

FOCUS: SCIENCE AND THE LAW

Introduction

Cross-Examination?

*By D. Graham Burnett**

ABSTRACT

From Galileo to the Bhopal tort litigation, Scopes to OncoMouse®, Lysenko to the lie detector, the agonistic and alethic forum of the courtroom has offered unique opportunities to witness science and scientists being made and unmade. Evolving legal systems have consistently been forced to draw on (or defensibly away from) scientific knowledge, scientific methods, and scientific experts in the pursuit of truth and justice. At the same time, courts—in many ways the original site for the production of social facts—have to a significant extent shaped both the theories and the practices of knowledge production central to the emergence of modern science. This Focus section draws together a set of scholars at work on these borrowings and aims to stimulate more research in an important and fast-expanding area of scholarship.

IN DECEMBER 1818 William Sampson, an Irish Jacobin agitator turned New York lawyer and serial pamphleteer, lit up the Mayor's Court of Manhattan with a fiery rant against the pretensions of natural philosophy and, specifically, against the culotte-wearing metaphysicians who periodically showed up to lecture his juries about the nature of reality. Science? Learning? Expertise? Said who? Dismissing the high-handed pronouncements of the city's leading medical doctor (who had just taken the stand in *Maurice v. Judd* to testify—on the basis of the latest French comparative anatomy—that *whales* were not *fish* and thus were not properly subject to tariffs and taxes on fish products), Sampson conjured up a long history of scientific hubris and error, softening up the gallery for his finale, a peroration on the need for a more open and democratic approach to science, wherein the

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adversarial mechanisms of the trial court—and, as it happened, the bulldogging of contentious lawyers like himself—would hold the key to the progressive knowledge of nature:

Had certain opinions of Aristotle, before they became articles of faith, been brought to the test of common sense, and that great man been called as a witness in the Heliaia, or other Athenian courts, and had some Crito, Phocion, or Isocrates, used the privilege of cross-examination, the schools would not have been occupied till our own times, with the unprofitable doctrines of form, privation, and matter, categories, sophisms, and syllogisms.

Scholastic physics, on this account, would have collapsed like a pillar of sand had it been subjected to the buffeting of a zealous opposing counsel. Imagine: no tedious clutching at Ptolemy, no Papist apologists for celestial sophistry, no millennial indoctrination in falsehood. In Sampson's demotic reverie, it was not that philosophy itself arose in the flight from the sophists of the Heliaia (the standard story of the birth of Greek rationality) but, rather, that by hiding from the *rhetors*, by slinking away from the courts, those first lovers of knowledge had in fact gone tragically astray. Moreover, as Sampson was quick to point out, calling science to the bar of common sense, common language, and the common man (a little populist genuflection here) constituted the very glory of a republic, where no clique of self-declared adepts ought ever be permitted to take refuge behind the ermine robes of princely power or the black veils of cultish priestcraft: "I am," Sampson announced proudly (when his rough handling of the distinguished doctor on the stand drew objections), "upon duty like a sentinel, bound to challenge every witness, and not let King nor Kayser pass, till he advance the parol." The parol was truth, and truth was originally and ultimately the business of the *court*.¹

In the wake of a quarter century of work in the history and sociology of science that has now unfolded in considerable detail the formal and genealogical links between scientific and legal practices (particularly in the early modern period, an era still of canonical significance in the field as a whole), Sampson's grandstanding on behalf of the primacy of the jurists could almost pass as a theory of science and society—which, in fact, it was.² It is of course by no means the only one available, then or now: I am reminded of a minor news item that surfaced in the midst of the tortured saga of the O. J. Simpson trial. A media-oriented performance artist—*cum*—con man issued a formal looking press release (on the letterhead of a fictitious but plausible-sounding research institute) announcing the creation of a new and sophisticated computer system that had crunched the evidence and

¹ The two quotations are drawn from a pamphlet transcript of this remarkable trial: William Sampson, *Is a Whale a Fish? An Accurate Report of the Case of James Maurice against Samuel Judd* (New York: Van Winkle, 1819), pp. 68–69, 34. I deal with *Maurice v. Judd* in some detail in my forthcoming book: D. Graham Burnett, *Trying Leviathan* (Princeton, N.J.: Princeton Univ. Press, 2007).

² No brief note can résumé this literature, but few summaries would omit the following: Barbara J. Shapiro, *Probability and Certainty in Seventeenth-Century England: A Study of the Relationships between Natural Science, Religion, History, Law, and Literature* (Princeton, N.J.: Princeton Univ. Press, 1983); Steven Shapin and Simon Schaffer, *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life* (Princeton, N.J.: Princeton Univ. Press, 1985); Lorraine Daston, "Marvelous Facts and Miraculous Evidence in Early Modern Europe," *Critical Inquiry*, 1991, 18:93–124; Shapin, *A Social History of Truth: Civility and Science in Seventeenth-Century England* (Chicago: Univ. Chicago Press, 1994); and Shapiro, *A Culture of Fact: England, 1550–1720* (Ithaca, N.Y.: Cornell Univ. Press, 2000). As for Sampson himself: he was philosophically opportunistic, to be sure, but his posture in *Maurice v. Judd* had deeper roots in the radical politics of the 1790s. For a sense of this see Jessica Riskin's treatment of Robespierre's evolving view of the relationship between physics and jurisprudence in *Science in the Age of Sensibility: The Sentimental Empiricists of the French Enlightenment* (Chicago: Univ. Chicago Press, 2002), Ch. 5.

resolved the case: O.J. was guilty; the computer had proven it! The merry prankster (who would probably have been content simply to frame the press release for his gallery show—as a tangible artifact of his ironical “happening”) was ill prepared for the television crews that actually showed up to tape segments for the evening news, and he found himself hustling to jury-rig a rather sad screen saver on his PC that showed a picture of the defendant under a bold and flashing verdict—anything to keep the joke going. Undaunted by this pathetic display of juridical technoscience, and thoroughly seduced by the Enlightenment-era fantasy of scientifically automated social justice, the crews shot the segment anyway: the idea was simply irresistible. While that story ultimately wound up in the (ample) annals of supine media gullibility, other “technologies of truth”—from forensic phrenology to “mind fingerprinting”—have had (and continue to have) their day in court.³

Indeed, my own interest in the topic of this Focus section can be traced to two long weeks in February 2000, when I spent a good deal of time sitting in a Manhattan courtroom listening to a precise Asian-American woman offer expert testimony on the identity of the person(s) whose blood had splattered the walls, furniture, door, mail slot, and front steps of a West Village apartment—the scene of a gruesome murder that I and eleven other jurors would be charged to sort out during four days of isolated deliberations.⁴ For anyone with a scholarly interest in the making of facts, the juror’s chair is a stool for serious meditation.

It is in the spirit of such meditation that the authors offer *Isis* readers this set of short papers. From intellectual property to midwifery, the neoliberal world order to sleepwalking, these essays tease out some of the complicated ways that scientific expertise has been

³ They have also drawn the attention of historians. See Ken Alder, *The Lie Detectors: The History of an American Obsession* (New York: Free Press, 2007), together with his several articles on the same topic: “America’s Two Gadgets: Of Bombs and Polygraphs,” *Isis*, 2007, 98:124–137; “A Social History of Untruth: Lie Detection and Trust in Twentieth-Century America,” *Representations*, 2002, 80:1–33; and “To Tell the Truth: The Polygraph Exam and the Marketing of American Expertise,” *Historical Reflections*, 1998, 24:487–525. Alison Winter, who contributes a piece on forensic hypnosis to this Focus section, has looked at the history of sodium pentothal and other “truth serums” as part of her forthcoming history of the sciences of witnessing. Also useful in this general area are Simon A. Cole, *Suspect Identities: A History of Fingerprinting and Criminal Identification* (Cambridge, Mass.: Harvard Univ. Press, 2001); and Jennifer Mnookin, “The Image of Truth: Photographic Evidence and the Power of Analogy,” *Yale Journal of Law and the Humanities*, 1998, 10(1):1–74. One of the early and ambitious efforts to tie forensic technologies to broader epistemological problems in the humanities, arts, and emerging human sciences should not be overlooked: Carlo Ginzburg, “Clues: Roots of an Evidential Paradigm,” *History Workshop*, 1980, 9:5–36 (this was the English translation of the original Italian essay that appeared in 1979). By the early 1990s historicizing proof and evidence had become a major interdisciplinary project, to which philosophers, legal scholars, historians of science, and literary critics all contributed. These investigations went beyond forensic practices as such but never strayed too far from law and courts. For a stimulating summary of this work see James Chandler, Arnold I. Davidson, and Harry Harootunian, eds., *Questions of Evidence: Proof, Practice, and Persuasion across the Disciplines* (Chicago: Univ. Chicago Press, 1994).

⁴ Tal Golan has taken up the history of this very form of expert witnessing in “Blood Will Out: Distinguishing Humans from Animals and Scientists from Charlatans in the Nineteenth-Century Courtroom,” *Historical Studies in the Physical and Biological Sciences*, 2000, 31:93–124; this material also appears in his general study of the topic of scientific witnesses in the Anglo-American judicial system: Golan, *Laws of Men and Laws of Nature: The History of Scientific Expert Testimony in England and America* (Cambridge, Mass.: Harvard Univ. Press, 2004), Ch. 4. Also useful in this area (since it touches on the Continent as well and has several strong analytical chapters) is Roger Smith and Brian Wynn, eds., *Expert Evidence: Interpreting Science in the Law* (London: Routledge, 1989). Specifically medical witnessing (like that discussed by Silvia De Renzi in her piece in this Focus section) has been the subject of several specialized studies. See, e.g., Smith, *Trial by Medicine: Insanity and Responsibility in Victorian Trials* (Edinburgh: Edinburgh Univ. Press, 1981); and James C. Mohr, *Doctors and the Law: Medical Jurisprudence in Nineteenth-Century America* (Baltimore: Johns Hopkins Univ. Press, 1993). I wrote about my own experience in the courtroom in D. Graham Burnett, *A Trial by Jury* (New York: Knopf, 2001).

deployed in the formal contests of social regulation and punishment. Alison Winter traces the rise and fall of a novel scientific technique for accessing (and guaranteeing the veracity of) human memory: if the mind recorded events in a ledger that lay beneath the reach of ordinary consciousness, then a new cohort of properly trained experts would be able to mobilize ordinary people as repositories of extraordinary happenings; it would be as close as investigators were likely to get to omniscience. Omniscience, of course, would resolve many legal matters. But not all. As an evidence professor I know likes to point out: if we ever discover a time machine, evidence classes will disappear from the law school curriculum—but the first-year course on property will not. And as Daniel Kevles shows in his essay on the prehistory of patenting living creatures, those who possessed deep craft knowledge of breeding and hybridization found ways to mobilize available legal and extralegal resources to protect their intellectual property. Because modern intellectual property regimes disallow the patenting of natural laws or facts, but permit individuals to stake a claim to techniques and applications, this vast area of legal doctrine and case law affords a remarkable arena where ideas of “pure” and “applied” science square off in high-stakes tournaments. If in Winter’s essay we catch a glimpse of the role of the law in shaping key concepts in the sciences of mind and behavior in the twentieth century, then, in an analogous way, Silvia De Renzi points to legal proceedings as a critical site for the construction of the body (and the investigation of its workings) in the early modern period. Bodies, minds, property: in a caustic and personal essay, Sheila Jasanoff, one of the earliest and most important commentators on the entanglements of law and technoscience, here turns her attention to the global and local repercussions of legal regimes that use scientific uncertainty to protect the mercurial flow of capital, even as large parts of the world come to look like a cesspool.⁵

Broad and rich as these contributions are, there are unifying themes that thread between periods and places. Each case, it might be noted, hinges at that difficult spot where the two tines of Hume’s fork (perhaps better, Hume’s scissor?)—statements about the world on one side, statements about ideas on the other; or, to use a more Kantian language, facts and values, is and ought—come together, and this may be a general feature of the problems raised when science enters the court or emerges therefrom. At a slightly more mundane level, it is worth considering the role of legal proceedings in the dynamics of scientific professionalization: each of these essays is concerned with learned communities whose identities are bound up with their success in the arena of the law.

For all the interest of these and other intersections among the essays in this Focus section, the four pieces are probably best treated as a set of fingerposts, pointing the way to vast areas for future work and suggesting different approaches. For instance, there is certainly much to be said for further investigations into the place of science and technology in the actual practices of courts at different times and places. And yet the increasingly sophisticated commercialization of research science and the transformation of systems of credit and funding have meant that the courts have played more and more complex roles in scientific life: scientific fraud, priority disputes, the regulation of research on ethical and political grounds—all of these topics too offer important problems for the historian

⁵ Sheila Jasanoff, *Science at the Bar: Law, Science, and Technology in America* (Cambridge, Mass.: Harvard Univ. Press, 1995), remains an excellent point of departure for this area as a whole. Environmental issues afford particularly rich terrain for historians of science willing to tap legal sources and interested in the role of scientific expertise in legislation and policy. A good point of departure for these problems is David Delaney, *Law and Nature* (Cambridge: Cambridge Univ. Press, 2003).

of science. Nor are we limited to those two vectors—“science-in-the-courts” or “the-courts-in-science”—regardless of how much remains to be done in those areas. We have by no means exhausted the deep vein of scholarship that has for a long time sought historical links between legal concepts and practices and those of the evolving sciences. Yes, the laws of nature and the laws of kings have danced several times; and yes, civil “constitutions” can be modeled on Newtonian planetary dynamics; but are there claims of comparable breadth that will emerge in the era of the Internet and the modern administrative state? What is to be made, for instance, of the fate of the proposals for a “Science Court” in the United States in the 1970s?⁶ Finally, putting aside these vast speculations and returning to thoroughly pragmatic matters, it is worth remembering the extraordinary body of juicy primary source material that has become available to historians and students of history in the last twenty years, as legal records have been digitized faster and more completely than any comparable corpus. From the records of the Old Bailey, to the staggering resources of Westlaw, to the massive archives of several important tort litigations, an Internet portal can now deliver reams of fully searchable court material, opening windows onto dramatic moments in the history of science, technology, and society. For teaching purposes (how many of our students go on to law school?), as well as for our own research, there is every reason to take advantage of these new resources.

For historians of science, the courts beckon.

⁶ For an introduction to this topic see Arthur Kantrowitz *et al.*, “The Science Court Experiment: Criticisms and Responses,” *Bulletin of the Atomic Scientists*, 1977, 33(4):43–53.

Medical Expertise, Bodies, and the Law in Early Modern Courts

By *Silvia De Renzi**

ABSTRACT

Going beyond Enlightenment critiques of *ancien régime* justice, historians are now exploring its distinctive procedures; courtrooms have become a fundamental site for recapturing early modern political and social dynamics. Historians of science and medicine can benefit too. Serving as expert witnesses was prominent among the activities of medical practitioners; and, especially in Continental Europe, natural and medical knowledge was routinely presented and contested in tribunals. This essay aims to promote further research on the resulting wealth of manuscript and printed sources that give access to crucial social and epistemological issues. The voices of different actors, preserved in trial records, can extend our histories of the body. The relations among medical practitioners, and with the legal authorities, provide a hitherto neglected context within which to understand contemporary epistemological debates, from claims and challenges to expertise to the definition and production of evidence, including the status of signs, personal observation, and tests.

OUR LANDSCAPE OF EARLY MODERN NATURAL KNOWLEDGE has recently been transformed. Bringing travelers, apothecaries, merchants, missionaries, and artisans into the picture allows historians to make sense of a wider range of specific practices and sites where such knowledge was produced. As a result, we can also look afresh at the contribution of the two traditional learned professions of medicine and the law. Medicine has always had a place in accounts of early modern natural knowledge, but recent work has convincingly shown how physicians' practices, including collecting and discussing cases, contributed to broader epistemological debates.¹ Given the competition from other medical practitioners, studies of early modern learned physicians are particularly well placed to help make sense of the building and contesting of intellectual and social authority.

