Truth and Justice, Inquiry and Advocacy, Science and Law

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Abstract. There is tension between the adversarialism of the U.S. legal culture and the investigative procedures of the sciences, and between the law’s concern for finality and the open-ended fallibilism of science. A long history of attempts to domesticate scientific testimony by legal rules of admissibility has left federal judges with broad screening responsibilities; recent adaptations of adversarialism in the form of court-appointed experts have been criticized as “inquisitorial,” even “undemocratic.” In exploring their benefits and disadvantages, it would make sense to look to the experience of other legal systems.

No one will deny that the law should in some way effectively use expert knowledge wherever it will aid in settling disputes. The only question is as to how it can do so best. (Judge Learned Hand 1901)¹

I

Justice requires just laws, of course, and just administration of those laws; but it also requires factual truth. And in determining factual truth, in both civil cases and criminal, courts very often need to call on scientists: on toxicologists and tool-mark examiners, epidemiologists and engineers, serologists and psychiatrists, experts on PCBs and experts on paternity, experts on rape trauma syndrome and experts on respiratory disorders, experts on blood, on bullets, on battered women, and so forth and so on. For, as science has grown, so too has the dependence of the legal system on scientific testimony. Such testimony can be a powerful tool for justice; but it can also be a powerful source of confusion—not to mention of opportunities for opportunism.

Who could have imagined, for example, when DNA was first identified as the genetic material half a century ago, that DNA analysis would by now have come to play so large a role in the criminal justice system, and in the

¹ Hand 1901, 40, italics mine.
public perception of the law? At first, after DNA “fingerprinting” made its way into U.S. legal proceedings in 1987, it was strenuously contested in the courts; but as its solidity, and its power to enable justice, became unmistakable, the “DNA Wars” gradually died down. By now DNA testing has not only helped convict numerous rapists and murderers, but also exonerated many convicted prisoners, including a significant number on death row.\(^2\) In one instance, DNA even exonerated a prisoner of the rape for which he was serving 25 to 50 years, and then, three years later, helped convict the same man of a different rape. Even so, many problems remain: Police officers and forensic scientists make mistakes, honest or otherwise; juries misunderstand the significance of random-match probabilities, or can’t combine them with information about the likelihood that a sample was mishandled; criminals misdirect investigators by planting someone else’s DNA; inmates request DNA testing in hopes of creating confusion and raising factitious doubts of their guilt; etc.

And who could have imagined, when Hugo Münsterberg urged in his *Essays on Psychology and Crime*, published in 1908, that U.S. courts should follow the European example of looking to the work of experimental psychologists on eyewitnesses, memory, etc.,\(^3\) that such work would by now have proven so useful—or that clinical psychologists’ and psychiatrists’ diagnoses of various syndromes, and especially of supposedly repressed and recovered memories, would have become the subject of heated battles in the courtroom, in the press, and in the academy? In the mid-1980s, testimony of recovered memories was crucial in such high-profile trials as the McMartin Preschool case, one of the longest and most expensive U.S. criminal trials ever. The kindergarten teachers at the McMartin School were eventually acquitted of the numerous charges of ritual sexual abuse of the children in their care; and by the mid-1990s it seemed that the skepticism about recovered memories expressed by experimental psychologists like Elizabeth Loftus was vindicated. But recently the “Memory Wars” have flared up again, now in claims against Catholic priests accused of sexual abuse of young people.

“If Science, for a consideration, can be induced to prove anything a litigant needs [. . .], then Science is fairly open to the charge of venality and perjury, rendered the more base by the disguise of natural truth in which she robes herself,” wrote John Ordronaux in the *American Journal of Insanity* for 1874; and lawyers and legal scholars still complain that venal scientists brought in by unscrupulous attorneys will testify to just about anything a case demands. Some scientists concur; but others think the problem is that juries, judges, and attorneys are too illiterate scientifically to discriminate

\(^{2}\) For a list, see http://www.innocenceproject.org.

\(^{3}\) Münsterberg 1908; shortly after the publication of his book, he was mercilessly satirized by the celebrated evidence scholar John Wigmore, who put Münsterberg himself “on the witness stand” in Wigmore 1909.
sound science from charlatanism. There surely are venal and incompetent scientists, and scientifically ignorant and credulous jurors, attorneys, and judges. However, there are also deep tensions between science and the law—tensions which contribute significantly to the problems of handling scientific testimony.

