BOOK REVIEW

SCIENCE AT THE BAR: LAW, SCIENCE, AND TECHNOLOGY IN AMERICA

by SHEILA JASANOFF
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INTRODUCTION

Science and technology are two of the most powerful institutions in modern life. Over the course of the last century, their growth has propelled the pace of American economic development and has been instrumental in consolidating our nation's position as a geo-political leader.[1] Consequently, science and technology have captivated the public's outlook with visions of unyielding progress and boundless material prosperity. Nonetheless, Americans do not tend to regard these two institutions with untempered optimism. Traditionally, we have been wary of science and technology's ominous potential and deleterious side effects—whether expressed in paranoia about an authoritarian future where science and technology become instruments of oppression,[2] concerns about nuclear annihilation and ozone depletion, or more immediate fears that cellular phones may cause

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1. *See generally* CHRISTOPHER FREEMAN, ECONOMICS OF INDUSTRIAL INNOVATION (2d ed. 1982).

2. *See, e.g.*, GEORGE ORWELL, 1984 (1949); Robert D. McFadden, *Times and The Washington Post Grant Mail Bomber's Demand*, N.Y. TIMES, Sept. 19, 1995, at A1. This article refers to "Industrial Society and Its Future," the 35,000-word manuscript submitted to *The New York Times* and *The Washington Post* by UNABOM, the notorious mail-bomb terrorist. The tract sketches "a nightmarish vision of humanity enslaved by machines and society deteriorating under the influence of the industrial system and modern technology." *Id.* The two newspapers, conceding to the bomber's threats to send out more mail bombs, published the manuscript in a special supplement to the Sept. 19, 1995 daily edition of *The Washington Post*.

cancer.[3] Another distinctive feature of American culture is our willingness to seek legal redress for all manner of conflicts, from personal injury cases involving tangible harm[4] to cases involving broader moral or ideological grievances.[5] Thus, Sheila Jasanoff asserts, "[i]t is hardly surprising that in an age of anxiety about the products of science and technology the U.S. public has increasingly turned to law to reassert control over the processes of scientific and technological change or to seek recompense for the failed promises of technology."[6]

The many ways in which the law has come to influence the institutions of science and technology is the subject of *Science at the Bar*, Jasanoff's latest work. Professor Jasanoff is Chair of the Department of Science and Technology Studies at Cornell University. It is perhaps not a novel observation that science and technology often cross paths with the law and significantly affect the dynamics of legal practice. In the courtroom, scientific practices and technology-related harms are increasingly the subject of litigation.[7]

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3. *See* John Schwartz, *Court Call Favors Cellular; Judge Throws Out Claim of Link to Brain Cancer*, WASH. POST, May 20, 1995, at A2 (discussing public concern about the potential link between cellular phone signals and cancer and referring to Reynard v. NEC Corp., 887 F. Supp. 1500 (M.D. Fl. 1995), a case in which a plaintiff's claim that his wife's brain cancer was partially or fully owing to her use of a cellular telephone was denied for lack of evidence establishing causation).

4. *See, e.g.*, Waters v. Ford Motor Co., No. 95-3891, 1996 U.S. Dist. LEXIS 3050 (E.D. Pa. Mar. 13, 1996) (holding that plaintiff's suit against Ford for opting not to install airbags in their 1985 Mustangs was preempted by Federal Motor Vehicle Safety Standard 208, 49 C.F.R. § 571.208 (1984), which accorded auto manufacturers at that time the choice of installing any of several passenger restraint systems in their cars); Dan Shaw, *Coffee, Tea or Ouch*, N.Y. TIMES, Oct. 12, 1994, at C1 (describing a New Mexico case in which a jury awarded an 81-year-old plaintiff almost $2.9 million in punitive and compensatory damages for the third-degree burns she sustained when a cup of coffee she purchased at a McDonald's restaurant spilled in her lap).