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¹ Gianna Pomata, "Praxis Historialis: The Uses of *Historia* in Early Modern Medicine," in *Historia: Empiricism and Erudition in Early Modern Europe*, ed. Pomata and Nancy G. Siraisi (Cambridge, Mass.: MIT Press, 2005), pp. 105–146. On our wider view of early modern knowledge see, e.g., Pamela H. Smith and Paula Findlen, eds., *Merchants and Marvels: Commerce, Science, and Art in Early Modern Europe* (New York: Routledge, 2002).

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By contrast, jurists have only recently entered the world of historians of science, although legal sources and examples were the basis of students' general dialectical training, as legalistic ways of arguing in astronomical disputes and natural historical compilations show. Francis Bacon's reformed natural philosophy has now been linked to his legal competence, and the fact-finding techniques used in the legal arena have been presented as one root of experimental philosophers' key notion of fact.²

Jurists were not alone, however; unique features of the *ius commune*—the mixture of Roman law and canon law followed in Continental European tribunals, as opposed to the common-law tradition that was dominant in the English-speaking world—meant that practitioners with specific expertise shared in establishing facts. Judges would routinely resort to expert witnesses, such as surveyors, when they lacked the competence to understand the details of a case. Since the Middle Ages, medical practitioners were much the most active expert witnesses, and on the Continent between the seventeenth and eighteenth centuries a special discipline of legal medicine was created. While Anglophone historians of science have brilliantly used the etiquette of princely courts to make sense of specific features of early modern natural investigations, the rules of another kind of court were every bit as important in determining which natural phenomena would be explored, how, and by whom.³

Since encounters between medical and legal experts in Continental courtrooms focused on bodily issues, medicolegal sources can enrich the history of the body. I wish more specifically to show how they might throw light on two questions now at the center of research on early modern medicine and science. On the one hand, these materials offer a new perspective on the definition of, and negotiations surrounding, experts' authority; on the other, they provide insights into a kind of knowledge that did not meet the highest Aristotelian standards of universality and necessity but nevertheless played the dominant role in many fields. A distinct discipline at the intersection between medicine and the law, legal medicine centered on semiology, the complex art of reading signs. One of the most important and difficult-to-learn doctrines, allegedly distinguishing the educated physician from the crowd of unlearned practitioners, semiology was also one of the most conjectural parts of medicine: bodily signs were ambiguous and could be the effects of very different causes. We now have comprehensive accounts of the logic on which semiology rested and of practical semiology at the bedside;⁴ studying medicolegal practice allows us to see these skills used more expansively in one of the most important functions of *ancien régime* societies: the administration of justice.

I begin, though, with a brief survey of the historiography of legal medicine and how recent changes have started to unlock its potential for a broader history of early modern knowledge.

² Rose-Mary Sargent, "Scientific Experiment and Legal Expertise: The Way of Experience in Seventeenth-Century England," *Studies in History and Philosophy of Science*, 1989, 20:19–45; Barbara J. Shapiro, *A Culture of Fact: England, 1550–1720* (Ithaca, N.Y.: Cornell Univ. Press, 2000); and James Franklin, *The Science of Conjecture: Evidence and Probability before Pascal* (Baltimore: Johns Hopkins Univ. Press, 2001).

³ Mario Biagioli, *Galileo, Courtier: The Practice of Science in the Culture of Absolutism* (Chicago: Univ. Chicago Press, 1993); and Paula Findlen, *Possessing Nature: Museums, Collecting, and Scientific Culture in Early Modern Italy* (Berkeley: Univ. California Press, 1994).

⁴ Ian Maclean, *Logic, Signs, and Nature in the Renaissance: The Case of Learned Medicine* (Cambridge: Cambridge Univ. Press, 2002); Nancy G. Siraisi, *The Clock and the Mirror: Girolamo Cardano and Renaissance Medicine* (Princeton, N.J.: Princeton Univ. Press, 1997); and Brian Nance, *Turquet de Mayerne as Baroque Physician: The Art of Medical Portraiture* (Amsterdam: Rodopi, 2001).

NEW APPROACHES TO EARLY MODERN LEGAL MEDICINE

For a long time early modern medicolegal practice and theory were underinvestigated—at best, a niche interest for retired practitioners seeking the forerunners of their pet tests.⁵ Even when encounters between science, medicine, and the law became a well-established field of research, most studies began with the mid-eighteenth century. For scholars interested in the Anglo-American legal tradition, this starting point was determined by the so-called adversarial revolution in legal procedures—that is, eighteenth-century lawyers' admission to the courtroom, which led to cross-examination of expert witnesses engaged by the parties in the dispute. Only then was the experts' competence properly acknowledged and sought after. Even with regard to legal medicine on the Continent, where expert witnesses had been used routinely since the Middle Ages, historical research has been patchy and focused either on medieval "firsts" or on post-eighteenth-century cases, when medicolegal activities were part of the gradual expansion of physicians' authority.⁶ In general, scholars have preferred to work on the period when an emerging science was mobilized in renewed legal systems. Recently, however, things have started to change.

In her outstanding discussion of legal medicine up to the Enlightenment, Esther Fischer-Homberger approached the topic thematically and so was able to recapture how contemporary social and political concerns shaped medicolegal practice and doctrine. In the vast body of learned treatises at the center of her survey, two major areas stand out: sexuality and generation, on the one hand; and violent deaths, on the other. We have yet to process the astonishing amount of material she made available, and it was only in the early 1990s, as social historians started to dig into the medicolegal documentation accompanying trial records, that the extent of expert witnesses' presence in the courtroom (always in the form of written reports) started to be fully acknowledged and their day-to-day activities reconstructed.⁷

The medical reports, which were often brief and formulaic but sometimes longer and more doctrinal, throw new light on contemporary perceptions of the body. Take cases of suspicious death. Dissection was a common procedure, and the by now ubiquitous surgeons would take the size, color, and texture of solid organs into account in deciding the cause of death. We have been aware for a while now that cutting bodies was not taboo, but this evidence reinforces the need to reassess how the familiar Galenic humoral body intersected in this period with the surgical body's solid organs. More generally, one of the most interesting gains from trial documentation is the narratives included not only in expert witnesses' testimonies but also in lay witnesses' statements and defendants' declarations: together they provide rich sources for a history of the body from below.⁸

⁵ An exception is Erwin H. Ackerknecht, "Early History of Legal Medicine," *Ciba Symposia*, 1951, 11:1288–1304, rpt. in *Legacies in Law and Medicine*, ed. Chester R. Burns (New York: Science History Publications, 1977), pp. 249–271.

⁶ Carlo Colombero, "Il medico e il giudice," *Materiali per una Storia della Cultura Giuridica*, 1986, 16:363–381; and Michel Porret, ed., *Beccaria et la culture juridique des Lumières* (Geneva: Droz, 1997).

⁷ Esther Fischer-Homberger, *Medizin vor Gericht: Gerichtsmedizin von der Renaissance bis zur Aufklärung* (Bern: Huber, 1983). On expert witnesses' presence in the courtroom see, among others, Michael Clark and Catherine Crawford, eds., *Legal Medicine in History* (Cambridge: Cambridge Univ. Press, 1994); Alessandro Pastore, *Il medico in tribunale: La perizia medica nella procedura penale di antico regime (secoli XVI–XVIII)* (Bellinzona: Casagrande, 1998); and Vincent Barras and Michel Porret, eds., *Homo criminalis: Pratiques et doctrines médico-légales (XVIe–XXe siècles)*, *Equinoxe*, 1999, 22.

⁸ Mark Jackson, *New-Born Child Murder: Women, Illegitimacy, and the Courts in Eighteenth-Century England* (Manchester: Manchester Univ. Press, 1996); Gianna Pomata, *Contracting a Cure: Patients, Healers, and the*

Historians have long argued that the body underwent “medicalization” at the end of the classical age—that is, the rules regulating behavior and establishing the boundaries of normality were increasingly imposed by physicians, including through their involvement in both criminal and civil cases.⁹ Going to court was extremely common—and not just for the rich—and the range of natural and medical questions that arose is astonishing: from the resemblance of children to parents as evidence in paternity disputes to complex calculations of seniority at birth in disagreements over heredity, and from assessment of alleged illnesses in pleas for exemption from duties to the definition of miraculous healing in canonization trials. Here were strong incentives for physicians to reexamine the medical tradition, particularly as they had to contend with theological and legal experts, under whose competence issues related to the body had traditionally also fallen. The body was medicalized, but by exploring medicolegal sources we can provide richer accounts of this process. An example is in recent research on controversies over the rights of people with ambiguous sexual characters—hermaphrodites, as they were known.¹⁰ Some of the problems that emerge from these sources concern the authority of medical practitioners vis-à-vis their legal counterparts and the question of how medical knowledge fared in relation to legal procedure and jurists’ expectations.

EXPERTISE, SIGNS, AND THE MAKING OF EVIDENCE

A growing area of research, the history of early modern expertise can benefit from exploration of how expertise was used and contested in the legal arena. Early modern judges would routinely seek specific expertise where general consensus placed it: for example, competence on female bodies remained with midwives well after learned physicians had launched their attack on women’s knowledge, and surgeons were the main port of call in cases of violent death. It is useful to be reminded that before the Enlightenment and subsequent processes of professionalization, judges endorsed the allocation of competence established by a secular tradition or by guild regulations, expertise was assessed on the basis of practical skills rather than academic credentials, and social trust could come with membership in a corporation as much as with social rank. It is, moreover, difficult to overestimate the value to practitioners’ standing of being associated with courts of law.¹¹

The emergence of medicolegal practice and doctrine was certainly facilitated by the sharing of epistemological procedures between medicine and the law, including a focus on individual cases and, in particular, a two-pronged approach to them. First, jurists and physicians had to use clues to reconstruct events that were hidden, either because they had happened in the past or because they were altogether invisible; second, they had to place

Law in Early Modern Bologna (Baltimore: Johns Hopkins Univ. Press, 1998); and Cathy McClive, “The Hidden Truths of the Belly: The Uncertainties of Pregnancy in Early Modern Europe,” *Social History of Medicine*, 2002, 15:209–227. On early modern perceptions of the body see Barbara Duden, *The Woman Beneath the Skin: A Doctor’s Patients in Eighteenth-Century Germany* (Cambridge, Mass.: Harvard Univ. Press, 1991).

⁹ Maren Lorenz, *Kriminelle Körper—Gestörte Gemüter: Die Normierung des Individuums in Gerichtsmedizin und Psychiatrie der Aufklärung* (Hamburg: Hamburger Edition, 1999).

¹⁰ Valerio Marchetti, *L’invenzione della bisessualità: Discussioni tra teologi, medici e giuristi del XVII secolo sull’ambiguità dei corpi e delle anime* (Milan: Bruno Mondadori, 2001).

¹¹ Pastore, *Il medico in tribunale* (cit. n. 7), p. 144; McClive, “Hidden Truths of the Belly” (cit. n. 8); and Pomata, *Contracting a Cure* (cit. n. 8). On the history of early modern expertise see, e.g., Peter Dear, *Discipline and Experience: The Mathematical Way in the Scientific Revolution* (Chicago: Univ. Chicago Press, 1995); and Eric H. Ash, *Power, Knowledge, and Expertise in Elizabethan England* (Baltimore: Johns Hopkins Univ. Press, 2004).

these events or phenomena within general rules, which had usually themselves been based on individual cases. Within this procedure, ranking and evaluating indications or signs played a dominant role.¹² The status of semiology in Aristotelian logic was complex, and it was widely accepted that ambiguous bodily signs, especially, could never lead to necessary and causal knowledge; the result was merely conjectural and rested, at best, on knowledge of what happens most of the time. Furthermore, arguing from sensory experience to causes was an inferior form of demonstration; but as historians are increasingly concerned with practices of knowledge that fell outside the strict Aristotelian criteria, physicians' epistemological strategies become particularly interesting. For their part, jurists' treatises set out complicated hierarchies of clues pertaining to different crimes, though assessing them was at the judge's discretion and indications remained a weaker form of evidence than testimony.¹³

Physicians seem to have suffered most for their failure to produce necessary and universal knowledge, and, interestingly, among the weapons they used to bolster their status was the claim that, unlike the law, medicine could at least draw on the universal principles of natural philosophy. Whatever the physicians' view, epistemological weakness did not prevent judges from holding a firm grip on society; by contrast, physicians did not always fare well with their patients. Epistemological strength did not map onto social authority, and this is precisely where the history of legal medicine—including how medical evidence was built up and assessed in the courtroom—becomes a particularly fruitful area of investigation and a valuable vantage point from which to revisit well-established topics in the historiography of early modern natural knowledge and medicine. Before it can be used to full effect, however, finer-grained accounts of specific legal settings and procedures are required.

Much research in the history of legal medicine has relied on legal historians' account of how an inquisitorial procedure was established in Continental courtrooms between the twelfth and thirteenth centuries, replacing an earlier accusatorial, or triadic, model.¹⁴ No longer mediators between the parties to a dispute, judges took full charge of the investigation, the interrogation of the witnesses, and the issuing of the sentence. However, the story of the replacement of one model by the other has recently been questioned, and a more nuanced account of the coexistence of various features of the two procedures has gained consensus. For example, the parties retained a stronger presence than previously thought, including—what is important here—their ability to nominate expert witnesses.

¹² Catherine Crawford, "Legalizing Medicine: Early Modern Legal Systems and the Growth of Medico-Legal Knowledge," in *Legal Medicine in History*, ed. Clark and Crawford (cit. n. 7), pp. 89–116. The dynamic between individual cases and norms in legal reasoning is explored in Manlio Bellomo, "'Factum' e 'ius': Itinerari di ricerca tra le certezze e i dubbi del pensiero giuridico medioevale," *Rivista Internazionale di Diritto Comune*, 1996, 7:21–46; for the medical scene see Nancy G. Siraisi, "'L' 'individuale' nella medicina tra Medioevo e Umanesimo: I 'casi clinici,'" in *Umanesimo e medicina: Il problema dell' 'individuale'*, ed. Roberto Cardini and Mariangela Regoliosi (Rome: Bulzoni, 1996), pp. 33–62; for broader reflections on cases see John Forrester, "If P, Then What? Thinking in Cases," *History of the Human Sciences*, 1996, 9:1–25.

¹³ On physicians' epistemological strategies see Heikki Mikkeli, *An Aristotelian Response to Renaissance Humanism: Jacopo Zabarella on the Nature of the Arts and Sciences* (Helsinki: SHS, 1992); Ian Maclean, "Evidence, Logic, the Rule, and the Exception in Renaissance Law and Medicine," *Early Science and Medicine*, 2000, 5:227–257; and Nancy G. Siraisi, *Medicine and the Italian Universities, 1250–1600* (Leiden: Brill, 2001). On the complications of assessing "indicators" as evidence see Giorgia Alessi Palazzolo, *Prova legale e pena: La crisi del sistema tra evo medio e moderno* (Naples: Jovene, 1979). For a discussion of the different take on the logical tradition by physicians and jurists see Maclean, "Evidence, Logic, the Rule, and the Exception."

¹⁴ Alessandro Giuliani, "Prova (filosofia)," in *Enciclopedia del diritto*, Vol. 37 (Milan: Giuffrè, 1988), pp. 518–579.

Well before the emergence of the adversarial trial, this made medicolegal practice much more contentious than we have appreciated.

In discussing how to deal with cases of alleged poisoning, the seventeenth-century judge Antonio Maria Cospi advised proceeding as follows: the victim's vomit was to be fed to a dog in the presence of the judge, a notary, and a clock; careful note should be taken as to whether and when the symptoms of poisoning started to appear, and the record could then be used as evidence. It is interesting that, according to Cospi, a judge—not a physician—should supervise what was a well-established procedure. Assessing allegedly poisonous substances usually fell to medical expert witnesses; but Cospi was frustrated with physicians' overconfidence, in particular their tendency to favor natural causes of death over poisoning. He was clearly referring here to expert witnesses giving testimony on behalf of defendants, and he claimed that they could severely hinder the administration of justice. His book was meant to show judges how to examine evidence for themselves and so stand up to medical experts' arrogance.¹⁵

This reaction may have been extreme, but it shows that concern about the role of the experts was building. Cospi was arguing for his role as the main investigator in the cases he oversaw and for his right to retain complete discretion in the evaluation of evidence. This is also a reminder that *ancien régime* justice was highly individualized and that the assessment of specific circumstances often prevailed over the application of the law—Enlightenment reformers would define this as arbitrary and unfair. Moving beyond prejudice and digging into the archives, historians have now started to make sense of how the system worked—for example, by exploring the social dynamics and expectations involved in going to court.¹⁶ Only slowly is a new picture emerging, and much still has to be done to establish how legal evidence was produced and assessed in practice; it is within this framework, though, that a richer understanding of the nature and use of medical evidence will also be gained.