Peter Schuck describes the interactions of the law with science and with politics as a kind of “multiculturalism”; Steven Goldberg writes of the “culture clash” of law and science in America.⁴ But the “two cultures” model is in some respects potentially misleading; “the nature of science and the culture of law” might be a better way to put it. For, though science surely is, among other things, a social institution, scientific inquiry arises from a desire to understand and control natural phenomena, and so is responsible to the character of the world it investigates, as well as constrained by the cognitive powers and limitations of human inquirers; and while details of its practice and etiquette certainly vary with time and place, it is at its core essentially the same the world over. Legal systems, on the other hand, arise in response to conflict, to disputes, and though no doubt broadly constrained by facts about human nature and society, are much more largely the product of convention, coming into existence only because of human institutional practices; and they are local, specific to a time and place, in a way that science is not.⁵

I shall focus here on the tensions between the adversarialism of the U.S. legal culture and the quite different procedures of the sciences, and between the legal concern for prompt and final resolutions and the open-ended falsibilism of science. No doubt some aspects of this story, though familiar to American readers, will seem quite strange to European legal scholars. I can only hope that, rather than producing mutual incomprehension, this may prompt fruitful cross-cultural discussion.

II

“Science,” as I construe it, picks out a loose federation of kinds of inquiry; “law,” on the other hand, Webster’s dictionary tells us, refers to “a body of customs, practices, or rules of conduct recognized as binding or enforced by a controlling authority.” It is important not to overstate the contrast. A scientific investigation is an attempt to arrive at the truth of some question; but so too, it is often said, is a trial: in a 1966 ruling the U.S. Supreme Court averred that “[t]he basic purpose of a trial is the determination of truth”;⁶ one of the avowed goals of the Federal Rules of Evidence is “that the truth be ascertained”; in her introduction to the 1996 National Institute of Justice

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⁴ Schuck 1993; Goldberg 1994.
⁵ My thanks to Mark Migotti for very helpful discussion of the issues raised in this paragraph.
Report on DNA evidence, then-Attorney General Janet Reno affirmed that “[o]ur system of criminal justice is best described as a search for truth.”

But it is no less important not to understate the contrast, to acknowledge, with Justice Blackmun, the “important differences between the quest for truth in the courtroom and the quest for truth in the laboratory.” At a trial a jury is asked to decide whether guilt or liability has been established to the desired degree of proof. This is a very special kind of inquiry into a very special kind of proposition, and is constrained not only by the demands of evidence, but also by considerations of principle and policy: that it is worse to convict the innocent than to free the guilty; that constitutional rights must be observed, that people should not be discouraged from making repairs which, if made earlier, might have prevented the events for which they are being sued, and so forth. Moreover, the procedures of a trial are quite unlike those of ordinary scientific or historical inquiry, or even of investigative journalism or detective work; as is the very special division of labor inherent in the adversarial system, where competing advocates, held to legally proper conduct by a judge, present the evidence on the basis of which a jury is to arrive at its verdict.

Scientists, like historians, detectives, investigative journalists, legal and literary scholars, etc., are by profession inquirers. Inquiry is an attempt to discover the truth of some question or questions; so the obligation of a scientist, qua inquirer, is to seek out all the evidence he can, to assess its worth as impartially as possible, to draw conclusions only if and as the evidence warrants doing so, and when the available evidence is inadequate, to try, acknowledging that at present he simply doesn’t know, to get better evidence. Attorneys, by contrast, like lobbyists or clergymen, are by profession not inquirers, but advocates. Advocacy is an attempt to make a case for the truth of some proposition or propositions; and so the obligation of an attorney, qua advocate, is to seek out evidence favoring the proposition(s) in question, to present it as persuasively as possible, and to play down, or explain away, unfavorable evidence—or to look for legal grounds for its exclusion.

Once again, it is important neither to overstate nor to understate the contrast. Science is the work of many people, both within and across generations. Often it is co-operative; but sometimes it is competitive, with proponents of rival theories or approaches seeking out the flaws and difficulties in a competing theory that its proponents are motivated to play down

7 Reno 1996.
9 The ruling in Tehan (note 6 above) continues: “by contrast, the Fifth Amendment Privilege against self-incrimination is not an adjunct to the ascertainment of truth [...] but stands as a protection of quite different constitutional values [...].”
10 Federal Rule of Evidence 407: evidence of “subsequent remedial measures” is inadmissible.
11 This is not, of course, to deny that in applied science—in medicine or engineering, for example—practical decisions may have to be made in the absence of good evidence.