5. *See, e.g.*, Animal Legal Defense Fund v. Quigg, 932 F.2d 920 (Fed. Cir. 1991) (holding that plaintiffs seeking policy declaration by the United States Patent and Trademark Office that animal species are per se unpatentable lacked proper standing upon which to bring suit); Edwards v. Aguillard, 482 U.S. 578 (1987) (holding that a law providing that evolution may not be taught in public schools unless equal time was given to theories of "creation science" violated the constitutionally required separation of church and state).

6. SHEILA JASANOFF, SCIENCE AT THE BAR: LAW, SCIENCE, AND TECHNOLOGY IN AMERICA 4 (1995).

7. *See, e.g.*, Lotus Dev. Corp. v. Borland Int'l, 49 F.3d 807 (1st Cir. 1995), *aff'd without opinion by an equally divided Court*, 116 S. Ct. 804, *reh'g denied*, 64 U.S.L.W. 3592 (1996) (holding that the menu command hierarchy of a popular computer spreadsheet program was not copyrightable and hence that the plaintiff had no valid infringement claim); Foundation on Economic Trends v. Heckler, 756 F.2d 143 (D.C. Cir. 1985) (mandating that the defendant prepare an environmental impact statement before experimenting with genetically-engineered frost-inhibiting bacteria).

Scientific and technological evidence, such as genetic tests and digital (re)animation,[8] have found frequent though somewhat controversial utility, especially in criminal cases. Scientific discourse also enters the courtroom through the testimony of expert witnesses, whether they are scientists employed to address the scientific or technological subjects of litigation or forensic specialists called in to interpret technical evidence itself. What makes Jasanoff's work unique is its exploration of the reciprocal manner in which the law shapes the practice of science and the production of technology. In developing these themes, she employs a novel approach, linking the insights and more creative perspectives of critical and sociological theories of science and technology to those of more conventional legal analysis.[9] On Jasanoff's account, not only is the law's influence on the other institutions more significant than many commentators suppose but that influence, on the whole, is more beneficial than most are willing to acknowledge.

SYNOPSIS

Jasanoff conducts her inquiry by focusing on some of the most publicly controversial intersections between science, technology and the law—environmental regulation, toxic torts, genetic engineering, reproductive technology and medical decisions concerning life and death. In courtroom litigation involving these sensitive matters, the resolution of conflict has frequently been neither smooth nor satisfactory. Consequently, it is in regard to these matters that the law's role in addressing the moral, political and social consequences of science and technology has been especially subject to criticism. In the illuminating first chapter of *Science at the Bar*, Jasanoff outlines the source of much of this criticism—in her view, some legitimate concerns led astray by faulty presumptions and hasty conclusions about how the law and science each function.

To begin, Jasanoff addresses two distinct lines of criticism—one concerned with the uses of "science in policy" and the other with the judicial crafting of "policies for science." Noting that judges, juries and lawyers know on average very little about the organization and practice of science, Jasanoff states that the first line "has

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8. *See* John Selbak, *Digital Litigation: The Prejudicial Effects of High Technology Animation in the Courtroom*, 9 HIGH TECH. L.J. 337 (1994).

9. Some notable recent works presenting critical and sociological theories of science and technology include BRUNO LATOUR & STEVE WOOLGAR, LABORATORY LIFE (1986); THE SOCIAL CONSTRUCTION OF TECHNOLOGICAL SYSTEMS (Wiebe E. Bijker et al. eds., 1987); REPRESENTATION IN SCIENTIFIC PRACTICE (Michael Lynch & Steve Woolgar eds., MIT Press 1990) (1988).

encompassed repeated proposals to 'improve' the use of science in legal decision making by reforming the selection of expert witnesses, reeducating judges and juries, and changing the standards for validating technical evidence."[10] The other line of criticism, concerned with "policies for science," questions "whether the judiciary is institutionally capable or constitutionally empowered to make policy on issues such as biotechnology, nuclear power, or new medical and reproductive technologies."[11] Jasanoff reiterates and responds to both lines of criticism throughout the book. She immediately notes, however, that "these standard framings converge in their assumption that science and, to a lesser extent, technology possess an inner logic, an autonomous framework of validation and control, that operates irrespective of the law and does not need to be subjected to the law's normative concerns or institutional practices."[12] Furthermore, conventional recommendations for improving both "science in policy" and "policies for science" overestimate the power of technical experts to effectively rationalize moral and political choices about science and technology.