The uncertainties surrounding the body as a source of evidence could be skillfully used by parties' expert witnesses. But even when a medical practitioner testified at the behest of the judge controversies might arise. Normally surgeons, midwives, and physicians were expected to assess bodily signs in relation to specific questions. Was the wound lethal? Could an illness explain the state of the viscera, or was poison to blame? Had a baby been stillborn or born alive? By the beginning of the seventeenth century, handbooks instructing medical practitioners how to record and assess what they could see or touch started to appear. Their interpretations could be relatively simple and might even include popular assumptions—abundant bleeding from a wound is bad; nails indicate that the baby was mature, therefore very likely alive—but could become much more complex.

Here is an example presented by Paolo Zacchia, a contemporary of Cospi and the author of the first systematic treatise of legal medicine. A few days after dinner with a friend, a man feels unwell, quickly deteriorates, and dies. Doubts arise, an investigation is opened, and an autopsy is ordered: the dead man's viscera are found to be swollen and their color is suspicious. A charge of poisoning is made. After gathering inconsistent evidence from

¹⁵ Antonio Maria Cospi, *Il giudice criminalista: Opera del Sig. Antonio Maria Cospi: Distinta in tre volumi: Dove con dottrina teologica, canonica, civile, filosofica, medica, storica, e poetica si discorre di tutte quelle cose, che al Giudice delle cause criminali possono avvenire* (Florence: Zanobi Pignoni, 1643), pp. 452 (describing the procedure), 422 (regarding experts' arrogance).

¹⁶ See, e.g., Renata Ago, "Una giustizia personalizzata: I tribunali civili di Roma nel XVII secolo," *Quaderni Storici*, 1999, 101:389–412.

various witnesses, the prosecutor asks for the advice of a physician—Zacchia. His *consilium* is built as a checklist of all known poisons and their *modi operandi*, including the symptoms they usually bring about.¹⁷ Having found that none is present in this case, he concludes—although admitting that the autopsy strongly points toward poisoning—that the death was instead caused by a disease. Judge Cospi would have been upset. In Zacchia's argument, the following reasoning takes precedence over visual inspection. The man remained well for several days, so any poison would have to have had a delayed effect. However, he then deteriorated quickly, which contrasts with the slow action to be expected of such a poison. He never suffered from either an unbearable thirst or a slow fever, which are typical signs of poisoning; and his cadaver quickly corrupted—just the opposite of the slow process usually found in poisoning victims. Finally, the man's tendency to debauchery was well known, and while the quick death of a healthy person would be suspicious, disease was a probable cause in someone already debilitated.

At the center of the *consilium* was an assessment of the victim's unique circumstances, including his lifestyle, and of the temporal sequence of bodily phenomena. Neither of these could be reconstructed from anatomical evidence alone. Establishing the right sequence of events was a major task for expert witnesses, and physicians took this to demand mastery of fine points of medical semiology. Next to a physician's complex assessment of bodily evidence, Cospi's test with the dog and clock appears almost a parody. It was based on the onset of a dog's distress—and so ignored medical insistence on attention to the unique reactions of each human body. More generally, physicians argued that simple sensory experience was misleading unless it was expertly placed in the right theoretical grid. And physicians might have objected to precisely what appealed to Cospi as a judge: as a simple source of evidence, the dog test made him independent of expert witnesses.¹⁸

Physicians' testimonies emerged from, and were shaped by, increasing social and intellectual tensions between, on the one hand, the growing practice of autopsy and other firsthand observations that were the remit of surgeons and low-status practitioners, and, on the other, traditional medical doctrine. Autopsies were often the opening gambit of investigations into violent deaths, and physicians had to engage with surgeons' findings, if only to challenge and criticize them. The contrasts between early modern medical practitioners are well known, but the dynamics set off by the legal procedure add an interesting twist to the story, while allowing a new appreciation of the challenges autopsies posed to medical semiology.¹⁹ Similarly, the use of animals in investigations of cases of alleged poisoning, which also awaits full exploration, might prove to be part of a story of competition over the access to, production of, and assessment of evidence, while also revealing one of the roots of contemporary experimentation with animals. Among the multifarious investigations by Francesco Redi, the anatomist, naturalist, and physician active at the

¹⁷ Paolo Zacchia, *Quaestionum medico-legalium Tomus Prior [posterior] in hac editione lugdunensi ab auctore novis additionibus locupletatus, hoc signo notatis* (Lyon: Ioannis-Antonii Huguetan & Marci-Antonii Ravaud, 1661), tomus posterior, pp. 156–160. The first edition appeared between 1621 and 1635. See Silvia De Renzi, "Witnesses of the Body: Medico-Legal Cases in Seventeenth-Century Rome," *Stud. Hist. Phil. Sci.*, 2002, 33:219–242.

¹⁸ It is worth noting, however, that Zacchia mentions the test Cospi describes in his discussion of poisoning. For an exemplary discussion of the importance of placing sensory experience in the right theoretical grid—if for an earlier period—see Chiara Crisciani, "L' 'individuale' nella medicina tra Medioevo e Umanesimo: I 'consilia,'" in *Umanesimo e medicina*, ed. Cardini and Regoliosi (cit. n. 12), pp. 1–32.

¹⁹ For an insightful discussion see Nancy G. Siraisi, "Segni evidenti, teoria e testimonianza nelle narrazioni di autopsie del Rinascimento," *Quad. Stor.*, 2001, 108:719–744.

court of the Medici in the second half of the seventeenth century, was research into the action of viper's poison and new antidotes to it—the latter tested by feeding his “remedies” to all sorts of animals; that he took a keen interest in legal medicine certainly sharpens our understanding of his activities.²⁰

Much remains to be done empirically. Within broader projects aiming to recover the range of early modern medical genres and how they articulated theory and practice, the neglected collections of medicolegal *consilia* should be brought to light and examined in tandem with contemporary medicolegal treatises. Together they will allow us to provide more precise accounts of how, over the centuries and depending on specific political and social circumstances, medical evidence was negotiated in court and how broader debates on semiology, the value of postmortems, and the reliability of tests were shaped by medicolegal activities.

CONCLUSION

Medical practitioners have been the subject of comprehensive research for a while now, and this makes them valuable examples in the growing history of early modern expertise. Thanks to recent changes in historical writing on legal medicine, their function as expert witnesses in Continental courtrooms has also surfaced, and important insights into the sanctioning of authority and expertise are emerging. In the legal arena medical and natural knowledge were routinely sought in relation to bodily issues; taking this into account gives us a new perspective on the history of the body. But the history of legal medicine also provides new insights into the practices of two important groups of learned experts, jurists and physicians. Their epistemologically weak but socially powerful knowledge can be looked at afresh, revealing, for example, how in their changing encounters they would mobilize intellectual tools such as semiology and articulate key notions such as fact and evidence. Making the body a source of evidence and an object of discipline in early modern tribunals required the knowledge and practices of a range of experts, and it was not a linear process. What it took and how a new discipline came to be established offer an exceptionally rich case for studying how social and epistemological issues were intertwined in the early modern period.

²⁰ Giovanni Bianchini, “La nostra ‘comune patria’: Redi ed i suoi corrispondenti aretini,” in *Francesco Redi, un protagonista della scienza moderna: Documenti, esperimenti, immagini*, ed. Walter Bernardi and Luigi Guerrini (Florence: Olschki, 1999), pp. 197–210, esp. p. 204.

Patents, Protections, and Privileges

The Establishment of Intellectual Property in Animals and Plants

*By Daniel J. Kevles**

ABSTRACT

Utility patent protection has been granted broadly to living organisms in the United States only in the last quarter century, but in the late nineteenth century, for reasons related to the nationalization of agricultural markets, animal breeders and plant innovators began attempting to devise alternative arrangements to protect intellectual property (IP) in their living products. The arrangements had to take into account both the requirements of IP protection and the various ways the organisms could be reproduced. For animals, prior to patentability, the arrangements involved mainly breed associations and registries. Plant innovators tried to achieve returns from their IP through pricing strategies and trademarks. Finding neither adequate, they began to agitate for legislation that would protect their type of IP, an effort that resulted in the passage of the Plant Patent Act of 1930, the first legislation anywhere to extend a type of patent protection to living products.

IN JUNE 1980, in *Diamond v. Chakrabarty*, the United States Supreme Court held by a majority of five to four that so-called utility patent protection could be extended to a living microorganism. The microorganism in question was a type of *Pseudomonas*, a bacterium that Ananda Chakrabarty, a biochemist at the General Electric Company, had bioengineered to consume oil slicks by introducing into it plasmid DNA from foreign bacteria. The requirements for a utility patent, which is by far the most common type, include the stipulations that the invention must be man made and useful. The U.S. Patent Office had denied Chakrabarty's patent application on grounds that a utility patent could not be issued on a microorganism because it was a product of nature rather than of man and because it was living. The Court held, however, that whether an invention was alive was irrelevant

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to its patentability, that the bacterium was a product not of nature but of Chakrabarty's ingenuity, and that it thus merited a patent under existing law.¹

The section in the U.S. patent code on which the Court relied declared, in language written by Thomas Jefferson in the patent law of 1793, that patents could be obtained for "any new and useful . . . machine, manufacture, or composition of matter, or any new or useful improvement thereof."² What enabled the patenting of Chakrabarty's bacterium was the finding of molecular biology that genes are DNA, a chemical molecule. Chakrabarty's introduction of the foreign DNA into the *Pseudomonas* thus made the recipient bacterium a new, man-made composition of matter. After the *Chakrabarty* ruling, several critics noted that the decision appeared to leave no legal obstacle to the patenting of higher forms of life, including animals. They were right. In 1985 the U.S. Patent Office issued the first utility patent on a genetically engineered plant. In 1987 it held that genetically engineered animals other than human beings were patentable; and in 1988 it issued the world's first animal patent, on a mouse that had been genetically engineered at Harvard University to be supersusceptible to cancer.³

The U.S. patent system, which rests on Article I, Section 8, of the Constitution, reflects the nation's commitment to technological development in the context of a capitalist, free-market economy. It grants innovators the exclusive right to make, use, and sell their inventions for a limited number of years in exchange for their willingness to reveal the details of their creations. It aims to provide an incentive to invention and is grounded in the premise that innovators have a right to profit from their labors.⁴ If the extension of utility patents to living organisms was enabled by advances in molecular genetics and technology, it was also promoted by advocates of the emerging biotechnology industry and its academic allies, both of whom frankly declared to the Court their manifest interest in the incentives and the profits that such extension would provide.⁵ The recent history of intellectual property (IP) in living organisms is thus a branch of the history of molecular genetics and biomedicine, with connections to utility patent law and the commercialization of the university.

The biotechnologists of recent history, however, were not the first to be concerned with protecting intellectual property in living organisms. Through much of the nineteenth cen-

¹ *Diamond v. Chakrabarty*, 447 U.S. 303, 100 S.Ct. (1980), 2207. For the full story of the case see Daniel J. Kevles, "Ananda Chakrabarty Wins a Patent," *Historical Studies in the Physical and Biological Sciences*, 1994, 25:111–136; and Rebecca S. Eisenberg, "The Story of *Diamond v. Chakrabarty*: Technological Change and the Subject Matter Boundaries of the Patent System," in *Intellectual Property Stories*, ed. J. C. Ginsburg and R. C. Dreyfuss (New York: Foundation, 2006), pp. 327–357.

² 35 U.S.C. §101; Bruce W. Bugbee, *Genesis of American Patent and Copyright Law* (Washington, D.C.: Public Affairs Press, 1967), p. 152; and Fritz Machlup, "Patents," *International Encyclopedia of the Social Sciences*, ed. David L. Sills (New York: Macmillan, 1968), Vol. 11, pp. 461–464.

³ Glen Bugos and Daniel J. Kevles, "Plants as Intellectual Property: American Law, Policy, and Practice in World Context," *Osiris*, 2nd Ser., 1992, 7:119–148; and Kevles, "Of Mice and Money: The Story of the World's First Animal Patent," *Daedalus*, Spring 2002, 131:78–88.

⁴ The monopoly part of the bargain is to provide incentive for the inventor, and the publication part is to promote further innovation by others. See the introductory overview of patent law in Arthur R. Miller and Michael H. Davis, *Intellectual Property: Patents, Trademarks, and Copyrights in a Nutshell*, 2nd ed. (St. Paul, Minn.: West, 1990), pp. 4–18.

⁵ The briefs *amicus curiae* in the *Chakrabarty* case reveal these interests. See *Brief Amicus Curiae of the Regents of the University of California*, Jan. 1980; *Brief of Dr. Leroy Hood, Dr. Thomas Maniatis, Dr. David S. Eisenberg, the American Society of Biological Chemists, the Association of American Medical Colleges, the California Institute of Technology, the American Council on Education as Amicus Curiae*, 28 Jan. 1980; and *Brief on Behalf of Genentech, Inc., Amicus Curiae*, Jan. 1980. The *amicus* briefs are with *Diamond v. Chakrabarty*, U.S. Supreme Court, Docket No. 79–136, 447 U.S. 303, Jan. 1980.

ture, plant and animal improvers did not speak of “intellectual property”—the phrase was coined in a Massachusetts court case in 1845—but they were alive to the concept. They understood that utility patents were unavailable to them.⁶ Plants and animals were not machines or manufactures. Improvements upon them were not then identifiable as new compositions of matter. And how could one define the utility of an ornamental plant—say, a rose exhibiting a new fragrance or hue? No less profit minded and imaginative than contemporary biotechnologists, these plant and animal improvers devised a variety of property-protection arrangements outside the patent system to achieve protection of the IP in their living innovations.

In establishing their arrangements, the improvers recognized, at least tacitly, that they had to deal with several difficulties. No property right is worth the paper it is written on if it cannot be enforced. The requirements for enforcement include the ability to specify and warrant the identity of the property. This was easily accomplished with a tract of land by surveying and recording the lengths and bearings of its boundaries. In contrast, specifying the identity of a living organism—for example, a Shorthorn bull or a Concord grape—was problematic, given that defining biological knowledge such as blood types and DNA sequences lay far in the future.

The establishment of *intellectual* property in an invention also calls for capability to reproduce the product with its valuable characters. Absent that ability, the IP would be worthless. Faithful reproduction of an organism depends on practical and/or theoretical knowledge of heredity. But the achievement of reproductive fidelity posed a problem for plant and animal improvers that the innovators of, say, mechanical reapers did not face. Unlike reapers, living organisms reproduce themselves. If an improved plant or animal reproduced itself faithfully—or could be made so to reproduce itself—the original improver potentially faced competition from the purchaser.

In the nineteenth century, identification of a living organism could take the form of a written description, a drawing, or a photograph, but such descriptions were by no means exact or adequate for the purposes of IP disputes. The ability to identify and reproduce a plant or animal depended on the improver’s craft knowledge of biology, heredity, and breeding practices.⁷ Adumbrating the later history, the history of IP in living organisms during the nineteenth century—and, indeed, even long after the rediscovery of Mendel’s laws, in 1900—thus concerns the interplay among such craft knowledge on the one side and the arrangements that this body of knowledge and skills at any given time permitted.

In the United States, IP protection in law for living products found its way onto the agenda of plant and animal improvers during the latter third of the nineteenth century.