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or ignore. Such competition can be a real spur to intellectual effort; as with James Watson’s (probably exaggerated) perception that Pauling and his team were racing against Crick and himself to solve the structure of DNA. But what Watson wanted wasn’t simply to beat out Pauling; it was to discover the truth about DNA before Pauling did. Even when science is at its most competitive, its procedures are very far from the adversarial procedures of a trial: there is no real analogue of the legal division of labor between attorneys, judge, and jury; and scientists’ competition for priority is very different from attorneys’ competition to win a case.

As C. S. Peirce observed in a lecture of 1898, the idea of science is to keep working at a question, sometimes for generation after generation, until the truth is finally attained. By now, there is a vast body of scientific knowledge, well-warranted by evidence, and unlikely to be overturned. But many, many scientific questions are as yet unanswered (not to mention those as yet unaskable), and not all scientific theories are well-supported by good evidence: Most get discarded as the evidence turns out against them; nearly all, at some stage of their careers, are only tenuously-supported speculations; and even the best-warranted are in principle subject to revision should new evidence demand it. For preparedness to revise even the most entrenched claim in the face of unfavorable evidence is essential to scientific inquiry; as is agnosticism, a willingness, that is, to admit that you just don’t know. In the law, however, a judgment must be reached—a “quick, final, and binding” judgment, in Justice Blackmun’s words—however weak or defective the available evidence may be. Peirce comments that this is why the law needs standards of proof; more clearly, it is why the law needs statutes of limitations, restrictions on the introduction of new evidence, and final courts of appeal.

Because of the tensions of fallibilism with finality, the legal system sometimes asks more of science than science can give: When courts need an answer to some scientific question (is Bendectin teratogenic? does this minuscule sample of blood come from the victim? do silicone breast implants promote systemic connective-tissue disease?), there may still be reasonable disagreement among scientists in the relevant field, or agreement that no warranted answer is yet available; and when a warranted answer is available, it may be legally too late—this is new evidence, no longer admissible, the period within which you may prosecute or sue has elapsed, etc. And because of the tension of inquiry with adversarialism, the legal system often gets less from science than science could give: For attorneys are motivated by the demands of their profession to seek out experts willing to shade or select the evidence as a case demands, and may encourage maverick, marginal, or less-than-honest scientists into the lucrative business of the

12 Peirce 1931–58, 6.3.
13 Daubert at 2798.
professional expert witness—perhaps keeping scientific disputes legally alive long after the scientific community has come to see them as pretty firmly settled.

III

Not surprisingly, it has proven difficult to harness science to the U.S. legal culture, and in particular to domesticate scientific testimony by legal rules of admissibility.

Courts have always needed to determine matters of fact. But in early medieval times “proof was not an attempt to convince the judges; it was an appeal to the supernatural [. . .]. The common modes of proof [were] oath and ordeal”; for example, in an action for debt a defendant might be required to prove his claim that he owed nothing by swearing to it, and bringing in “oath-helpers” to swear that his oath was not perjured. 14 “Proof,” here, has its old sense, testing; and such tests were based on the assumption that God would punish those who swore falsely, would ensure that an innocent man’s arm was not scalded if he plunged it into boiling water, and so forth. In 1215, however, the fourth Lateran Council prohibited priests from taking part in such tests.

In early jury trials, rather than witnesses being called, jurors could go around and investigate for themselves, and, in cases where specialized knowledge was required, might be selected for their expertise—e.g., a jury of hatters when the defendant was accused of selling badly-made caps; or the court itself might call an expert—e.g., a master of grammar to help construe doubtful words in a bond. The custom of calling witnesses gradually developed, and then the adversary system, with cross-examination and formal rules governing the admissibility of evidence; until eventually there were expert witnesses in something like the modern sense: experts proffered by the parties and asked, not to testify to what they saw, but to give their informed opinion. 15