Jasanoff next reacts to what she perceives as the oversimplified views of science and law expounded in comparative theories of the two disciplines. Such theories, in her view, have a tendency to over-idealize the methods and culture of science and, in turn, to unfairly denigrate those of law. Thus, common distinctions drawn between the two enterprises include: science seeks "truth" while the law seeks "justice"; science employs stringent methods designed to obtain the truth as efficiently as possible while the law allows those with better rhetorical tactics to prevail; and science involves a disinterested process of inquiry, withdrawn from worldly concerns, while the law is rife with politics and partisan interests. While such characterizations may not be entirely false, they fail to capture the entire picture.[13] In Jasanoff's view, they unfairly contribute to the notion that in cases where science and the law do not fit together smoothly, the fault is entirely due to inadequacies in the law. Accordingly, by "[t]aking real decisions and controversies rather than wishful scenarios as the point of departure," she endeavors to

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10. JASANOFF, *supra* note 6, at 5.

11. *Id.* at 6.

12. *Id.*

13. *Compare* Howard A. Denemark, *The Search for "Scientific Knowledge" in Federal Courts in the Post-*Frye *Era: Refuting the Assertion That "Law Seeks Justice While Science Seeks Truth,"* 8 HIGH TECH. L.J. 235 (1993) (reappraising conventional notions about the objectives and methods of scientific and legal inquiry in the context of cases concerning legal fact-finding and the use of scientific evidence).

demonstrate how "the cultures of law and science are in fact mutually constitutive in ways that have previously escaped systematic analysis."[14]

Jasanoff additionally addresses the contemporary political sentiment that the law is a significant impediment to the efficient development and exploitation of science and technology. Whether through the machinations of bureaucratic government regulation or the gross excess of courtroom litigation, the law is currently perceived as posing a plethora of unnecessary economic hindrances. Jasanoff does not deny that such problems exist. On balance, however, she is confident that the law serves a positive function in the meaningful and expedient integration of science and technology in our society.[15] She is especially optimistic about the role that the courts as distinctive institutional actors can play in this process. Understanding courts' positive contributions to the management of scientific and technological change is an important first step toward correcting those aspects of legal oversight that could use improvement. Ultimately, appreciating "how [all three] institutions jointly produce our social and scientific knowledge, and our relationships with technological objects, is indispensable to any effective attempt at policy reform."[16]

For practitioners of law, the historical influence of science and technology on the development of substantive legal doctrine is familiar. In almost all first-year law school courses, there are notable cases in which some new technological product or system is either at the center of litigation or otherwise poses problems to the smooth adjudication of legal conflicts.[17] In Chapter 2, Jasanoff

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14. JASANOFF, *supra* note 6, at 8.

15. *Compare* Mary L. Lyndon, *Tort Law and Technology*, 12 YALE J. ON REG. 137 (1995) (arguing that tort law plays a valuable role in the regulation of new technologies).

16. JASANOFF, *supra* note 6, at 8.

17. *See, e.g.*, LeRoy Fibre Co. v. Chicago, Milwaukee & St. Paul Ry., 232 U.S. 340 (1914) (a tort case holding that a plaintiff who stored straw on his own property but within 100 feet of a railroad's right of way was not contributorily negligent when sparks from a passing train ignited and destroyed all of the straw); Loretto v. Teleprompter Manhattan CATV Corp., 458 U.S. 419 (1982) (a property law case holding that a New York City law requiring landlords to permit a cable television company to lay cable lines on their premises constitutes a regulatory "taking"; the plaintiff landlord was thus entitled to compensation); *In re* Northern District of California, Dalkon Shield IUD Products Liability Litigation, 693 F.2d 847 (9th Cir. 1982), *cert. denied sub nom.*, A. H. Robins Co. v. Abed, 459 U.S. 1171 (1983) (a civil procedure case addressing the many complexities of representing in one class action the interests of a large number of geographically dispersed plaintiffs, all injured by a common birth control device); U.S. v. Dorrell, 758 F.2d 427 (9th Cir. 1985) (a criminal law case holding that the defendant could not invoke the defense of necessity—based