⁶ The judge in the 1845 case, upholding the broad patent of an inventor of cotton-spinning machinery, declared: “Only . . . in this way can we protect intellectual property, the labors of the mind, productions and interests as much a man’s own, and as much the fruit of his honest industry, as the wheat he cultivates, or the flocks he rears.” Quoted in Catherine Fisk, “The History of Intellectual Property Comes of Age,” Keynote Address, Wisconsin Legal History Symposium, University of Wisconsin Law School, 13 Nov. 2004, p. 6 (unpublished MS, copy in author’s possession). In the nineteenth century only one utility patent was issued on a living organism in the United States—a type of yeast that Louis Pasteur claimed as an “article of manufacture”—but that was the exception that proved the rule. Pasteur’s patent, no. 141,072, was issued in 1873. See Graham Dutfield, *Intellectual Property Rights and the Life Science Industries: A Twentieth-Century History* (London: Ashgate, 2003), p. 151.

⁷ The *locus classicus* for information on the biological beliefs and practices of plant and animal breeders in the later nineteenth century is, of course, Charles Darwin, *Variation in Plants and Animals under Domestication*, 2 vols. (London: John Murray, 1868), available at *The Writings of Charles Darwin on the Web*, http://pages.britishlibrary.net/charles.darwin/texts/variation/variation_fm1.html (accessed 29 Jan. 2006).

Before then, markets in agricultural stock were largely local, and the seed, nursery, and animal breeding industries were only incipient. It is likely that the warrant for the identity and character of what was offered for sale rested on the purchaser's knowledge of the purveyor and his reputation. How subsequent competition from buyers was handled is largely unknown, but it may not have been an issue—if only because in this period the large majority of new animal breeds, as well as plant species and varieties, were not the product of effort and investment by improvers. They were imported to the United States, usually at the cost and with the encouragement of the federal government.⁸ If breeders did invest in improvements, they likely commanded the local market enough to disregard or shame copycat competitors, or they may have considered their efforts a pro bono service to the community, finding reward enough in the admiration of the local agricultural society.

Attention to IP protection for plants and animals loomed larger after the Civil War, for several likely reasons. Regional and national agricultural markets emerged with the construction of the railroads and amid increasing urban demand for meats, fruits, and vegetables, as well as ornamental plants, trees, flowers, and shrubs.⁹ The number of animal breeders, orchardists, and nurserymen was growing. Eager to be competitive, the proprietors of these enterprises felt the need to offer new and superior breeds or varieties as often as possible. But in doing business across vast, impersonal distances, animal and plant improvers could rely much less on reputation to warrant the identity and quality of their products. And the distance as well as the impersonality of the buyer-seller relationship made it all the easier for purchasers to propagate an improver's innovation and sell it as their own.

By the late nineteenth century, breeders of purebred Shorthorn cattle had devised a system for protecting the IP in their animals that was responsive to these circumstances. Drawing on methods pioneered by the English breeder Robert Bakewell in the late eighteenth century, they bred through pedigree, selecting for valuable characters and intensifying their embodiment in the animals through inbreeding.¹⁰ The resulting purebreds likely tended to possess a feature essential to IP licensing—intergenerational reliability, which is to say that the products of their stud service were likely to resemble them.

Warranting the identity of the animals was achieved by registering the pedigrees in publicly available studbooks. The books—originally imported from England, along with the breed—were developed by private entrepreneurs in different states, and by the late nineteenth century they were increasingly characterized by nonuniformity in standards, sloppiness in the records, and general unreliability. As warrants of identity, they left a good deal to be desired. To solve that problem, the Shorthorn breeders moved in 1876 to regulate their market to a degree by forming the American Shorthorn Association. The association bought the existing registry books and amalgamated them into one. The arrangement thus advantaged genuine Shorthorn breeders and protected buyers against fraudulent sellers—

⁸ Cary Fowler, "The Plant Patent Act of 1930: A Sociological History of Its Creation," *Journal of the Patent and Trademark Office Society*, 2000, 82:621–644, on pp. 622–623; Jack R. Kloppenburg, Jr., *First the Seed: The Political Economy of Plant Biotechnology*, 2nd ed. (Madison: Univ. Wisconsin Press, 2004), pp. 50–57; and Margaret Derry, *Bred for Perfection: Shorthorn Cattle, Collies, and Arabian Horses since 1800* (Baltimore: Johns Hopkins Univ. Press, 2003).

⁹ Fowler, "Plant Patent Act of 1930," pp. 623–624.

¹⁰ On Bakewell see Harriet Ritvo, "Possessing Mother Nature: Genetic Capital in Eighteenth-Century Britain," in *Early Modern Conceptions of Property*, ed. John Brewer and Susan Staves (London/New York: Routledge, 1995), pp. 413–426. See also H. Cecil Pawson, *Robert Bakewell: Pioneer Livestock Breeder* (London: Crosby Lockwood, 1957).

that is, purveyors of putative Shorthorns whose animals were not registered with the association.¹¹

This system for the protection of IP in Shorthorns was likely exemplary of the systems developed for other farm animals and, with some variation, for pets and racehorses. It did not firmly protect the IP developed by individual breeders, but it did protect very well the collective IP of the cartel of breeders represented by the breed association.¹² In all, the breed association/studbook system provided the degree and type of protection consistent with what could be done, given the state of biological and breeding knowledge, to specify the animal's hereditary essence, warrant its hereditary prowess, and transmit that hereditary essence to succeeding generations. Still, it remains an open historical question whether and how the purveyors of purebred animals or stud services managed to discourage purchasers from competing against them with the offspring of their animals. They may have done so through the terms of the sales contract or the stud agreement.

The principal IP-related problem for improvers of plants that were reproduced sexually—for example, corn, the grains, most vegetables, and flowers—was that they did not ordinarily breed true. Sellers of their seed thus could not guarantee the quality and character of any given crop.¹³ Then, too, farmers could save seed from their crops and then plant them, sell them, or both, thus undercutting the improver's control of his IP in the plant. Under the circumstances, the nascent private seed industry paid little attention to IP protection. It was content to rely for new varieties on importation and on the innovations produced by the state agricultural experiment stations established by the Hatch Act in 1887. Of far greater concern than IP protection was the competition the seed trade faced from the federal government. Beginning in the 1830s, the U.S. Patent Office and then the U.S. Department of Agriculture distributed seed gratis to farmers—more than ten million packets annually in the 1890s—via members of Congress and their franking privilege. What the private seed industry wanted from the policy arena was not IP protection but an end to the public seed-distribution program, a campaign that succeeded in 1924.¹⁴

Innovations and improvements in asexually reproducible plants and trees—the foundation of the horticultural industry—came partly from the hybridizing work of breeders like Luther Burbank but in the overwhelming main from chance finds in the field and

¹¹ Derry, *Bred for Perfection* (cit. n. 8), pp. 15, 20–29, 34–36. For a more extensive discussion of the history of IP in animal breeding see Daniel J. Kevles, "Breeding, Biotechnology, and Agriculture: The Establishment and Protection of Intellectual Property in Animals since the Late Eighteenth Century," in *History and Epistemology of Molecular Biology and Beyond: Problems and Perspectives* (Preprint 310) (Berlin: Max-Planck-Institut für Wissenschaftsgeschichte, 2006), pp. 69–80.

¹² On the extension of the system for the protection of IP to other animals see Derry, *Bred for Perfection*. In 1891 Liberty Hyde Bailey, the prominent plant scientist and a professor at Cornell University, noted the value of the system: "There is no law to compel one to register an animal, but every breeder knows that it is only through registration that he can advertise, sell and protect blooded stock. And there is no intelligent purchaser who would think of negotiating for such stock without having obtained the testimony of the herd-book." Liberty Hyde Bailey, "Protection to the Originator of Varieties," report read at the meeting of the American Association of Nurserymen, 4 June 1891, printed in *Transactions of the American Association [of Nurserymen]*, 3–13 June 1891, pp. 88–91.

¹³ J. M. Thorburn & Company, of New York, warned buyers that they gave "no warranty, express or implied, as to description, quality, productiveness, or any other matter of any seeds, bulbs or plants they send out." Among the reasons was "the well-known tendency of many vegetables to revert to their original types, notwithstanding the care of the seed-grower": J. M. Thorburn & Co. catalogue [1908], copy in New York Botanical Gardens Archives, Catalogue Collection, Box 538.

¹⁴ Fowler, "Plant Patent Act of 1930" (cit. n. 8), pp. 622–623; and Kloppenburg, *First the Seed* (cit. n. 8), pp. 61–65.

orchard.¹⁵ The finds arose from bud sports or fortunate sexual pollinations, but once found they could be reproduced virtually identically by the nurturing of grafts or cuttings. Commercial nurseries acquired such finds, tested them for characteristics like sturdiness and fruit-bearing qualities, and then put them on the market. Stark Brothers Nursery and Orchards, based in Louisiana, Missouri, was one of the oldest and perhaps the largest such enterprise in the country. It sponsored an annual fair that encouraged farmers to submit their good fruits, including those of chance finds. In 1893, through this means, the firm learned about an apple tree that produced a luscious red fruit. The next year it bought the tree, with all propagation rights—which is to say all its IP—from its owner, a farmer in Iowa. Stark named the fruit the “Delicious” apple and proceeded to market the tree to the world.¹⁶

Nurserymen and orchardists could be confident that the young trees they sold would bear fruit very much like that on the trees from which they had been derived. Yet the ease with which, say, valuable fruit trees could be reproduced virtually identically, through grafting, and thus numerously multiplied facilitated theft of the developer’s IP. Competitors could purchase the trees, or take cuttings of them from someone’s nursery in the dead of night, then propagate and sell them. Burbank tried to protect himself against such thieves by telling buyers that the way to judge novel fruits was to **“look to their source,”** and also **if possible purchase direct from the originator.** He also charged high prices for his innovations—say, \$3,000 for a new plum tree, including all “stock and control”—thus attempting to gain in the initial sale revenue that would cover his costs and return a reasonable profit.¹⁷ The pricing strategy was intended to capture what economists call all the discounted downstream revenues of which thieves might deprive him, since he would be unable to control the reproduction of the tree once he had sold it. Trouble was that the high first-sale pricing did not work very effectively to compensate horticultural innovators for the loss of IP in their new fruit trees. Nurserymen repeatedly complained that they failed to receive just returns for all their investments of time and money because their innovations in plants and trees were quickly stolen.¹⁸

As an innovator, Burbank was largely in the business of selling to nurseries and orchardists, middlemen who would propagate his trees and sell them to gardeners, farmers,

¹⁵ Bailey, “Protection to the Originator of Varieties” (cit. n. 12), pp. 88–89. For a pioneering scholarly account of horticulture in nineteenth-century America see Philip J. Pauly, *Fruits and Plains: The Horticultural Transformation of America* (Cambridge, Mass.: Harvard Univ. Press, forthcoming).

¹⁶ Dickson Terry, *The Stark Story: Stark Nurseries’ 150th Anniversary* (Columbus: Missouri Historical Society, 1966), pp. 38–40.

¹⁷ *New Creations in Fruits and Flowers, June 1893* [catalogue] (Santa Rosa, Calif.: Burbank’s Experimental Grounds, 1893), p. 12; and *Twentieth Century Fruits, 1911–1912* [catalogue] (Santa Rosa, Calif.: Burbank’s Experiment Farms, 1911), p. 1: copies in Luther Burbank Papers, Library of Congress, Washington, D.C., Box 14. The boldface type is in the original.

¹⁸ Burbank fulminated to the readers of *Green’s Fruit Grower* that he had “been robbed and swindled out of my best work by name thieves, plant thieves and in various ways too well known to the originator. . . . A plant which has cost thousands of dollars in coin and years of intensest [*sic*] labor and care and which is of priceless value to humanity may now be stolen with perfect impunity by any sneaking rascal. . . . Many times have I named a new fruit or flower and before a stock could be produced some horticultural pirate had either appropriated the name, using it on some old, well-known or inferior variety or stealing the plant and introducing it as their own, or offering a big stock as soon as the originator commences to advertise the new variety.” Luther Burbank to Jacob Moore, 4 May 1898, published in *Green’s Fruit Grower*, June 1898, clipping in Luther Burbank Papers, Luther Burbank Home and Gardens, Archives, Santa Rosa, California, Scrapbooks, Vol. 2, p. 45. See also Moore to Chas. A. Green, 20 Apr. 1898; “Protection for Fruit Evolvers” [editorial], *California Fruit Grower*, n.d.; and Moore to Peter Gideon, n.d., *Green’s Fruit Grower*: Luther Burbank Papers, Luther Burbank Home and Gardens, Archives, Scrapbooks, Vol. 2, pp. 44, 47, 115.

and other consumers. Stark Brothers, which did not breed new fruit trees but only acquired them, was in the business of mass marketing. Realizing the value of their IP by charging high prices would have been counterproductive to their business plan. To protect the IP in their fruit trees, the Starks trademarked them.¹⁹ The trademark, however, did not necessarily prevent someone from obtaining the tree or cuttings from it, propagating the wood, and then selling the tree under a different name.

Under the circumstances, beginning in the 1880s and with mounting insistence in the 1890s, American nurserymen began urging the establishment of legal protection for what they called the rights of “originators.” Some recommended the expansion of the patent system to include coverage for innovations in plants and trees. Mindful of their exclusion from the patent system, nurserymen wondered why, as the *California Fruit Grower* put it, “the writer of a book, the composer of a song, the designer of a drawing or the originator of a mechanical device should be protected in their productions, while the originator of an improved flower or fruit is denied the same privilege.”²⁰

The move to patentability was blocked, however, in 1889 when, in *Ex parte Latimer*, the U.S. Commissioner of Patents rejected an application for a patent to cover a fiber identified in the needles of a pine tree, declaring that it would be “unreasonable and impossible to allow patents upon the trees of the forest and the plants of the earth.” The ruling constituted formal enunciation of the “product-of-nature” doctrine that the Patent Office would invoke in the Chakrabarty case.²¹

In 1895, trademark protection for fruit trees similarly fell to the ruling of a federal appeals court in the case of *Hoyt et al. v. J. T. Lovett Co.* James Hoyt and Edwin Hoyt, nurserymen in Connecticut, had sued the J. T. Lovett Nursery, in New Jersey, for selling a grape that had been found in the Green Mountains in Vermont. The Hoyts believed they had bought the grape wood with exclusive rights, and they had trademarked it as the “Green Mountain Grape.” The court found against the Hoyts, partly on grounds that trademark law did not cover living products, holding:

The Hoyts did not make the Green Mountain vine, nor, strictly speaking, did they produce it. It grew out of the earth, was fashioned by nature, and endowed with powers and qualities which no human ingenuity or skill could create or imitate. If such protection as that now claimed by the complainants was allowed, a breeder of cattle could with equal propriety and reason demand like protection for the natural increase of his herd. In every aspect such claims would seem to be impracticable and inequitable.²²

During the next decade the leading nurseries, including Burbank and Stark Brothers, moved to obtain federal legislation for IP protection of their products. In 1906 they suc-

¹⁹ See, e.g., the cover of the *Stark Nurseries Fruit Book*, 1895, depicting the Gold Plum with the caption “Trade Mark Pat’d 1895,” in Luther Burbank Papers, Luther Burbank Home and Gardens, Archives, Scrapbooks, Vol. 1, p. 141.

²⁰ “Protection for Fruit Evolvers” [editorial], *California Fruit Grower*, quoted in Luther Burbank, Burbank’s Experiment Farms, *The 1899 Supplement to New Creations in Fruits and Flowers* [catalogue], Luther Burbank Papers, Library of Congress, Box 14.

²¹ *Ex Parte Latimer*, 12 Mar. 1889, C.D., 46 O.G. 1638, U.S. Patent Office, *Decisions of the Commissioner of Patents and of the United States Courts in Patent Cases . . . 1889* (Washington, D.C.: Government Printing Office, 1890), pp. 123–127. See also H. Thorne, “Relation of Patent Law to Natural Products,” *Journal of the Patent Office Society*, 1923, 6:23–28. In a report to the American Association of Nurserymen in 1891, Bailey had observed that patents on new horticultural varieties were unwarranted because most were not inventions but accidental volunteers found in the fields: Bailey, “Protection to the Originator of Varieties” (cit. n. 12), pp. 88–89.