For a long time it was required only that a scientific witness, like any other expert witness, establish his qualifications as an expert. Then in 1923 the Frye ruling imposed new restrictions on the proffered testimony itself; excluding testimony of a then-new blood-pressure deception test, the D. C. court ruled that novel scientific evidence was admissible only if it had gained “general acceptance in the field to which it belongs.” 16 At first cited only rarely, the “Frye rule” gradually came to be widely followed in criminal trials, and by

14 Maitland 1909, lecture II.
15 According to Learned Hand (1901, 45, 56) the first case of an expert witness as exception to the rule that the conclusions of a witness are inadmissible was in Alsop v. Bowtrell, Cro. Jac. 541 (1620). According to Stephan Landsman (1995, 141), one of the earliest cases of expert witnesses called by the parties and subject to cross-examination was Folkes v. Chadd, 3 Doug. 157 (1782).
1975, when the Federal Rules of Evidence were enacted, had been adopted in a majority of states. The *Frye* test is a better proxy for scientific robustness, obviously, when the field in question is a mature, established scientific specialty than when it is a highly speculative area of research, or, worse, the professional turf of a trade union of mutually-supportive charlatans; and it can be made more or less demanding according to how broadly or narrowly the relevant field is specified. Nevertheless, it was commonly criticized as too restrictive.

The Federal Rules set what seemed to be a less restrictive standard: The testimony of a qualified expert is admissible provided only that it is relevant, and not legally excluded on grounds of unfair prejudice, waste of time, or potential to confuse or mislead the jury. In *Barefoot* (1983) the Supreme Court ruled that the constitutional rights of a defendant in a Texas capital-sentencing case had not been violated by admitting testimony that he would be dangerous in future—even though an amicus brief from the American Psychiatric Association reported that two out of three predictions of future dangerousness are wrong. Writing for the majority, Justice White observed that federal and state rules of evidence “anticipate that relevant, unprivileged evidence should be admitted and its weight left to the fact-finder, who would have the benefit of cross-examination and contrary evidence by the opposing party.”

Justice Blackmun wrote an angry dissent.

But by the late 1980s, while legal scholars debated whether the Federal Rules had or hadn’t superseded *Frye*, and whether a more or a less restrictive approach to scientific testimony was preferable, there was rising public concern that the tort system was getting out of hand. In 1991 Peter Huber urged in an influential book, *Galileo’s Revenge*, that “junk science,” which would have been excluded under *Frye*, was being admitted under the FRE. In 1992 proposals to tighten up the FRE were before Congress. In 1993 the Supreme Court issued its landmark ruling in *Daubert*—a Bendectin case, and the first in its 204-year history where the Court ruled on the standard of admissibility of scientific testimony.

The FRE had superseded *Frye*, the Supreme Court ruled, but the Rules themselves required judges to screen proffered expert testimony not only for relevance, but also for reliability. In doing this, Justice Blackmun wrote for the majority, courts must look, not to an expert’s conclusions, but to his “methodology,” to determine whether proffered testimony is really “scientific . . . knowledge,” and hence reliable. Citing law professor Michael Green citing philosopher of science Karl Popper, adding a quotation from Carl Hempel for good measure, the *Daubert* Court suggested four factors for assessing reliability: “falsifiability,” i.e., whether the testimony “can be or has been tested”; the known or potential error rate; peer review and

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publication; and, in a nod to Frye, acceptance in the relevant community. In dissent, however, pointing out that the word “reliable” nowhere occurs in the text of Rule 702, Justice Rehnquist worried aloud that federal judges were being asked to be amateur scientists; anticipated difficulties over whether and if so how Daubert should apply to non-scientific expert testimony; and questioned the wisdom of his colleagues’ foray into philosophy of science.

Perhaps the Daubert Court was drawn into its unfortunate philosophical excursus by that all-too-common honorific use of “science” and “scientific” as generic terms of epistemic praise—as, in television advertisements, actors in white coats urge us to get our clothes even cleaner with new, “scientific” Bioclen. At any rate—quite apart from the confusion of Popper’s and Hempel’s incompatible philosophies of science, and quite apart from the inappropriateness of looking to Popper, who insists that scientific claims can never be shown true or even probable, and explicitly repudiates any concern for reliability, for an account of what makes evidence reliable—the fundamental problem is that no criterion could identify the “methodology” that discriminates the scientific, and hence reliable, from the unscientific and unreliable. For not all, and not only, scientists are good, reliable inquirers; and there is no “scientific method” in the sense the Court assumed, i.e., no uniquely rational mode of inference or procedure of inquiry used by all scientists and only by scientists. Rather, as Einstein once put it, scientific inquiry is “a refinement of our everyday thinking,” superimposing on the inferential and inferential common to all serious empirical inquiry a vast variety of constantly evolving, and usually local, “helps” to inquiry: instruments of observation, special mathematical or statistical techniques of reasoning, and so forth.