examines briefly the incremental transformation of standards of liability in several areas of law: products liability, medical malpractice and environmental protection. In her view, it was in these areas, especially, that "technological change was bound up with profound changes in the public's expectations of liberty, privacy and physical well-being. Disputes over products liability, medical malpractice and environmental protection . . . recast the courts as a proving ground for scientific claims supporting different theories of causation and responsibility."[18]

What is most notable about the transformation of products liability doctrine over the last century is the shift from extremely limited manufacturer liability under contract law theories,[19] to more fault-based liability,[20] to the current regime of "strict liability."[21] As the products of industrialization and their attendant hazards became more profuse, courts became ever more willing to extend the scope of manufacturer liability. Jasanoff attributes this willingness to a significant change in intellectual outlook among judges this century. Namely, "[t]he view that the primary function of tort litigation was to compensate injured persons gained ground over the countervailing doctrine that torts were mainly a legal device for punishing fault."[22]

In the area of medical malpractice, changes in liability criteria were characterized by an increasing substitution of legal standards of appropriate conduct for those of medicine.[23] That is, instead of uncritically deferring to medical practitioners, courts began to require them to justify their performance and treatment decisions in

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upon his concerns about nuclear war and world starvation—to justify his trespassing on an air force base and attempting to damage an MX missile assembly facility).

18. JASANOFF, *supra* note 6, at 25.

19. For much of the nineteenth century, manufacturers of defective products were shielded from liability by the doctrine of "privity of contract." Under this legal rule, a party is only liable to those persons with whom they establish a direct contractual relationship. Thus, if a dealer or other third party stood between an injured customer and the manufacturer of the injury-causing good, no cause of action could accrue. WILLIAM L. PROSSER, LAW OF TORTS 641 (4th ed. 1971).

20. *See, e.g.*, the oft-noted case of MacPherson v. Buick Motor Co., 217 N.Y. 382 (1916) (holding that negligent manufacturers could be liable for injury to an immediate buyer and for any foreseeable harm to a subsequent purchaser).

21. Under this theory of liability, also known as liability without fault, as long as the cause of an accident is established with certainty the party responsible for producing the harmful item or substance is held to be financially responsible. PROSSER, *supra* note 19, at 656-67.

22. JASANOFF, *supra* note 6, at 27. Courts grounded this view on the reasoning that commercial enterprises, whether through obtaining insurance or internalizing their liability risks in the price of their products, would not be unduly penalized by a strict liability regime.

23. *Id.* at 32.

particular cases. Furthermore, in the 1960s the doctrine of "informed consent" came to prominence, establishing that doctors have an affirmative duty to inform patients about alternative courses of treatment and the risks associated with each course.[24] This doctrine supported the notion that patients are autonomous, rights-bearing individuals—a conception of persons already native to the law—rather than simply biological organisms whose medical interests should be left solely to the discretion of medical professionals.[25]

Finally, in the area of environmental litigation "[s]teadily accumulating knowledge about the long-term effects of pollution, produced partly by research and partly by accident, was one factor that reshaped judicial thinking on environmental issues."[26] These developments, combined with the promulgation of the National Environmental Policy Act (NEPA) of 1969,[27] occasioned a drastic change in the role courts played in the mediation of environmental disputes. Thus throughout the 1970s, new environmental laws gave courts the power to review decisions by administrative agencies and authorized private citizens to bring suit when otherwise responsible agencies failed to take action.[28] The primary significance of changing liability standards in all three areas of law was that "[c]oncerns for promoting public participation in technological decisions and protecting individuals against involuntarily assumed risks emerged as important themes in legal controversies over science and technology."[29]

The third chapter of *Science at the Bar* examines the manner in which the law constructs the credibility of expert witnesses and the specialized knowledge they purport to possess. In it, Jasanoff explicates how

> legal fact-finding is constrained not only by the moral and ethical standards articulated by judges but also by sociological factors specific to both law and science, including the ways in which expert witnesses are selected and acculturated for courtroom appearances, as well as the general processes by which claims gain authority within the scientific community.[30]

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24. For a comprehensive argument in support of the doctrine of informed consent, see Marjorie M. Shultz, *Informed Consent: A New Protected Interest*, 95 YALE L.J. 219 (1985).