²² *Hoyt et al. v. J. T. Lovett Co.*, Circuit Court of Appeals, Third Circuit, 71 F.173, 3 Dec. 1895.

ceeded in having a bill introduced in the House that would amend the Trademark Act by authorizing the Commissioner of Patents to register an originator's new variety of plant, bush, shrub, tree, or vine, with the proviso that registration of the name would constitute a trademark and would include for twenty years the "exclusive right to propagate for sale and vend such variety of horticultural product under the name so registered." The bill enjoyed broad support from nurserymen, a number of whom explained to the House Committee on Patents that their innovations were frequently pirated. But while several committee members expressed sympathy for protecting the rights of the originators, the leadership found the bill before it constitutionally dubious, not least on grounds that by trying to protect rights in a product by protecting rights to the name, it sought to combine the exclusivity of a patent with the coverage of a trademark.²³

Although it failed at the time, the 1906 venture led to the formation of a lobbying group, the National Committee on Plant Patents, under the American Association of Nurserymen. In 1929 Paul Stark, of Stark Brothers, became chair of the committee. Along with other nurseries, Stark Brothers had been trying to protect its propagation rights in new fruits by imposing contractual obligations on the purchaser—for example, an agreement not to sell or give away scions, cuttings, or buds. However, the contracts were sometimes difficult to enforce, which helped energize Stark's eagerness for the stronger IP protection that a patent would provide; and in 1930, in part as the result of Stark's lobbying effort, Congress passed the Plant Patent Act.²⁴

The act covered only asexually reproduced organisms, and it authorized a patent to anyone who "has invented or discovered and asexually reproduced any distinct and new variety of plant, other than a tuber-propagated plant."²⁵ Given its requirement of distinctiveness rather than usefulness, it was not a utility patent law. Nor did it qualify for the conventional legal bargain that granted the inventor a monopoly right in exchange for public knowledge of how the invention was produced so that others could innovate beyond it. The Plant Patent Act rather harkened back to the seventeenth century, when patents were granted as privileges in the market, royal dispensations to encourage commerce in new technologies, often from abroad, or to reward favorites. Indeed, the Plant Patent Act might well have been called the Stark Horticultural Privilege Act, not only because of Stark's role in its passage but because it granted a privilege of IP protection that was tailored to the needs of horticultural innovators.²⁶

Nevertheless, for all its simultaneous restrictiveness and looseness, the act was the first statute passed anywhere in the world that extended patent coverage to living organisms. It helped pave the way for the 1970 passage of the Plant Variety Protection Act (PVPA),

²³ U.S. Congress, House of Representatives, Committee on Patents, *Arguments before the Committee . . . on H.R. 113570, Authorizing the Registration of the Names of Horticultural Products and to Protect the Same, March 28, 1906, 59th Cong.* (Washington, D.C.: Government Printing Office, 1906), pp. 3–5 (the quotation is from p. 5), 12–13. For nurserymen's views see, e.g., M. Crawford to F. T. F. Johnson, 19 Mar. 1906, *ibid.*, p. 10; for the committee members' and leaders' views see *ibid.*, pp. 4–5, 9.

²⁴ Bailey had suggested in 1891 that nurserymen use such contractual arrangements, and the court in *Hoyt et al.* had noted their acceptability in passing. See Bailey, "Protection to the Originator of Varieties" (cit. n. 12), p. 90; *Hoyt et al. v. J. T. Lovett Co.*, 71 F.173, 3 Dec. 1895; Fowler, "Plant Patent Act of 1930" (cit. n. 8), pp. 630–642; and Bugos and Kevles, "Plants as Intellectual Property" (cit. n. 3).

²⁵ Quoted in Fowler, "Plant Patent Act of 1930," p. 641.

²⁶ I am indebted to Mario Biagioli for this analogy. On patents as privileges see Miller and Davis, *Intellectual Property* (cit. n. 4), p. 5; and Jessica He, "'Hail to the Patents!' The Ethics, Politics, and Economics of the Early Modern Patent System in England" (Senior Essay, Program in Ethics, Politics, and Economics, Yale Univ., 2005), pp. 2–27.

which provided IP protection for sexually reproducing plants. The PVPA was passed in part to bring the United States into harmony with a European convention for similar protection that went into effect in 1968. It expressed both the ability of plant breeders by then to produce varieties that were distinctive, uniform, and stable—the criteria for protection that the plant had to meet—and the felt need to integrate American plant breeding into an IP regime that was increasingly global. Like the act that preceded it and the court decisions that followed it, the PVPA expressed the dynamic interaction of craft and scientific knowledge with the political economy of intellectual property in living organisms.²⁷

²⁷ The European convention is UPOV, “L’union internationale pour la protection des obtentions végétales,” or the “International Union for the Protection of New Plant Varieties.” See Bugos and Kevles, “Plants as Intellectual Property” (cit. n. 3).

A Forensics of the Mind

*By Alison Winter**

ABSTRACT

This essay discusses the yoked history of witnessing in science and the law and examines the history of attempts, over the past century, to use science to improve the surety of witness testimony. It examines some of these projects, particularly in the 1960s and 1970s. The essay argues that modern psychology offers a particularly problematic form of expertise because its focus is a task central to the jury's mandate, the evaluation of a witness and his or her testimony. It concludes that a key feature of modern disputes over the legal relevance of psychological techniques is not the quality or character of the expertise being offered to the court but, rather, the question of whether expertise is needed at all and under what circumstances it should impinge on the jury's decision making.

WITNESSING IN SCIENCE AND THE LAW

Witnessing has been held to be fundamental to the authority of both science and the law for centuries. Its status seems unassailable. Yet parsing the testimony of actual witnesses has always been conceded to be problematic. In practice, as scholars in many fields have shown, actual instances of witnessing are often and perhaps inevitably shot through with so many vulnerabilities that it can be hard to see how they could count as secure foundations for decisions in either realm. Both legal and scientific enterprises have consequently developed elaborate protocols for securing reliable testimony. And if science owes a debt to the law for some of its historical and sociological foundations, it does so most importantly with respect to these protocols. Early experimental philosophy drew on legal customs as it developed its own conventions for the witnessing of natural phenomena.¹

Both the history of science and that of the law are consequently full of lessons about how testimony may be elicited, tweaked, probed, or set aside altogether, either by the adducing of alternative testimony or by the invocation of rules of method. I want here to examine an acutely pertinent case when these histories converged. A new science of mem-

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¹ Steven Shapin, *A Social History of Truth: Civility and Science in Seventeenth-Century England* (Chicago: Univ. Chicago Press, 1994); Barbara J. Shapiro, *"Beyond Reasonable Doubt" and "Probable Cause": Historical Perspectives on the Anglo-American Law of Evidence* (Berkeley: Univ. California Press, 1991); and Shapiro, *A Culture of Fact: England, 1550–1720* (Ithaca, N.Y.: Cornell Univ. Press, 2000).

ory was recruited in the name of jurisprudence and asked to provide new foundations for the security of courtroom testimony. The ambition was to place certain kinds of legal decisions on a surer and more accountable foundation. But the result was almost exactly the opposite: a radical dissolution of the testimonial assumptions on which the science based itself.

Since the eighteenth century, science and the law might seem to have moved in opposite directions in terms of their handling of witnesses. Science has narrowed the pool: it has increasingly removed third-party witnessing from the equation, so that scientific papers conventionally appeal almost exclusively to small cadres of experts (sociologists' "core sets") and sometimes only to those responsible for doing the actual research itself. The laboratory is no longer a gentleman's household, in which hospitality to ideal lay witnesses was enjoined on the patron. The law, on the other hand, has since the early nineteenth century dramatically expanded its use of various kinds of witnesses, developing an elaborate set of conventions for handling them.²

But in another respect science and the law have actually converged on the matter of testimony. As the law has experienced an increasing need for solutions to the problems presented by witnessing, so science has stepped up to offer those solutions. Researchers in the human sciences in particular have repeatedly held out the hope of such solutions, and the law has increasingly reached for them, although never without a certain ambivalence. Amid the great turn of legal scholars toward the social sciences in the twentieth century, this trend only accelerated. In particular, psychological researchers attempted to make a science of testimony, memory, and witnessing. The ambition discussed in this essay arose first in that community.

As the psychological disciplines developed and diversified in the prewar decades, whole subfields based on assertions of common ground between psychology and the law arose. Historians of science have recently begun to examine some threads of this rich and consequential history. Tal Golan's two-century chronology of expert witnessing, for example, includes a contextualized account of psychologists' troubled courtship of the legal community, while Ken Alder's new history of the lie detector reconstructs juridical expectations surrounding what one might call "truth technologies" in the first half of the twentieth century.³ Yet despite the suggestiveness of such work, there is no sustained literature that I know of that considers questions of witnessing itself. To show why we might want one, I shall describe a practice that emerged from the same cultural background as Golan's and Alder's subjects but directed its focus explicitly on the problems of witnessing to remembered events. That practice is forensic hypnosis.

In the early twentieth century, the emergence of the broad field of forensic psychology was signaled by a moment of rhetorical excess that staked out the battleground between legal and psychological conventions for the next century. It was a conflict between two giants in their respective fields: John Henry Wigmore, a preeminent authority on evidence law; and Hugo Münsterberg, now considered a founding father of applied psychology. Wigmore was a professor of law (and, during the period in question, dean) at Northwestern Law School and a prolific writer on evidence. His reputation and productivity (more than

² C. J. W. Allen, *The Law of Evidence in Victorian England* (Cambridge: Cambridge Univ. Press, 1997).

³ Tal Golan, *Laws of Men and Laws of Nature: The History of Scientific Expert Testimony in England and America* (Cambridge, Mass.: Harvard Univ. Press, 2004); and Ken Alder, *The Lie Detectors: The History of an American Obsession* (New York: Free Press, 2007). See also Alder, "A Social History of Untruth: Lie Detection and Trust in Twentieth-Century America," *Representations*, 2002, 80:1–33, on p. 4.

nine hundred articles over the course of his career) dwarfed other writers in the field, and several of his treatises have become classics. Hugo Münsterberg is less well known today, but he was a giant among psychologists of the turn of the century. He was initially trained in Wilhelm Wundt's psychological laboratory, and in the 1890s he was recruited from Germany to bring laboratory-based psychological research to Harvard. He was not content to establish a powerful experimental psychology program at the university but sought also to export experimental techniques from the laboratory into new contexts such as schools, factories, and businesses.⁴ He hoped that in these new sites the tools of experimental psychology would become the core of new applied psychological fields such as educational psychology and industrial psychology. In the years 1905–1908, the courtroom was the site that Münsterberg identified as being in urgent need of psychological transformation.

Münsterberg had become interested in a couple of significant trials where the case turned on the question of the validity of witness testimony. In 1906 he was asked to bring his psychological instruments to Idaho to help (using association tests) in the evaluation of testimony crucial to one of the biggest trials of the period, that of William "Big Bill" Haywood for murder; and less than a year later he became involved in a dispute over the validity of the confession of a defendant, Richard Ivens, in a Chicago murder case. In both instances he made the opposite choice from the jury. In the Haywood case he was convinced of the witness's truthfulness (the jury was more skeptical); in the Ivens case he was sure that the defendant's confession was the result of a false memory manufactured by aggressive police interrogation (Ivens was found guilty and hanged).⁵ Münsterberg mounted a campaign to bring psychological expertise before the jury, where he felt it was desperately needed to prevent miscarriages of justice based on naive evaluations of witness testimony.

In 1908 Münsterberg published *On the Witness Stand: Essays on Psychology and Crime*, an aggressive manifesto proclaiming that psychology was now essential to evaluate witness testimony. Witnesses' memories, and hence their testimony, could not be evaluated by common sense alone. Münsterberg claimed that only with the help of techniques drawn from the laboratory would juries be able properly to interpret what witnesses said on the stand. Psychologists must then become routine figures within the courtroom, since they alone were sufficiently expert to use those techniques.

Wigmore was interested in the use of science to improve evidence law, but he thought Münsterberg was underestimating what lawyers knew, how the structure of witness examination affected the evidential status of the claims a witness made, and, most important, what juries were capable of in terms of evaluating witness testimony. He saw Münsterberg's book as an unwarranted bid to trump juries' authority. In a mock trial transcript, he subjected Münsterberg to a fictional suit for libel.

Wigmore convicted the psychologist of groundlessly castigating the legal community and making exaggerated claims for what psychologists could do.⁶ He found that the issue

⁴ On Münsterberg's career, and for an overview of his various projects, see Matthew Hale, *Human Science and Social Order: Hugo Münsterberg and the Origins of Applied Psychology* (Philadelphia: Temple Univ. Press, 1980).

⁵ On the Haywood case see J. Anthony Lukas, *Big Trouble: A Murder in a Small Western Town Sets Off a Struggle for the Soul of America* (New York: Simon & Schuster, 1998). On the Ivens case see the final chapter of Golan, *Laws of Men and Laws of Nature* (cit. n. 3).

⁶ John H. Wigmore, "Professor Münsterberg and the Psychology of Testimony: Being a Report of the Case of *Cokestone v. Muensterberg*," *Illinois Law Review*, 1909, 3:399–445. On the effects of Wigmore's satire on psychological research see H. Cairns, *Law and the Social Sciences* (New York: Harcourt, Brace, 1935), p. 169. For a historical discussion in the context of a normative argument about the reliability of witness testimony see

of the fallibility of memory and testimony was by no means as novel as Münsterberg made out.⁷ Nor did the law ignore the frailties of memory, as Münsterberg had claimed; in fact, techniques such as cross-examination were designed expressly to address these very fallibilities. Wigmore also concluded that experimental psychology—the form of knowledge most touted by Münsterberg as a remedy for the courts' supposed deficiencies—was in any case itself insufficiently precise to do the job. Its vaunted ability to evaluate individuals' minds was in reality too slight to support a significant reform of legal conventions and practices. Finally, he claimed that the adversarial system provided a more than sufficient incentive to litigators to use a tool like experimental psychology if they could truly make it work for them in a courtroom.

It was a devastating display. Yet despite his stinging repudiation of forensic psychology in its present state, Wigmore himself was, and forever remained, enthusiastic about the potential of psychology to produce useful legal tools. And that did eventually happen—but the tools took unexpected forms. Münsterberg had argued that courts needed psychologists to teach them to devalue testimony that seemed on its face to be secure. Many of the techniques that eventually proved attractive (if controversial) to the legal community, however, offered to do the opposite. They promised to take apparently insecure memories and make them surer. Of these techniques, forensic hypnosis was one of the first and most credible.

FORENSIC HYPNOSIS

Forensic hypnosis had roots in the late nineteenth century, but it became fashionable only in the mid twentieth. Its advocates—men like the Los Angeles psycholegal consultant William Jennings Bryan, namesake of his famous grandfather—claimed that it could scientifically “refresh” lost or compromised memories, restoring them to a pristine and faithful original.⁸ It was an ambitious claim, and it relied on an assumption that, perhaps ironically, was far more sanguine about the representational character of memory itself than anything in the practice of courtroom lawyers experienced in dealing with memory's actual foibles. The hypnotists assumed that all life experiences were recorded intact in one's memory and could be tapped with the right tool. Their sporadic attempts to introduce forensic hypnosis into the courts in the first half of the twentieth century met with consistent rebuffs, generally on the grounds that the practice was unproven. But after World War II the situation had changed radically. The war had seen a proliferation of hypnotic practices in military psychiatry, and this gave the field a strong reputation as a therapy for problems identified with memory loss and retrieval. When advocates again urged its courtroom use in the 1950s and 1960s, therefore, they met

James M. Doyle, *True Witness: Cops, Courts, Science, and the Battle against Misidentification* (New York: Palgrave Macmillan, 2005), pp. 9–34.

⁷ Christopher Buccafusco has written a historical study of the development of intellectual accounts of memory in the eighteenth and nineteenth centuries (by philosophers and men of science and by legal scholars discussing this work). His essay confirms Wigmore's claim that legal writers were aware of, and interested in, scientific writings on memory before Münsterberg. See Christopher Buccafusco, “The Pre-History of Anglo-American Forensic Psychology: Witness Memory from Locke and Gilbert to Wigmore and Münsterberg” (unpublished MS, Univ. Chicago, 2006).