Perhaps this partly explains why, only four years after Daubert, quietly backing away from its reliance on Popper, Hempel, falsifiability, etc., in Joiner (a toxic tort case involving PCB exposure), the Supreme Court denied the legitimacy of the distinction between methodology and conclusions on which it had insisted in Daubert. And only two years after that—trying to sort out the problems with non-scientific experts which, as Justice Rehnquist anticipated, soon arose in the wake of Daubert—the Court ruled in Kumho (a product-liability case involving a tire blowout), that the key word in Rule

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18 Since the 19th century the usual reference of the English word “science” has narrowed, so that now it ordinarily encompasses the natural and (usually) the social sciences, but not any and all systematic fields of study. Presumably because of the successes of the natural sciences, the word now often carries a strongly honorific connotation, so that debates about whether this or that discipline or theory is genuinely “scientific” tend to be fraught with strong feelings. (As I understand it, though Wissenschaft also carries the connotation, careful, scrupulous, not first impression, the broader German term doesn’t so strongly encourage the slide from a descriptive to an honorific use.)

19 See Popper 1972, 18.


702 is “knowledge,” not “scientific”; what matters is whether proffered testimony is reliable, not whether it is science. Quite so.

However, far from backing away from Daubert’s commitment to judges’ gatekeeping responsibilities, the Joiner Court affirmed that a judge’s decision to allow or exclude scientific testimony, even though it may be outcome-determinative, is subject only to review for abuse of discretion, not to any more stringent standard; and the Kumho court, stressing that the Daubert factors are “flexible,” ruled that a judge may use any, all, or none of them. A year after Kumho, revised Federal Rules made explicit what according to Daubert had been implicit in Rule 702 all along: admissible expert testimony must be based on “sufficient” data, the product of “reliable” principles “reliably” applied to the facts of the case. Federal judges now have substantial responsibility and broad discretion in screening expert testimony, but very little guidance about how to do this.

IV

No wonder then, that, besides these efforts to domesticate scientific testimony by legal rules, there have also been some notable modifications both of the concern for finality and of adversarialism, as the legal culture has adapted to accommodate scientific evidence.

Among the ripple effects of those dramatic DNA exonerations—besides reinforcing reservations about the death penalty and prompting renewed scrutiny of the other kinds of evidence on which those exonerated by DNA (and doubtless many others) were originally convicted—have been significant modifications of the legal restrictions on new evidence, on statutes of limitations, etc.: many jurisdictions have enacted statues allowing convicted prisoners access to DNA testing; some states have increased the statute of limitations on crimes for which DNA evidence may be available; and some prosecutors have begun to issue “John Doe” warrants, identifying suspects only by their DNA, on the eve of the expiration of the statute of limitations, effectively tolling the statute should the suspect’s DNA turn up in one of the data-banks. It is salutary to remember that the brouhaha over recovered memories also prompted some modifications of statutes of limitations, to enable prosecution of (supposed) long-ago crimes. Still, when new scientific work makes it possible to establish that an innocent person has been convicted, it seems more than reasonable to make some compromise of finality in the service of truth.

And the new responsibilities for scrutinizing proffered expert testimony imposed on federal judges by Daubert, Joiner, and Kumho have given rise to significant modifications of adversarialism. Since 1975, under FRE 706 and

22 Swedlow 2002 gives a list and notes some significant restrictions.
many state equivalents, a court has had the power to “appoint witnesses of
its own selection.” Used in a number of asbestos cases between 1987 and
1990, the practice was adopted in the late 1990s in response to a wave of
lawsuits against the manufacturers of silicone breast-implants: by Judge
Jones in *Hall*; and most notably by Judge Samuel Pointer, to whom several
thousand federal silicone breast-implant cases had been consolidated. In
1998, Judge Pointer’s 4-member National Science Panel reported, as Judge
Jones’s experts had, that the evidence did not warrant claims that the
implants caused the systemic connective-tissue diseases attributed to them;
6 months later, a 13-member committee of the Institute of Medicine reached
the same conclusion. Before the panel members’ testimony had been tran-
scribed, the cases were settled. In other cases, court-appointed experts have
advised judges on the potential dangers of seat-belt buckles, the diet drug
fen-phen, and the anti-lactation drug Parlodel; and in the Court of Appeals
in Michigan, on Bendectin.