25. JASANOFF, *supra* note 6, at 33-34.

26. *Id.* at 37.

27. Pub. L. No. 91-190, 83 Stat. 852 (1970).

28. JASANOFF, *supra* note 6, at 37.

29. *Id.* at 40.

30. *Id.* at 43-44.

She begins by exposing those aspects of the expert witness system that have been duly subjected to criticism. Primarily, there is the fact that expert witnesses have become commodified. Not only are expert witnesses sought out and specifically trained by disputing parties to perform in the courtroom but, with compensation ranging from $50 an hour to $10,000 a day,[31] many in the scientific community virtually make a career by providing witness services. Thus, whether eagerly or reluctantly filling the role of "hired guns" in adversarial legal proceedings, science professionals qua expert witnesses are often prone to exaggerate their views, frame their testimony more definitively than their actual beliefs, and offer opinions beyond the limits of their competence.[32] Furthermore, "[a]ll the factors that go into establishing a witness's credibility—not only knowledge but also social and cultural factors such as demeanor, personality, interests and rhetorical skills—are simultaneously open to attack when scientific testimony is subjected to the adversary process."[33] These factors all tend to undermine, as critics point out, the quality and integrity of the scientific information factored into courtroom deliberations.

It is not always the case, however, that adversarial proceedings distort the presentation of scientific knowledge by expert witnesses. Jasanoff suggests that the adversary system more often than not simply reveals pre-existing inconsistencies and professional disagreements within various scientific disciplines. It has long been acknowledged that the authority of most scientific claims to truth derives, "not directly, from the representation of physical reality, but indirectly, from the certification of claims through a multitude of informal, often invisible, negotiations among members of relevant disciplines."[34] Furthermore, most scientists prefer to air their

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31. *Id.* at 45-46.

32. *Id.* at 45, 47-48.

33. *Id.* at 54.

34. *Id.* at 52. For the classic view that what counts as valid scientific knowledge arises through a process of negotiation and compromise among influential practitioners of science, see THOMAS KUHN, THE STRUCTURE OF SCIENTIFIC REVOLUTIONS (1962). For a recent example of the contentious nature of producing valid scientific knowledge, see Sandra Blakeslee, *Heretical Theory on Brain Diseases Gains New Ground*, N.Y. TIMES, Oct. 8, 1991, at C1; Gina Kolata, *Virus or Prions: An Old Medical Debate Still Rages*, N.Y. TIMES, Oct. 4, 1994, at C1; Lawrence K. Altman, *Mad Cow Epidemic Puts Spotlight On Puzzling Human Brain Disease*, N.Y. TIMES, Apr. 2, 1996, at C3. These articles describe the debate over "prions," tiny proteins now widely believed to be responsible for Creutzfeldt-Jakob disease, a neuro-degenerative brain affliction which is a human version of "Mad Cow Disease." Controversy first arose when Dr. Prusiner, a neurologist at the University of California at San Francisco, proposed in 1981 that prions—even though they often carry no genetic material—act

differences within the confines of professional meetings and journals, away from public scrutiny, in order to avoid the weakening of public trust in their professional authority and judgments.[35] Thus, instead of obscuring otherwise coherent expert testimony, the adversary process often exposes truly conflicting or undeveloped areas of scientific and technical knowledge. This is exemplified by the fact that research ensues or is undertaken more vigorously on certain scientific issues only after the onset of litigation.[36]

A majority of the numerous existing federal administrative agencies—the unofficial "fourth branch" of government[37]—arose this century to help address the complexities and hazards posed by the proliferation of industrial, commercial and consumer technologies. In chapter four, Jasanoff explores the paradoxical power that lay judges possess "to overturn decisions made by administrative agencies with considerably greater technical expertise and policy experience."[38] Taking three such agencies as her focus—the Environmental Protection Agency (EPA), Occupational Safety and Health Administration (OSHA) and Consumer Product Safety Commission (CPSC)—Jasanoff examines the difficulties which arise in specific cases when courts elect to overturn regulatory decisions.