⁸ Bryan wrote one of the first “textbooks” in forensic hypnosis: William J. Bryan, *Legal Aspects of Hypnosis* (Springfield, Ill.: Thomas, 1962). For a discussion of some of Bryan's cases and others of the 1950s–1960s see Alan Schefflin, *Trance on Trial* (New York: Guilford, 1989); and Jean-Roch Lawrence and Campbell Perry, *Hypnosis, Will, and Memory: A Psycho-Legal History* (New York: Guilford, 1988).

with much greater success. By the early 1960s, hypnotically refreshed memory still had not been admitted as evidence in any American court, but it had become widespread under the radar of official record keeping. Police and litigators alike were routinely using it in their everyday investigations.

A capital murder case of 1962 provides a useful example of the tensions implicit in this situation. In April of the previous year, one Arthur Nebb of Columbus, Ohio, had walked past several witnesses, taking a fully loaded gun into his estranged wife's house; he had then emptied it into her and her lover. The lover died and the wife was severely injured. Nebb was arrested and charged with first-degree murder. At trial, however, he claimed not to remember the events. His attorney proposed using forensic hypnosis—on the stand itself—to refresh his memory. The judge was intrigued: he sent the jury away and allowed Nebb to be hypnotized with the attorneys and himself as witnesses. The entranced Nebb—who, it is worth noting, had already been hypnotized on several occasions before the trial—now produced a complete narrative. He had not intended to use his gun, he recounted, but when he saw his wife with her lover, he had gone into a trance of some kind. The gun had gone off without his intending to shoot it, and after the first bullet was fired he had kept shooting involuntarily.

The performance of testimony here was quite complex. At the time, Nebb's attorney suggested that the hypnotic state not only helped Nebb to remember what had happened but also gave assurance that what he related was said in good faith. Hypnosis had put his client into an automaton-like state in which he could not censor himself. The validity of the trance in the courtroom, in being credited by its (legally expert) onlookers, in itself evidenced the power of that other trance—the one that Nebb, his will vitiated in his current trance state, described as having vitiated his will during the shooting. It worked. In fact, from the historian's perspective it worked distinctly too well: precisely because Nebb's performance was so convincing, we have no official record of it. After seeing the trance testimony, the prosecutor decided to settle for second-degree manslaughter (and therefore for a two- to four-year prison term). The deal meant that no publicly accessible record of the hearings would be retained. All that are left to us are newspaper articles.⁹

The Nebb case was unusual only in its high drama. Similar incidents multiplied in the 1960s. Meanwhile, psychologists and lawyers joined forces, forming professional societies, journals, and programs dedicated to forging a nexus between legal and psychological research.¹⁰ Research psychologists, clinicians, and, later, neuroscientists were all drawn into their efforts. Indeed, these developments ushered in a cooperative (albeit still vexed) relationship between the legal and the psychological fields that has continued to develop and intensify to the present day. The routine inclusion of psychological expertise in the evaluation of witness testimony seemed finally to be coming about.

In 1968 forensic hypnosis finally achieved a degree of formal legal recognition. In a Maryland rape case (*Harding v. State*), the victim had been left for dead by the side of the road. When police found her unable to recount any of the events of the assault, they enlisted the help of a forensic hypnotist. Under hypnosis, the victim produced a complete narrative

⁹ *State v. Nebb*, No. 39540 (Ohio CP, Franklin County, 28 May 1962). See also R.T.C., "The Admissibility of Testimony Influenced by Hypnosis," *Virginia Law Review*, 1981, 67:1203–1233. The case was publicized among psychologists by Bryan's *Legal Aspects of Hypnosis*.

¹⁰ See, e.g., Thomas Grisso, "A Developmental History of the American Psychology-Law Society," *Law and Human Behavior*, 1991, 15:213–231.

of the rape. The judge allowed her to testify, ruling that forensic hypnosis was sufficiently established as a scientific technique when used by an experienced practitioner. He did permit the jury to decide, if they wished, to give this kind of testimony less weight than they would a statement made from a memory that had never been impaired. The complaining witness made her statement, and the defendant was convicted almost entirely on the basis of it.¹¹

The 1968 decision threw open the courtroom doors to forensic hypnosis. In the 1970s hypnosis became one of the great technological hopes of American police departments and prosecutors, particularly in California, and thousands of police were trained in the practice.¹² A flood of cases involving hypnosis occurred in these years. In only a fraction of these was hypnotic evidence actually entered into evidence in litigation, but the indications were that hypnosis was becoming part of police and jurisprudential culture. There was even talk that it would usher in a new age of investigative and testimonial certainty. Yet this was still not quite a realization of Münsterberg's original objectives. Münsterberg had foreseen a unified body of experts sharing common intellectual assumptions. What in fact emerged were discrete expert communities that often disagreed as to basic conventions, approaches, and perspectives. And because of that the authority of forensic hypnosis remained very fragile.

Cognitive psychologists, in particular, worked to develop a highly reconstructive understanding of memory during these years. According to their models—for example, the work of Elizabeth Loftus, who has become the best-known researcher to apply memory research to legal questions—memories were decidedly not stable recordings. Rather, they were continually refreshed and revised in various ways over time. As one writer on Loftus has observed, her work made “the mind of the eyewitness . . . for every practical purpose a part of the crime scene.”¹³

Social psychologists were also developing a suggestion-based understanding of human interaction in general and of hypnosis in particular. The very idea of the reliability of eyewitness memories was implicitly challenged by such models. But that remained an implicit issue until the claims of forensic hypnosis came under scientific challenge in the courts. At that point, reconstructivist psychologists showed themselves willing to question particular testimonies in particular court cases. And they revealed themselves to be appalled at the very idea of forensic hypnosis, which they thought was more likely to manufacture pseudomemories than to refresh real ones. They certainly had their own uses for hypnosis—jurisprudential uses among them—but trawling for memories was anathema. A series of pitched battles now took place between these camps. Forensic hypnotists were attacked

¹¹ *Harding v. State*, 5 Md.App. 230, 246 A.2d 302 (1968).

¹² The leading figure in this period was Martin Reiser, a clinical psychologist who ran a hypnosis training institute and forensics service associated with the Los Angeles Police Department during the 1970s and early 1980s and traveled the country staging brief training programs at conferences and for individual police departments. He initially used unpublished training materials but eventually published a textbook: Martin Reiser, *Handbook of Investigative Hypnosis* (Los Angeles: Lehi, 1980).

¹³ Doyle, *True Witness* (cit. n. 6), p. 98. Loftus's work during the 1970s and early 1980s did not directly engage the issue of hypnosis; it focused on research supporting the changeable character of ordinary memories. For examples of her early work see Elizabeth Loftus and J. C. Palmer, “Reconstruction of Automobile Destruction: An Example of the Interaction between Language and Memory,” *Journal of Verbal Learning and Verbal Behavior*, 1974, 13:585–589; E. Loftus, *Eyewitness Testimony* (Cambridge, Mass.: Harvard Univ. Press, 1979); and E. Loftus and Geoffrey Loftus, “On the Permanence of Stored Information in the Human Brain,” *American Psychologist*, 1980, 35:409–420. Elizabeth Loftus's role as a leading expert witness on matters of memory will be discussed later in this essay.

by cognitive researchers and social psychologists in a series of criminal cases of the late 1970s and early 1980s.¹⁴

These clashes climaxed in an influential California ruling, *People v. Shirley* (1982).¹⁵ First, the court ruled that forensic hypnosis must not be used to fish for information that might be used directly as testimonial evidence in court, because the practice, in the court's opinion, was as likely to manufacture fake memories as to "refresh" real ones. But the court went considerably further in its decision. It found that the *entire body* of a hypnotic subject's memory of a crime was inadmissible, not just the specific information that had been probed by the hypnotic interview. The witness was therefore disabled as a witness *completely*, with respect not only to the specific topics discussed during hypnotic interviews but to the whole body of events in question.

This suddenly and radically reversed what had been an emerging understanding of witness memory, according to which it represented a perfect record that only required expertise to be excavated. There is a certain symmetry to the decision: its sweeping dismissal of posthypnotic memory (as being absolutely spoiled) mirrored the sweeping acceptance of this kind of testimony (as being absolutely, or at least unusually, reliable) that forensic psychologists had sought to establish during the 1970s. Both stances had the effect of playing down the need for the jury to make its own evaluation of the plausibility of a witness's refreshed memory. The forensic hypnotists had claimed that their techniques validated their subject's "refreshed memories" and even that they were more trustworthy than ordinary memories. The skeptics whose views were represented in the *Shirley* decision thought such statements were so terribly unreliable that juries must not even be allowed to hear them. Both stances were ultimately unsuccessful, as I will explain below.

The decision resituated psychological expertise more generally. Now memory became a highly malleable entity, subject not to restoration but to manipulation by experts. In the courtroom, the expert's role was now that of a guard who shielded the jury from pseudomemories rather than authorizing real ones. The previously flourishing practice of forensic hypnosis promptly collapsed, at least in this context.

The legal and social history of forensic hypnosis—and, more generally, of the treatment of memories that "returned" after a period of absence—grew more complex from this point. The legal status of posthypnotic testimony itself was not as unequivocally bad as the *Shirley* decision made it out to be. In 1987, for instance, the Supreme Court reversed a ruling (*Rock v. Arkansas*) that followed *Shirley* in prohibiting posthypnotic testimony. The opinion stated that "true" memories as well as false ones were generated by hypnosis, but for this very reason the special protections surrounding defendants' right to speak in their own defense trumped the arguments about the problems of posthypnotic testimony;

¹⁴ *Quaglino v. California*, 58 L.Ed. 2d 189 (1978); *State v. Mack*, 292 N.W.2d 764 (Minn. 1980); and *State v. Hurd*, 432 A.2d 86 (N.J. 1981). An influential social psychologist on the "reconstructive" side of the debate was Martin Orne; in addition to playing a role in these cases (e.g., he prepared an *amicus* brief in the Quaglino case), he wrote sharply normative papers during these years about the dangers he saw in forensic hypnosis. See, e.g., Martin Orne, "The Use and Misuse of Hypnosis in Court," *Crime and Justice*, 1981, 3:61–104.

¹⁵ *People v. Shirley*, 31 Cal.3d 18, 723 P.2d 1354, 181 Cal.Rptr. 243, cert. denied, 458 U.S. 1125 (1982). The effects of the *Shirley* decision were mitigated over the next several years, most dramatically in relation to a defendant's ability to give posthypnotic testimony. For two different accounts of the history of similar cases by protagonists on opposing sides of the debate over the legal status of these practices—both of which provide excellent guides to the history of these practices from the vantage point of practitioners—see Schefflin, *Trance on Trial* (cit. n. 8); and Lawrence and Perry, *Hypnosis, Will, and Memory* (cit. n. 8).

defendants could at least offer such testimony, though of course the jury was free to discount it in light of the testimony of skeptical expert witnesses.¹⁶

Why should we care about the career of this very specific and, at least in recent years, fairly marginal practice? One reason is that the way it rose and fell, and the story of where and how it gained and lost plausibility, illuminates the history of other practices, bodies of knowledge, and assumptions about mind whose credibility was tied up with it. Debates about forensic hypnosis display in extreme form problems that are much more general and that are fundamental to testimony: How can you ask someone about the past without having an effect on the answers you receive? How do you know the memory record is reliable? How can the witness herself call the memory to consciousness without altering it? Who is the more significant “agent” in the production of testimony—police, scientific consultants, litigators, the witness herself? Once you decide, what is the significance of the decision? The law has generated conventions for answering each of these questions. From here one can see that it plays a major role, though one as yet unstudied by historians of science, in the construction of our understanding of mind.

The broader history, since the early 1980s, of memories “exhumed” from some state of inaccessibility is both complex and consequential. In the 1980s there was a flood of cases involving such memories, followed by a backlash on an equal scale as the proponents of “false memory syndrome” (which reinterpreted the previous cases) brought third-party suits against the psychologists who had made the initial diagnoses. The courtroom became the site at which the capabilities and frailties of mind and memory were defined and in which individuals invested their efforts, regarding these sites as the definitive location for validating the legitimacy of their memories or vindicating them from false accusations based on false memories.

HISTORY OF HUMAN SCIENCES AND THE LAW

The history I have recounted has more general implications for historians of the human sciences because it shows how important the law is in the construction of our understanding of mind. Forensic hypnosis became real and meaningful through the courts, or at least the broader world of legal negotiation; it lost its plausibility the same way. The particular understanding of what forensic hypnosis did to memory—that hypnosis “refreshed” memory (as opposed to “recovering,” “enhancing,” “exhuming,” or “improving” it)—came specifically from the practice of “refreshing” a witness’s memory by showing her something like a diary entry or a signature on a contract. The more “refreshed” the memory, the more specific, immediate, and vivid—and so the more apposite, without a reduction in reliability. When the courts admitted hypnotically “refreshed” memory, they helped establish the idea of hypnotically “refreshable” memory in public culture. Then, when they rejected it so dramatically in the early 1980s, they discouraged the idea, and these rulings created a testimonial obstacle course for the very high-profile litigation involving “recovered memories” in the late 1980s and 1990s. Because fights over posthypnotic testimony centrally involved the disputes over how to evaluate someone’s self-described memory, they are a useful lesson, for historians of science, in how the nature of mental processes

¹⁶ An Arkansas court had relied on the *Shirley* decision in a ruling barring a defendant from giving posthypnotic testimony. The Supreme Court’s reversal is *Rock v. Arkansas*, 483 U.S. 44 (1987). See also Andrew C. Callari, “*Rock v. Arkansas*: Hypnotically ‘Refreshed’ Testimony or Hypnotically ‘Manufactured’ Testimony,” *Cornell Law Review*, Nov. 1988, 74:136.

is always at stake in legal decision making: their nature is available for reevaluation whenever a witness testifies, and the constraints and conventions for making and interpreting testimony play a powerful, if little-studied (by historians of science), role in the meaning of mind beyond the witness box and jury room.

Historians of science can take some lessons from this when we think more generally about past science and the law. The construction of scientific authority has to contend not only with popular understandings but also with the law's own customary ways of thinking about what a fact is, what memory and testimony are, and what constitutes expertise (including scientific expertise). Court confrontations have changed how even scientific communities talk about truth telling and memory. Courts were here machines not just for garnering and appraising memories but for constructing what memory itself was and could be. The law does not merely provide a context in which experts fight over competing claims (that have been developed in scientific contexts); the law actually produces its own claims, as Sheila Jasanoff has shown, and these structure what scientific claims mean when they come into this arena.¹⁷

These issues lead naturally to further questions about the kind of authority that the law does in fact have and about the relationship of this authority to the different kinds of knowledge-making practices that are involved in both legal and scientific enterprises. For instance, we might ask what happens when one domain of expertise moves out of its home base and challenges another. For scientific and legal wrangling, the respective forms of expertise fare quite differently when they move into new areas of disputation.

Compare what happens when science moves out of the lab and challenges lawyers' views of the mind with what happens when lawyers move out of the courtroom and challenge, say, scientists' conventions of evidence in DNA testing labs. In each case an expertise is out of its place, challenging another that should have home court advantage. Why does it seem that all too often the lawyers win in the first case—and we conclude that this is because they are on their home turf—yet they also win in the second case? Perhaps it is because we are mistaken in thinking that in the second scenario lawyers move out of their own territory. In fact, the decision is still within the court, and it only *seems* that the laboratory (as a place) is involved: what is really being used is a representation of laboratory practices and scientific procedures that is tailored to work within the courtroom and for the consumption of jurors. Of course, this is an example of a major question to which answers cannot even be ventured here, but they deserve to be pursued.

In 1937, long after his conflict with Münsterberg, Wigmore reflected on the issue of admitting psychological expertise into the courtroom. “When the psychologists are ready for the courts,” he promised, “the courts will be ready for the psychologists.”¹⁸ This has become, among forensically minded psychologists, one of his most widely quoted statements, a challenge to meet a high standard in what science can offer to the jury. But the statement also implies that the only requirement is for *psychology* to change, in order to gain entry to the courtroom. The recent history of memory disputes suggests that the problems of psychological expertise may be more intractable, that the courts themselves might have to change—in terms of jurists' views of what kinds of knowledge the law is competent to produce and evaluate on its own—before psychological experts could become comfortable and authoritative on the stand.