Reading the plaintiffs’ attorneys’ depositions of the members of the
Pointer panel, you may smile wryly at the mutual incomprehension
revealed, for example, when a scientist is asked to produce her time-sheets;
or wince uncomfortably at the revelation that, while serving on the panel,
one of Judge Pointer’s scientists signed a letter asking for financial support
for another project from one of the defendant companies. You might rea-
sonably worry about just four scientists’ being, in effect, responsible for the
disposition of thousands of cases; or wonder what will happen if court-
appointed scientists disagree among themselves; and ask what other judges
could learn from Judge Pointer’s experience about the pitfalls of choosing
scientists to advise them, how to instruct those scientists on record-keeping,
countlict of interest, etc.

Most to the present purpose, this new reliance on court-appointed experts,
though quite modest in scale, represents a significant modification of the
adversarial culture of the U.S. legal system, more radical than *Frye’s* oblique
dereference to the relevant scientific community, or even than *Daubert’s* (and
*Joiner’s* and *Kumho’s*) extension of judges’ gatekeeping powers. Proponents
of the practice, including Learned Hand, have recognized this from the
beginning; and so do contemporary critics, who complain that it is “elitist”
and “undemocratic,” even “totalitarian,” a move in the direction of an
“inquisitorial” system.

Even if I were qualified to do so, it obviously isn’t feasible for me to under-
take a comprehensive comparison of adversarial and inquisitorial legal
systems in the present paper; but allow me to conclude with some brief

25 I have relied in what follows on Liebesny 1981, 327–45; Langbein 1985; and van Kampen
1998. My thanks to Richard Lempert—who will, however, disagree with what I have to say—
for helpful conversation and correspondence on some of the issues raised here.

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reflections on this kind of criticism. There is no question that trial by jury is a better way of getting at the truth than trial by oath or ordeal; nor that citizens’ service on juries is an expression of the democratic ethos. But it would be strange, to say the least, to deny that countries like Germany or the Netherlands are democracies simply because court-appointed experts are the rule rather than the exception. We might better conceive of democracy as having many facets: some, like universal suffrage and a free press, most central, and others, like referenda or civil jury trials, less so.

Moreover, the sharp contrast of “adversarial” versus “inquisitorial” legal systems disguises the fact that “inquisitorial” legal cultures include “adversarial” aspects; and the slightly sinister term “inquisitorial” conveys the impression—I trust, the false impression—that German, Dutch, etc., judges may be in the habit of racking defendants, or pulling out their fingernails. It also encourages us to forget that the proportion of U.S. cases decided by juries is now quite tiny, with only 4.3% of federal criminal cases and only 1.4% of federal civil cases ending in a jury verdict, and that in practice the ability of many plaintiffs and of indigent criminal defendants to call their own experts is severely limited. (At the time of Mr. Barefoot’s conviction, in capital cases in Texas the defense was allotted just $500 for “investigation and experts.”)

All this said, and with the essential caveats in place about the dangers of imagining that arrangements that work in one cultural niche can simply and easily be adopted or adapted in another, I will venture to say, first, that I don’t believe civics education for jurors can justify avoidable, consequential factual errors; so that, second, it seems reasonable to be willing to adapt the culture of the U.S. legal system a little in this way, if this would better serve the fundamental purpose of protecting citizens from arbitrary and irrational determinations of fact; and, third, that it would make sense, as we explore the benefits and drawbacks of such an adaptation, to look to the experience of other legal systems. For, as Learned Hand observed more than a century ago, in its search for factual truth the law must rely on expert knowledge, and the only question really is “how it can do so best.”

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27 On the U.S. experience, see, e.g., Cecil and Willging 2001; Monahan and Walker 2002.
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