Jasanoff focuses on caselaw arising after the late 1960s when, in addition to regulating technologies that were known to be harmful, agencies were charged by Congress with identifying and controlling hazards posing serious threats to the environment and to public

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as an infectious agent in carrier organisms in the same way that bacteria, viruses and fungi do. Dr. Prusiner was frequently the subject of hostility and derision by others in his field because his theory of prions contravenes the long held tenet of molecular biology that genetic material, such as DNA or RNA, must necessarily be present in order for infectious agents to spread disease. Nevertheless, because more colleagues took an interest in his theory of prions and subsequent research supported its plausibility, Dr. Prusiner won the prestigious Albert Lasker Award for basic medical research in 1994. Even though the evidence is not yet conclusive, prions are now commonly accepted as the cause of Creutzfeldt-Jakob disease and other related afflictions.

35. JASANOFF, *supra* note 6, at 50.

36. *Id.* Jasanoff provides examples of investigations into the causal connections between electromagnetic fields and cancer and between silicone gel breast implants and immune system disorders.

37. Administrative agencies are regarded by many commentators in this way because the Constitution—expressly authorizing the establishment of executive, legislative and judicial branches—makes no discrete provision for administrative agencies.

38. JASANOFF, *supra* note 6, at 69. Such power of review was conferred upon federal courts by the Administrative Procedure Act of 1946, *repealed by Act and provisions incorporated into* 5 U.S.C. §§ 551 *et seq.* and 701 *et seq.*, and specific provisions within a majority of 1970s regulatory statutes. *See id.*

health and safety.[39] Again, she acknowledges that, in many instances, courts were not in the best positions to resolve the conflicting technical evidence presented by agencies and the parties opposing their decisions. Nevertheless, Jasanoff argues,

> [i]n consequence of aggressive judicial review, the obligation to explain complicated decisions in ways that could be understood by lay judges and the public became an entrenched feature of the U.S. administrative process .... [C]ourts set aside the myth that only scientists could say with certainty when there was a sufficient basis for action.[40]

Therefore, on her account, this democratization of technical decision making ought to be heralded, "even if the decisions that institutionalized the norm of public accountability were not always wise or beyond scientific reproach."[41]

Normally, academic science and law have little occasion to cross paths. In chapter five, Jasanoff examines those instances where the professional activities of researchers and the internal workings of academic science become subject to legal scrutiny. It is in these circumstances "perhaps more than in any other setting," she posits, that "courts have to confront the discrepancies between science's idealized claims to special status and its actual social practices."[42]

Jasanoff identifies two major routes by which courts can become involved in the practice of academic science: (i) through charges of misconduct against scientists and scientific institutions, and (ii) through lawsuits motivated by religious or moral opposition to certain scientific projects. As to the first route, she finds that courts are very reluctant to disturb the process of peer review, employed by scientists to allocate research funds, select papers for publication and determine entitlement to promotion and professional awards. Furthermore, "[j]udges on the whole have been more cautious about second-guessing federal agencies that sponsor scientific research than they are about second-guessing agencies that are responsible for regulating hazardous technologies."[43] As to the second route, she claims that courts will more aggressively police the boundaries of scientific activity when the health or rights of human subjects are at

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39. *Id.* at 71.
40. *Id.* at 91.
41. *Id.* at 92.
42. *Id.* at 93.
43. *Id.* at 96. Examples of federal agencies that sponsor scientific research include the National Institutes of Health (NIH) and the National Science Foundation (NSF).