¹⁷ Sheila Jasanoff, *Science at the Bar: Law, Science, and Technology in America* (Cambridge, Mass.: Harvard Univ. Press, 1995); for a general argument see pp. 7–8.

¹⁸ John Henry Wigmore, *The Science of Judicial Proof*, 3rd ed. (Boston: Little, Brown, 1937).

In the past thirty years, memory research has matured—including research specifically designed for use in courts. There is a small but powerful community of experts who offer their testimony on memory issues, some of whom see themselves as delivering on the promise of Münsterberg and meeting the challenges of Wigmore. But the kinds of problems first encountered by scientific experts on witnessing have never been definitively dispatched. The past is very much present in current debates that question not only what kinds of experts are the best to speak on questions of memory but, more fundamentally, whether expertise of any kind is appropriate where witness testimony is concerned.

To see this, one need look no farther back than October 2006, at preliminary hearings before the 2007 trial of I. Lewis (“Scooter”) Libby for obstruction of justice and perjury related to the “outing” of CIA operative Valerie Plame. Libby has been accused of lying to prosecutors about statements concerning Plame he made to several reporters. His defense (as this essay goes to press) will be that he had forgotten he made the statements. To support the *prima facie* plausibility of such a claim, the defense wished to call memory experts to educate the jury about the frailties of memory and the reconstructive character of remembering. In a disclosure document, the defense put the government counsel, Patrick Fitzgerald, on notice about what arguments the proposed memory expert was going to make. First on the list was that “human memory does not function like a tape recorder, with memories retained, stored, and played back verbatim”; rather, memories were “reconstructions” of past events.¹⁹

But before these experts could be allowed to testify, the defense had to establish, among other things, that the jury actually needed help—for instance, that jurors did believe that memories were like tape recordings. Fitzgerald opposed the use of a memory expert on these grounds especially. He argued that in the absence of “special circumstances raising factual issues beyond the common knowledge and experience of jurors,” the Federal Rules of Evidence disallowed the use of experts; courts instead trusted to the combination of cross-examination, jury instructions, and the collective common sense of jury deliberations.²⁰

On 27 October there was a hearing to resolve the question of whether to admit a memory expert. Elizabeth Loftus, who is widely considered to be the leading expert witness in the United States on matters of memory, was called by the defense to make their case. She testified about the reconstructive character of memory and about the very different views of memory that she said potential jurors most often held. She described research on lay beliefs about memory that indicated that the general public vastly over-rated the reliability of memory; she had even studied the beliefs about memory of members of a jury pool. On the basis of this very specific research, she could claim with confidence that a jury would require expert guidance to appreciate the limitations of memory in a witness.

¹⁹ John Cline, Case 1:05-CR-00394-RBW, Document 125.2, filed 31 July 2006, 33 pp.

²⁰ The relevant rule, FRE 702, was cited and quoted in the memorandum: Patrick Fitzgerald, “Government’s Memorandum in Opposition to Defendant’s Motion to Admit Expert Testimony,” *U.S. v. Libby*, No. CR 05-394 (D.D.C., 7 Sept. 2006), p. 9. He continued: “This case involves no eyewitness identifications, no witnesses with mental conditions affecting memory, no repressed memories, and no other circumstance in which the admission of expert testimony on memory has been approved in past cases. To the contrary, the jury in this case will be asked to make the same credibility determinations required in every case in which witnesses recount historical events and conversations—nothing more or less. Thus, this case falls well within the mainstream of cases in which expert testimony regarding memory has been rejected” (p. 10).

Fitzgerald did not attack the expertise of the proposed witness, Robert Bjork, chair of psychology at UCLA. But he argued that the expertise on offer would be unhelpful and misleading to the jury.²¹ The key issue was how to identify, describe, and chart the limits of common sense. Were experts like Loftus constructing a spurious “ignorant public” to legitimize their claims to authority? Fitzgerald’s line of questioning broadly hinted at this and suggested that memory research could be interpreted as revealing the opposite of what Loftus was claiming—namely, that experts and laypersons were not very far apart in their basic views of memory. Loftus had stated, on the basis of research she had carried out herself, that “most jurors” regard memory as being akin to a mechanical recording (like a videotape) and thus were dangerously naive. But Fitzgerald pointed out that her research had found this belief (which was held by fewer than half the subjects) to apply only to memories of *traumatic* events—and most of these subjects also believed that memories could be changed by later experiences. No one had studied jurors’ attitudes to ordinary memories (such as the ones at issue in this case), and indeed, Fitzgerald implied, no one had studied potential jurors’ attitudes to other, more routine, memory phenomena (such as memories of conversations) for the simple reason that there was no need; these phenomena were not obscure enough to warrant expert testimony.²²

Whatever the beliefs about memory one could establish in individual surveys, Fitzgerald contended (drawing in part on memory studies themselves) that the environment of the courtroom made judges, at least, such good judges of memory that they sometimes did better than the experts. He then made a more general argument for the courtroom and the structure of a trial as a powerful (and self-sufficient) machine for the probing and evaluation of memory claims. In an elegant move that inspired a number of jokes in the press, he used Loftus’s own memory as an example: he reminded her that they had met once before, when she was an expert witness for the defense on another case. When Loftus failed to remember the event, he tried to refresh her memory by giving her more information about the original case. He then pointed out that memories (and the lack thereof) were routinely probed in this manner—that “witnesses are suddenly reminded of things in the courtroom before the jury”—and he asked skeptically whether she really believed “that jurors have any problem understanding that . . . people forget things”:

Aren’t trials different than experiments in a lot of different ways? For example in trials, unlike experiments, you ask *voir dire*. And when *voir dire* is conducted, people can ask jurors to be excused who don’t appreciate certain things or don’t seem sensitive to their concerns, correct? . . . [And judges] tell jurors not to isolate and focus on one single fact to the exclusion of all others. . . . And is it also fair to say that, unlike these experiments, when jurors participate in a trial they get to watch Cross-Examination, they get to watch witnesses . . . get confronted by facts that don’t line up with what they say, correct? . . . But surveys don’t study people after they have gone through this whole process of *voir dire*, watching witnesses testify, watching different witnesses contradict other witnesses, watching witnesses contradict themselves, watching witnesses being confronted with prior inconsistent statements, watching witnesses have their recollection refreshed, having instruction from a judge to take all this evidence together before they make a decision—that’s very different than a process by which we are estimating

²¹ Fitzgerald, “Government’s Memorandum in Opposition to Defendant’s Motion to Admit Expert Testimony,” *U.S. v. Libby*, No. CR 05-394 (D.D.C., 7 Sept. 2006).

²² The relevant exchange between Fitzgerald and Loftus is in “Transcript of Proceedings Before the Honorable Reggie B. Walton,” *U.S. v. Libby*, No. CR 05-394 (D.C.C., 26 Oct. 2006), A.M. session, pp. 61–70, 70–76, P.M. session, pp. 5 ff., 45–46. The paper at issue was Richard S. Schmechel, Timothy O’Toole, Catharine Easterly, and Elizabeth Loftus, “Beyond the Ken? Testing Jurors’ Understanding of Eye Witness Reliability Evidence,” *Jurimetrics Journal*, 2006, 46:177–204; the quotation being discussed is on p. 196.

how jurors will perform by performing a ten-minute or a ten-question telephone survey, correct?²³

Fitzgerald, in Wigmore mode—and with the advantage (or disadvantage) of having a real person on the stand, as opposed to a book—painted a picture of psychological expertise as being neither sufficiently reliable to offer reliable information in a courtroom nor necessary to correct deficiencies on the part of the jury. The arena of the courtroom and the structure of the litigation practices that went on within it were on the contrary a well-honed device for the production, calibration, and evaluation of memory statements.

Judge Reggie Walton agreed. He dismissed the proposal to bring in memory expert Robert Bjork as a “waste of time” that could mislead a jury into being overly skeptical of witness testimony. Jurors might not be familiar with a particular body of scientific research, but they were certainly familiar with the “frailties of memory” as a “commonplace matter of course,” and their own common sense was sufficient to understand how memory works, in the context in which they were called upon to make their particular judgments.²⁴ The reliability of memory continued to be a theme in the trial itself, and after the guilty verdict on March 6, 2007, there was speculation that the decision to refuse to allow a memory expert might provide him with one ground for appeal.

CONCLUSION

There is thus no tidy endpoint to the history of practices that seek to enrich or evaluate witness testimony. The scientific study of testimony continues to expand into a full-scale industry, and the current fashion for imaging technologies, for example, has seen the return of ambitious promises that science can arbitrate the credibility of memories recounted by a witness or defendant.²⁵ Our generation has seen an unprecedented amount of psychological expertise take the stand. But whether this is really producing a greater or more robust trust, either in the expertise or in the testimony, is still not clear.

One thing we can say, however, is this. In the twentieth century the aspiring science of memory retrieval tried many times to enter the courtroom, with grand designs of making it into a place of certainty. Those designs were utopian. In fact, the expertise of the courts proved more than a match for the expertise of the scientists. This was partly because litigants could call upon rival expertise from within science itself. The law could and did call into being a profound and decisive clash in a major scientific community, which then played out, at least halfway, in its space and on its terms. One final question is whether there are areas of scientific research—and memory would be one of them—that must always be difficult, volatile, and perhaps outright impossible for experts to speak about in court. The most recent episode in this history, in which Loftus played Münsterberg and Fitzgerald Wigmore, shows that after a century of memory researchers attempting to sell their science to the law, it is still possible for the courts to conclude that the knowledge and perspective psychologists offer may not be worth the price.

²³ “Transcript of Proceedings Before the Honorable Reggie B. Walton,” *U.S. v. Libby*, No. CR 05-394 (D.C.C., 26 Oct. 2006), A.M. session, pp. 76–78, P.M. session, pp. 31–33. The discussion of the first meeting between Fitzgerald and Loftus (on an earlier case) may be found on pp. 20–22.

²⁴ R. Walton, “Memorandum Opinion,” *U.S. v. Libby*, No. CR 05-394 (D.C.C., 2 Nov. 2006).

²⁵ See, e.g., Joe Dumit, *Picturing Personhood: Brain Scans and Biomedical Identity* (Princeton, N.J.: Princeton Univ. Press, 2003).

Bhopal's Trials of Knowledge and Ignorance

*By Sheila Jasanoff**

ABSTRACT

The disastrous gas leak at a Union Carbide plant in Bhopal, India, in December 1984 displayed the law's tragic inability to cope with the consequences of technological globalization. This essay describes the protracted efforts of the gas victims to obtain relief from courts in India and the United States and the reasons why the settlement of their legal claims did not satisfy their demands for justice. The victims' self-knowledge, whether scientific or social, found no traction in official medical record keeping or in courts of law. Their experience highlights the structural asymmetries of technology transfer across national boundaries. Union Carbide's technology of production moved from West to East with little hindrance and, in retrospect, with insufficient regard to conditions in Bhopal. By contrast, India's attempts to transfer legal accountability back to the exporting country proved essentially impossible, as American courts insisted that claims be resolved by Indian judges under Indian law.

FOR A BRIEF MOMENT in the late twentieth century, Bhopal, the sprawling, unremarkable capital of central India's province of Madhya Pradesh, became a staging ground for the ambiguous and contested emergence of global neoliberalism. The histories of states and markets, medicine and law, social activism and corporate power violently collided in that quiet provincial city. Though the loudest reverberations from that encounter have died down, the echoes will last as long as anyone is left alive to tell Bhopal's story. What happened there in the Orwellian year of 1984 says much about the human costs of globalization. It also illustrates the incapacity of law and science to restore order when radically different cultures of knowledge and justice come together in unplanned confrontation. Just such a clash of cultures occurred in Bhopal, and the results are important not only for postcolonial historians and students of legal history but also for historians and sociologists of scientific knowledge. For Bhopal's tragedy was as much about the capacity of powerful institutions selectively to highlight and screen out knowledge as it was about maimed lives and justice denied or delayed. The resulting double failure, of law and of science, is the subject of this reflection.

Minutes after midnight on 3 December 1984, the world's worst industrial accident shat-

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tered Bhopal.¹ A cloud of heavy, deadly methyl isocyanate (MIC) gas escaped from a Union Carbide pesticide plant and spread across some of the poorest sectors of the city. Especially hard hit was the colony of J. P. Nagar, located just across the street from the plant and inhabited mostly by Muslims and low-caste Hindus. Thousands of Bhopal's citizens died instantly or within days of the accident, blinded, choked, and suffocated by the acutely toxic fumes. Hundreds of thousands more were injured, many suffering intense physical and mental distress years, even decades, after the accident. One such delayed victim was Sunil Kumar Verma, a thirty-four-year-old activist who lost his father, mother, and five siblings in the disaster. As an adult, Verma ceaselessly campaigned for justice for the survivors until he hanged himself on 26 July 2006.² He had been under treatment for paranoid schizophrenia, but whether his condition was related to the gas exposure will never be known.

That is not the only unknown that lingers over Bhopal, long after a tragedy that took more lives than did the terrorist attacks of 11 September 2001 in the United States. What, for example, caused the disaster? We know that water introduced into a storage tank containing highly reactive liquid MIC unloosed an explosive reaction, but how the water got into the tank remains a mystery. On its Web site, Union Carbide Corporation (UCC), a wholly owned subsidiary of Dow Chemical since 2001, lists this entry for 1984: "In December, a gas leak at a plant in Bhopal, India, caused by an act of sabotage, results in tragic loss of life." A link leads to a consultant's report, prepared by the Arthur D. Little company in Cambridge, Massachusetts, that rules out accident and blames the Government of India for preventing an immediate, all-out investigation. Official Indian reports never accepted the sabotage theory, and Bhopal victims continue to hold Union Carbide responsible for the gross negligence and lack of maintenance that they say led to the tragedy. The unknowns include the number of deaths that occurred in the accident's immediate aftermath, the numbers and kinds of longer-term illnesses and injuries caused by exposure to MIC, the success or failure of rehabilitation efforts, the efficacy of funds disbursed for relief, and, most recently, the extent of damage to Bhopal's soil and water quality caused by the plant's pre-1984 activities.³

Why are the disaster's causes and consequences still shrouded in such uncertainty? The events of that December night did after all lead to protracted litigation, joining for a time the legal systems of India and the United States in what might have been a mutual project of discovery and restitution. The law, we know, can be a powerful engine for uncovering facts and spurring the production of new knowledge, and law in sometimes unexpected forms came to the victims' aid promptly enough. Immediately after the gas leak, a number of prominent U.S. tort lawyers descended on Bhopal in what the legal scholar Marc Galanter describes as "the great ambulance chase"⁴: the fabled dash by entrepreneurial lawyers

¹ For a dramatic, journalistic account of the events see Dominique Lapierre and Javier Moro, *Five Past Midnight: The Epic Story of the World's Deadliest Industrial Disaster* (New York: Warner, 2002).

² K. S. Shaini, "Bhopal Activist Dies with Broken Dreams," 17 Aug. 2006, http://news.bbc.co.uk/2/hi/south_asia/4795771.stm (accessed Sept. 2006).

³ Union Carbide Corporation, History, <http://www.unioncarbide.com/history/index.htm>; and Ashok Kalelkar, "Investigation of Large-Magnitude Incidents: Bhopal as a Case Study," Arthur D. Little, Inc., Cambridge, Mass., May 1988, <http://www.unioncarbide.com/history/index.htm>. For one set of estimates of deaths in the immediate aftermath of the accident see Roli Varma and Daya R. Varma, "The Bhopal Disaster of 1984," *Bulletin of Science, Technology, and Society*, 2005, 25(1):37–45.

⁴ Marc Galanter, "The Transnational Traffic in Legal Remedies," in *Learning from Disaster: Risk Management after Bhopal*, ed. Sheila Jasanoff (Philadelphia: Univ. Pennsylvania Press, 1994), pp. 133–157, on p. 147. On the law as a spur to knowledge production see Tal Golan, *Laws of Men and Laws of Nature: The History of*

to line up victims as clients—figuratively, on their way to the hospital—in the hope that the clients' misfortunes will not only be compensated but will line the pockets of those lucky enough to represent them. With the passage of the 1985 Bhopal Act, however, the Indian government short-circuited any such hope of private gain; the state itself took over the exclusive representation of all claims arising from the disaster, under the doctrine of *parens patriae* (father to the people).

