyers, business executives, and government officials discussed possible roles for The National Academies in this area.

During the 1990s The National Academies submitted amicus curiae briefs to the Supreme Court in two of the three earlier mentioned cases involving significant issues at the boundaries of science and law. In January 1993, the National Academy of Sciences (NAS) and the American Association for the Advancement of Science (AAAS) joined in an amicus

curiae brief in support of the respondent, Merrell Dow Pharmaceuticals, in *Daubert v. Merrell Dow Pharmaceuticals, Inc.* The National Academy of Engineering (NAE) in August 1998 submitted a brief in support of the petitioners in *Kumho Tire Company v. Carmichael.* The need for scientists participation in the legal arena was evident when Associate Justice Breyer addressed the 150th Annual Meeting of the AAAS in February 1998, saying "In this age of science we must build legal foundations that are sound in science as well as in law."

To continue exploration of these opportunities The National Academies established the Science, Technology, and Law (STL) Program. A major activity for the program is to convene a distinguished panel. The Panel was duly formed and held its first meeting on March 16–17, 2000. The Panel's desire is to establish a regular dialogue between the science and engineering community and the legal community to study pressing issues, improve communication, and help resolve disagreements.

ORGANIZATION OF THIS REPORT

Following this introductory chapter, this report summarizes the Panel's initial meeting and its future agenda. Chapter Two reviews issues arising as a result of three Supreme Court decisions regarding admissibility of expert testimony. During its deliberations the Panel considered a number of measures that might help judges, juries, and expert witnesses in the courtroom.

Chapter Three discusses the effect of law on the conduct of scientific and engineering activities. In particular, it reviews the impact of recent legal, legislative, and regulatory developments on ownership rights to research data. Some observers contend that permitting greatly expanded access to research data that is still under way by those who seek to influence decisions of courts and regulatory agencies will hinder the research enterprise and will impose excessive burdens on researchers. Others argue that the public has a right to the data generated by federal funds. In addition, this chapter discusses intellectual property and the new federal policy for research misconduct. Chapter Four summarizes the STL program's agenda for future activities.