stake.[44] In dealing with the claims of activists seeking to curtail animal experimentation or creationists seeking to promote theories of "creation science" over those of evolution, however, the judiciary has been more sympathetic to scientists. Ultimately, Jasanoff argues, "for all their willingness to probe the hinterlands of scientific practice when their own institutional interests are at stake, courts remain reluctant to participate in frontal assaults on the belief system of science or its methods of acquiring knowledge."[45]

In the remaining chapters of the book, Jasanoff brings to bear the perspectives she develops in chapters two through five to more specific areas of litigation involving controversial treatment of science and technology. In chapter six, on toxic torts, she examines how the difficulties in establishing conclusive causal links between the harms incurred by innocent plaintiffs and the toxic substances produced by defendants came to engender larger ideological conflicts. Thus, "[s]upport for or opposition to the current system inevitably signals commitment to a more complex set of values concerning the rights and responsibilities of individuals and corporations and the optimal way to apportion financial and moral blame for harms inflicted by technology."[46] This having been acknowledged, however, Jasanoff does not provide a very satisfactory account of the beneficial role that courts do or can play in disputes about toxic torts.

Chapter seven focuses on the law's encounters with genetic engineering, chapter eight on its role in sorting out conflicts involving reproductive technology and changing notions of family, and chapter nine on issues involving life-sustaining technology. In all three chapters, Jasanoff seeks to illustrate the judiciary's central role in constructing public understandings of technology and accommodating technological change.[47] Thus, before federal courts were drawn into regulating biotechnology, there was considerable disparity between the publicly perceived and scientifically assessed risks of genetic engineering. The courts, however, by articulating legal parameters and establishing requirements such as environmental impact statements for the practice of genetic engineering, have helped to provide a framework for public debate. In *Diamond v. Chakrabarty*,[48]

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44. *See, e.g.*, Moore v. Regents of the Univ. of Cal., 793 P.2d 479 (1990), *cert. denied*, 499 U.S. 936 (1991) (holding that a research physician who derived, without permission, a valuable cell-line from the spleen tissue of one of his patients for use in experiments had violated a duty of informed consent).

45. JASANOFF, *supra* note 6, at 113.

46. *Id.* at 115.

47. *Id.* at 140, 180, 184.

48. 447 U.S. 303 (1980).

for example, the Supreme Court held that a genetically altered form of bacteria was patentable subject matter under section 101 of the Patent Act.[49] Even though this decision may not have diffused the controversy over genetic engineering,[50] the Court did provide a definitive guideline for its practice, whereas Congress neglected entirely to address the matter. As Jasanoff puts it, "[f]ar from playing an obstructionist role, the courts have helped to normalize genetic engineering by providing forms and methods of discourse that made the applications of the technique seem amenable to control."[51] So too with reproductive and life-sustaining technologies, the courts have helped to ease the public impact of new innovations, even if their rulings on specific issues or the results of particular cases are not always widely approved.

In the final chapter, Jasanoff ties together the many themes of *Science at the Bar*. Here, she effectively summarizes her major insights and critical assessments. It is true that excess litigation may have an adverse effect on technological innovation, that case-by-case adjudication often leads to incoherent results in the evaluation of technical evidence and that judicial review may subvert the credibility of regulatory agencies.[52] Nevertheless, despite their various shortcomings, "[l]awsuits . . . are an essential part of the process by which American society comes to grips with the moral, material and institutional dimensions of technological change."[53] Overall, Jasanoff credits the courts with three major accomplishments in the course of legal proceedings involving science and technology: deconstructing expert authority, promoting civic education and effectively answering public demands for equity, efficiency and responsiveness in decisions involving science and technology.