This action by no means ended the entanglement of the American and Indian legal systems, with their inbuilt, culturally specific conceptions of truth and justice. In one of several tragicomic turns, India employed Galanter, an expert in American tort law, to make the argument that Indian courts were institutionally unqualified to deal with claims of this magnitude and diversity. Galanter surveyed a decade of Indian tort cases from 1975 to 1984 and concluded that delays of *Bleak House* proportions were routine, even for cases of no great complexity, and that (unlike in America) there had been no tie-in between industrial disasters and progressive developments in tort law.⁵ Galanter's was quite possibly the first systematic study of a developing nation's lack of legal instruments to deter the careless operation of extremely hazardous imported industries. India, in his uncompromising judgment, did not possess the homegrown legal competence to handle the disastrous consequences of an eminently non-homegrown technology.

Belying the apparent ease of transferring Carbide's technology of production from West to East, India's attempts to transfer the legal sanctions for failure back to the risk-exporting country proved much less easy. Globalization is anything but symmetrical in its flows and frictions. The government's class action on behalf of Bhopal's victims never went to trial. Instead, after much legal skirmishing over where the case should be adjudicated—a question resolved in Carbide's favor by federal district judge John F. Keenan, designating India as the proper venue—the Government of India accepted Carbide's settlement offer of \$470 million in May 1989.⁶ That action not only put an end to all outstanding claims against Carbide resulting from the gas leak but also ended official inquiry into the facts. Formally, the case was closed. For the survivors, though, it was merely the end of the beginning, in a saga that brought them neither cognitive closure nor a sense of justice achieved.

For Bhopal activists, the insufficiency of scientific knowledge is inseparable from the inadequacy of justice. Their sense of things left unresolved is consistent with much writing in science and technology studies demonstrating that scientific and technical controversies refuse to close unless associated normative disagreements are also addressed and resolved; scientific and social order, and disorder, are in this sense co-produced.⁷ In the survivors' accounts, both Carbide and the Indian state were implicated in equally reprehensible acts of denial—of knowledge as well as legal responsibility. UCC, for example, denied knowing both medical facts about the toxicity of MIC and management facts about what had been happening at the plant under the supervision of its partly owned subsidiary, Union

Scientific Expert Testimony in England and America (Cambridge, Mass.: Harvard Univ. Press, 2004); and Jasanoff, *Science at the Bar: Law, Science, and Technology in America* (Cambridge, Mass.: Harvard Univ. Press, 1995).

⁵ Galanter, "Transnational Traffic in Legal Remedies," pp. 145–146.

⁶ *In re: Union Carbide Corporation Gas Plant Disaster at Bhopal, India*, 634 F. Supp. 842 (SDNY 1986). Judge Keenan's denial of India's petition to move the Bhopal litigation to the United States, on the ground that India was after all a suitable forum for an action of this kind, represented a victory for Union Carbide, which wanted the case to remain in India.

⁷ For further elaboration of this point see Sheila Jasanoff, ed., *States of Knowledge: The Co-production of Science and Social Order* (London: Routledge, 2004).

Carbide India, Limited (UCIL). The first denial left victims without any known antidotes or treatment options in the wake of the accident. The second undercut their efforts to hold UCC, the parent company, responsible for UCIL's negligence.

Indian lawyers representing the victims argued that multinationals, by virtue of their global purpose, organization, and resources, should be treated as single, monolithic agents, rather than as a network of discrete, noninterdependent units. They used this reasoning to advance a novel theory of "multinational enterprise liability" whereby liability for a subsidiary's carelessness could be attributed to the parent company. But UCC's written rejoinder, filed in December 1986 in a Bhopal district court, rejected this logic as unfounded in existing law: "The defendant submits that there is no concept known to law as 'multinational corporation' or 'monolithic multinational.'" A 1990 compilation of documents in the case by the Indian Law Institute lampooned this "ontological negation" through which UCC denied its very existence as a corporate entity operating across national borders.⁸ More strikingly, the very company that had persuaded Judge Keenan that adequate legal remedies could be found in Indian courts rejected the doctrinal innovations that might have corrected for asymmetries of power and knowledge between producers and consumers of transnational risks. Relations of dependency were inscribed twice over. Not only had India needed to import Carbide's innovations in agrochemicals technology, but now Indian courts had to accept the conceptual structure of American corporate law as controlling.

For its part, the Indian state deployed its medical and scientific resources in ways that undercut the victims' claims of illness and, in one noteworthy instance, their experiences of healing. Relief workers who arrived on the scene soon after the disaster reported that only one treatment seemed to afford exposed persons any relief. This was the chemical sodium thiosulfate, an antidote to cyanide poisoning. Government doctors, however, denied that MIC exposure could cause cyanide-like symptoms and, in an action whose sheer arbitrariness victims' groups never forgave, forcibly put an end to any large-scale efforts to administer the antidote. The Indian Council of Medical Research, among the most trusted of the government's scientific units, inexplicably ended its follow-up studies of Bhopal victims in 1994, a mere ten years after the gas release, when many children of exposed persons had not yet been born and latent diseases like cancer likely had not fully manifested themselves.⁹ A state that had in 1985 declared itself the only qualified representative of the victims' legal claims evidently felt no equivalent custodial responsibility to validate or alleviate their ongoing medical complaints.

A full-blown history of Bhopal's legal ramifications would not stop with the settlement between UCC and the Government of India. Central as the compensation case was to the lives of disaster victims, some of the most far-reaching changes in the legal and scientific culture for managing hazardous chemicals occurred back in the producer countries. In 1986 the U.S. Congress enacted the Emergency Planning and Community Right-to-Know Act, which requires emitting facilities to report releases of chemicals outside the plant to a database, known as the Toxics Release Inventory (TRI), managed by the Environmental Protection Agency (EPA). In time, the data disclosed through that reporting system built pressure for companies to reduce their overall emissions, and the 1990 Pollution Prevention Act required companies to report additional information on their efforts to manage and

⁸ Upendra Baxi and Amita Dhanda, *Valiant Victims and Lethal Litigation: The Bhopal Case* (Delhi: Indian Law Institute, 1990), pp. 61 (OCC rejoinder), xiv ("ontological negation").

⁹ Charlene Crabb, "Revisiting the Bhopal Tragedy," *Science*, 2004, 306:1670–1671.

reduce wastes at the source. On its TRI Program Web page, the EPA at once recognizes and rewrites the genealogy of these laws. A text headed “What Is the Toxics Release Inventory (TRI) Program?” begins as follows:

In 1984 a deadly cloud of methyl isocyanate killed thousands of people in Bhopal, India. Shortly thereafter, there was a serious chemical release at a sister plant in West Virginia. These incidents underscored demands by industrial workers and communities in several states for information on hazardous materials. Public interest and environmental organizations around the country accelerated demands for information on toxic chemicals being released “beyond the fence line”—outside of the facility.¹⁰

EPA’s bureaucratic imagination here reduces to practically nothing the normative distance between a catastrophic industrial disaster in India and a routine chemical release in the United States. In EPA’s historiography, both “incidents” at “sister” plants equally spurred the demands for legislation and information provision—at home, in America.

Yet the knock-on effects of Bhopal in sites far removed from the initial tragedy only highlight what we know from comparative studies of law and science. Legal and scientific changes both play out against backdrops conditioned by human expectations about what constitutes adequate knowledge, what counts as justice, and how the two are linked. These expectations, moreover, are consolidated and continually reperformed by powerful institutions, creating the stable elements of political culture that I have elsewhere termed “civic epistemologies”: that is, shared understandings about what credible claims should look like and how they ought to be articulated, represented, and defended in public domains. If Bhopal gave rise to right-to-know laws in the United States, it was in part because technical information and “trust in numbers” occupy a different place in American than in Indian civic epistemology. EPA’s description of the TRI’s aims reaffirms the close connection between ideas of cognitive and normative sufficiency—indeed, their co-production—in U.S. political culture: “The goal of TRI is to empower citizens, through information, to hold companies and local governments accountable in terms of how toxic chemicals are managed.”¹¹

Much of this story will be available to the talented historian of the late twenty-first century who wishes to look back on Bhopal as a watershed in the long march of globalization; and minds trained by the dialogue between science studies and the history of science will be particularly attentive to the co-productionist aspects of these developments—that is, to the inseparable ties between social and scientific order. But are there pieces of the story that no archive can store and that we, as witnesses and narrators of our own present, have a special obligation to record? It was in search of answers to that question that I

¹⁰ U.S. Environmental Protection Agency, Toxics Release Inventory (TRI) Program, <http://www.epa.gov/tri/whatis.htm> (accessed Nov. 2006). On some European developments see Josee van Eindhoven, “Disaster Prevention in Europe,” in *Learning from Disaster*, ed. Jasanoff (cit. n. 4), pp. 113–132.

¹¹ Sheila Jasanoff, *Designs on Nature: Science and Democracy in Europe and the United States* (Princeton, N.J.: Princeton Univ. Press, 2005), pp. 247–271 (on “civic epistemology”); and EPA, TRI Program, <http://www.epa.gov/tri/whatis.htm>. I use the phrase “trust in numbers” to refer to American political culture’s particular devotion to the objectivity of numbers, as recounted in works like Theodore M. Porter, *Trust in Numbers: The Pursuit of Objectivity in Science and Public Life* (Princeton, N.J.: Princeton Univ. Press, 1995); and Jasanoff, *Risk Management and Political Culture* (New York: Sage, 1986). For an account that contrasts civic epistemology in America, Britain, and India see Jasanoff, “Restoring Reason: Causal Narratives and Political Culture,” in *Organizational Encounters with Risk*, ed. Bridget Hutter and Michael Power (Cambridge: Cambridge Univ. Press, 2005), pp. 209–232.

visited Bhopal with a friend in the summer of 2004, nearly twenty years after the disaster. I had written about the tragedy intermittently throughout that period and had interviewed or interacted with most of the leading figures involved in the early years of litigation, but I had never been to the city itself, and I wanted to hear from the Bhopal activists how they felt their cause had fared.¹²

Coincidentally, it was during our August visit that the Indian government paid out the final installment of the relief fund to the victims, and newspapers were full of accounts of money misspent on consumer goods, such as motorcycles. Leaders of two major survivor organizations, Abdul Jabbar of the Bhopal Gas-Affected Woman Workers' Organization and Satinath Sarangi of the Sambhavna Trust, told a different story.¹³ Hospitals had been built, they said, but were mismanaged and did not provide adequate care even for the gas victims, let alone for those afflicted by chronic pollution near the long-abandoned Carbide plant. Relief funds, amounting to no more than \$1,000 per person, fell hopelessly short of paying for the real costs of lifetimes of chronic illness. In a poisoned city, the chronicle of unredressed and unacknowledged medical cases had in any case swollen to include, by 2004, a generation of children born to gas-exposed parents.

Jabbar and Sarangi followed different paths in their efforts to secure the moral closure that legal negotiations between Carbide and the Indian state had denied to victims. Jabbar's family had lived two kilometers from the plant at the time of the accident, in the line of exposure. He coughed throughout our meeting and spoke English awkwardly as he told us stories of early deaths and enduring illness. His activism, too, stayed close to home. Jabbar's strategy is to empower local residents—not so much with knowledge as with other skills—while maintaining constant pressure on the Indian government in the hope that justice will someday prevail. His center offers women training in craft skills, such as sewing and embroidery, teaching them economic and social self-sufficiency. The women had come a long way, he told us, since the 1980s, when most still wore the traditional, all-concealing burka of Indian Muslims. They could stand up for themselves now and had learned to ask for reasons and identification if police or other officials came to question them. But Jabbar's most passionate wish seemed unlikely ever to be granted: he wanted to see Warren Anderson, former chairman of Union Carbide, jailed "for one day, but at least for one day." Anderson had visited India once, just after the accident, and was briefly detained but then let go. Subsequently, he was charged with culpable homicide in an Indian court and declared a fugitive from justice, but he never returned to India and the Indian government did not press for his extradition.

Sarangi's strategy looks outward, enlisting an international network of experts and activists and soliciting attention from the media to keep pressing on the world's forgetful conscience. Workers at his clinic have documented significant growth abnormalities among sons of gas-affected parents and have published their results in the *Journal of the American Medical Association*.¹⁴ In 2004, Sarangi was spearheading attempts to hold Dow Chemical legally responsible for environmental damage resulting from UCC's allegedly negligent operations at the plant before the gas release. Health claims resulting from that earlier

¹² For earlier treatment of the Bhopal tragedy see esp. Jasanoff, ed., *Learning from Disaster* (cit. n. 4).

¹³ I draw in the following paragraphs on personal interviews with Abdul Jabbar and Satinath Sarangi, Bhopal, 9–11 Aug. 2004.

¹⁴ Nishant Ranjan, Satinath Sarangi, Steve Holleran, Rajasekhar Ramakrishnan, and Daya R. Varma, "Methyl Isocyanate Exposure and Growth Patterns of Adolescents in Bhopal" [research letter], *Journal of the American Medical Association*, 2003, 290:422–423.

contamination, Sarangi and his supporters argued, could not have been extinguished by the 1989 settlement, which covered only the gas victims. But to pursue those collateral claims before a court-ordered time limit ran out, Bhopal activists had to persuade the Government of India to declare, quickly and publicly, that its *parens patriae* role, as articulated in the 1985 Bhopal Act, did not extend to injuries caused by environmental conditions in the city before the disaster.

Under severe time pressure, the activists could find no more effective instruments of persuasion than their own bodies. In Indian political space the language of suffering bodies still possesses an authenticity and power to convince that cannot be matched by any number of published scientific articles. In June 2004 Sarangi, accompanied by two of Bhopal's most famous women—Rashida Bee and Shahid Noor—and hundreds of volunteers, began a time-honored Indian ritual of protest. They fasted on the sidewalk outside the Jantar Mantar, Delhi's famous eighteenth-century outdoor observatory. But for these bodies to speak truth to power they had to be seen to be wasting, and time was in very short supply. The Bhopalis decided on a waterless fast, so that the effects would be more speedily visible; but their goal was to move the state, not to engage in a pointless heroics of self-sacrifice. Their attending physicians saw to it that they did not risk kidney failure from rapid dehydration in Delhi's punishing summer heat. A well-coordinated campaign by phone, fax, and email kept up the pressure on government officials, who bowed to the fasters' demands within a week.

It cost the state little—other than some temporary embarrassment—to give in to the protesters this time; all the government did was clear a legal hurdle to letting the collateral action against Dow go forward. For the Bhopalis, the state's move was more consequential because it opened a new legal front, along with the chance to generate yet further scientific representations of hurt and injury that might circulate in worlds outside the axis of Bhopal and New Delhi. It is worth stressing that science, for Bhopal activists, is not an “immutable mobile” that wholly captures or translates the reality of their suffering to distant venues.¹⁵ Science is one speaking voice among many, a tool that some have used with indifferent success for talking across institutional boundaries and enhancing credibility. But what mode of representation could possibly express the activists' unending quest for proper compensation? In what discourse of persuasion could a settlement be forged, or even imagined, between radically incompatible ideas of accountability? American public reason, formally articulated through law, science, or economics? Or Indian public morality, with its symbolic demands for social justice and the assumption of responsibility by the state for a grievously harmed community?

On the third and last night of our stay in Bhopal, we were invited to join a candlelight vigil organized by the Sambhavna Trust. Together with about fifty marchers, including survivors and their grown children, we quietly circled a block in the center of the city, candles in our hands, and stood for pictures for a few minutes before dispersing into the night. The ritual seemed familiar to the other participants, though the particular focus evidently changed from one time to the next. That night, the banners held by members of our group proclaimed solidarity with the Vietnamese victims of Agent Orange, one of Dow's most notorious chemical products. At the end of the evening, our candles, now massed on the ground, outlined in flickering light the trust's logo: two figures embracing.

¹⁵ For the use of the term “immutable mobile” to describe scientific representations see Bruno Latour, “Drawing Things Together,” in *Representation in Scientific Practice*, ed. Michael Lynch and Steve Woolgar (Cambridge, Mass.: MIT Press, 1990), pp. 19–68.