CONCLUSIONS

Science at the Bar is a provocative and well-written exposition of the many ways in which law, science and technology mutually influence each other's development. In a time when the judiciary and the law itself have come under increasing attack, Jasanoff's endeavor to clarify the ways in which the courts play a valuable role in mediating uncertainties in scientific practice and the process of technological change is a worthy one. Perhaps the most valuable

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49. 35 U.S.C. §§ 1-376.
50. *See, e.g.*, Animal Legal Defense Fund v. Quigg, 932 F.2d 920 (Fed. Cir. 1991).
51. JASANOFF, *supra* note 6, at 140.
52. *Id.* at 205.
53. *Id.* at 206.

aspect of the book is its critical evaluation of the ways in which misconceptions about the coherence and reliability of scientific knowledge get factored into both legal decisions and second-order critiques of the interaction between law, science and technology. Furthermore, Jasanoff's position that the law provides an appropriate public forum for addressing many of the moral and social consequences of new technologies is well worth underscoring.

Those readers who are not trained in the law or who are unfamiliar with the contemporary controversies addressed in *Science at the Bar* will find the book especially useful. It provides a well-informed, interpretive overview of some of the more vexing issues currently facing the American public. Lawyers and legal scholars already familiar with the matters presented in the book, however, may not find Jasanoff's analysis of particular issues as satisfying. Doubtless, her characterizations of the tensions and conflicts underlying various contemporary controversies are quite perceptive and provide useful insights. Nevertheless, although Jasanoff indicates throughout the book that she will offer substantive suggestions for policy reform based upon her overall analysis, such suggestions are ultimately vague in some instances and nonexistent in others.

There are two other noteworthy weak points in *Science at the Bar*. The first is its surprising omission of an account of intellectual property,[54] an area of law exerting a profound impact on the practice of science and the development of technology in America. Not only do intellectual property law and policy affect the pace of scientific and technological innovation,[55] but they also significantly influence the public's rights respecting access to and use of such innovations.[56] The second weak point is that Jasanoff's analysis of actual legal proceedings focuses only on prominent appellate cases. Consequently, she underestimates the important and more widespread role that jury

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54. The bodies of law governing intellectual property include patent law, trade secrets law, trademark and unfair competition law, and copyright law. Many other areas of law, such as contracts and antitrust law, also impinge on the protection of intellectual property rights.

55. *See generally* FREEMAN, *supra* note 1. *See also* Suzanne Scotchmer, *Standing on the Shoulders of Giants: Cumulative Research and the Patent Law*, 5 J. ECON. PERSP. 29 (1991).

56. *See, e.g.*, U.S. PATENT AND TRADEMARK OFFICE INFORMATION INFRASTRUCTURE TASK FORCE, INTELLECTUAL PROPERTY AND THE NATIONAL INFORMATION INFRASTRUCTURE: THE REPORT OF THE WORKING GROUP IN INTELLECTUAL PROPERTY RIGHTS 213 (Final Report, Sept. 5, 1995) (the White Paper) (proposing amendments to the Copyright Act which would grant the owners of copyrighted works—including software, audio-visual images and literary compositions—the exclusive right to transmit them in networked electronic environments such as the Internet).

trials play in addressing the challenges that science and technology pose to the public's expectations of liberty, privacy and physical well-being. Especially since she expresses concern for how the public comes to regard and affect the involvement of science and technology in their lives, one would expect Jasanoff to be more interested in the role which juries—direct representatives of the public—play in the adjudication of science and technology-related conflicts.[57] Beyond acknowledging that "[j]uries, who are responsible for a high percentage of legal fact-finding, represent [a] lower level of scientific sophistication [than judges],"[58] Jasanoff gives short shrift to appraising their actual or potential role in legal proceedings involving science or technology.

These undeveloped aspects of Jasanoff's inquiry do not, however, detract from the book's importance. The broader themes developed in *Science at the Bar* are valuable in their own right and provide excellent points of departure for more in-depth studies of particular areas of law.

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57. For a recent case illustrating the sensitive and sometimes contested role that juries play in the resolution of conflicts involving science and technology, see Markman v. Westview Instruments, 52 F.3d 967 (Fed. Cir. 1995), *cert. granted*, 116 S. Ct. 40 (1995) (holding that the interpretation and construction of patent claims, which define the scope of patent holders' rights, is a matter of law to be decided by judges, not by juries).

58. JASANOFF, *supra* note 6, at 43.