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# Book Review: Carl Cranor, Toxic Torts: Science, Law, and the Possibility of Justice

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**BOOK REVIEW**

# TOXIC TORTS: SCIENCE, LAW, AND THE POSSIBILITY OF JUSTICE

Carl F. Cranor
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Throughout our nation's legal history, the problem of how to ensure sound expertise in trials involving scientific issues has persisted. From the early nineteenth century, when party-affiliated scientists became fixtures in the courtroom, accusations of biased experts, overconfident testimony, and incompetent "junk" expertise were common.[1] Provincially, perhaps, we identify the 1993 *Daubert* opinion[2] as a watershed, but the discourse and concerns about reliability highlighted in *Daubert* were decades old.[3] Nevertheless, a

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1. *See generally* David S. Caudill, *Arsenic and Old Chemistry: Images of Mad Alchemists, Experts Attacking Experts, and the Crisis in Forensic Science*, 15 B.U. J. SCI. & TECH. L. 1 (2009).

2. *See* Daubert v. Merrell Dow Pharmaceuticals, Inc., 509 U.S. 579 (1993) (requiring judges to be gatekeepers to ensure reliable expert testimony in federal trials).

3. *See, e.g.,* SCIENCE, TECHNOLOGY AND JUDICIAL DECISION-MAKING: AN EXPLORATORY DISCUSSION (J.D. Nyhart ed., 1981) (edited transcript of the proceedings of the Conference on the Use of Scientific and Technical Evidence in Formal Judicial Proceedings, held Sept. 23–24, 1977). Chief Justice Howard Markey remarked at the conference, "I think that judges can become 'comfortable' with science or scientists if they know more about how they operate . . . . [T]here has been this notion that science is beyond us, in another world entirely, and that we cannot handle it. I

transformation of admissibility standards for expert evidence in federal and many state courts indeed began with *Daubert* and continued as those standards were adjusted in *Joiner*,[4] *Kumho Tire*,[5] and revisions to the Federal Rules of Evidence.[6] An extraordinary volume of commentary appeared in the wake of *Daubert*, and later after *Joiner* and *Kumho Tire*, criticizing, explaining and evaluating the new gatekeeping role of judges. Currently, in the second decade of that regime, scholars continue to assess the impact of *Daubert*. In the debates concerning how *Daubert* is working, one of the major points of contention is whether judicial gatekeeping unwittingly prevents jury trials and, thereby, disproportionately affects plaintiffs.[7]

Carl F. Cranor's *Toxic Torts: Science, Law, and the Possibility of Justice*[8] is a sustained, comprehensive argument that the *Daubert* gatekeeping regime has tilted the playing field against injured plaintiffs in toxic tort litigation. More generally, Cranor joins those who argue that the *Daubert* regime has not fared well in practice. Complex scientific evidence is not handled well in trials because scientific methods, data, and inferential reasoning are not well understood by gatekeeping judges.[9] Cranor's goal is to help solve this problem by offering a detailed description of the *patterns* of reasoning, evidence collection, and inference in nonlegal scientific settings. While numerous legal scholars are engaged in the tasks of criticizing and improving the *Daubert* regime, Cranor brings a unique perspective. Apart from the usual advantages of a book-length analysis in terms of detail, Cranor is a philosopher with a Master of Studies in Law from Yale University and a substantial scientific back-

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just do not buy that idea." *Id.* at 12. Thus, one of the main arguments of many recent publications, including the book here reviewed, that judges need to understand more about science and how it "operates," reflects a concern over thirty years old.

4. General Electric Co. v. Joiner, 522 U.S. 136, 143 (1997) (holding that abuse-of-discretion is the appropriate standard for review of admissibility decisions).

5. Kumho Tire Co. v. Carmichael, 526 U.S. 137, 148 (1999) (holding that the *Daubert* standards for reliability apply to all expert, and not simply scientific, testimony).

6. FED. R. EVID. 702–703 (revised in 2000 explicitly to follow *Daubert*).

7. *See, e.g.*, Allan Kanner & M. Ryan Carey, Daubert *and the Disappearing Jury Trial*, 69 U. PITT. L. REV. 281, 306 (2007) (the "aggressive invocation of the judge's new role as guardian of the purity of scientific evidence has had a disproportionate impact on plaintiffs."). *See also* John H. Mansfield, *An Embarrassing Episode in the History of the Law of Evidence*, 34 SETON HALL L. REV. 77, 78–84 (2003) (*Daubert* leads judges to invade the province of the jury, an error with constitutional dimensions).

8. CARL F. CRANOR, TOXIC TORTS: SCIENCE, LAW, AND THE POSSIBILITY OF JUSTICE (2006).

9. *See, e.g.,* Andrew W. Jurs, *Judicial Analysis of Complex and Cutting-Edge Science in the Daubert Era: Epidemiologic Risk Assessment as a Test Case for Reform Strategies*, 42 CONN. L. REV. (forthcoming 2009), *available at* http://works.bepress.com/cgi/viewcontent.cgi?article=1001&context=andrew_jurs (weaknesses of the *Daubert* regime include weak judicial training in scientific principles and statistical information). *See also* David E. Bernstein, *Expert Witnesses, Adversarial Bias, and the (Partial) Failure of the* Daubert *Revolution*, 93 IOWA L. REV. 451, 475–76 (2008) (judicial review of complex science is problematic and not in accord with scientific practices).

ground that includes (i) a stint as a consultant for the United States Congress Office of Technology Assessment, where he coauthored *Identifying and Regulating Carcinogens* (1987), (ii) service on science advisory panels and National Academy of Science Committees, and (iii) experience as a law firm consultant and an expert witness in toxic tort cases.

By way of summary, one can identify seven major themes in *Toxic Torts*:

> 1. Due to the complexity of legal processes and scientific evidence, the transformation in tort law engendered by *Daubert* is not visible to the public, who may not know that pretrial hearings are eliminating many personal injury suits before trial.[10]
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> 2. The perception of a crisis in tort law, the tort reform movement, the perceived danger of overdeterrence, the allegedly frequent appearance of charlatans peddling junk science in court, and the sound science movement, all converged in the 1980s and early 1990s to create a concern over standards for admissibility of experts.[11] However, many judges in the post-*Daubert* era hold views of science that are out of sync with the views of scientists themselves.[12] When two experts disagree, many judges wrongly believe one of them must be a junk scientist.[13] Judges also tend to adopt oversimplified rules or heuristics, such as requiring epidemiological studies to establish causation.[14] These trends allow tort defendants to win cases by manufacturing doubt and uncertainty.[15]
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> 3. Gatekeeping judges need to have a better understanding of science, including (i) the way scientists communicate, including "hedging"[16] for example, (ii) the well-established and widely utilized patterns of inferences to the best explanation, using all relevant information, (iii) the legitimate disagreements between scientists, (iv) the various types of evidence and the inferences they support when combined, (v) the way animal studies and chemical-structure studies are used in science, (vi) the regularity of *Joiner*-

10. CRANOR, *supra* note 8, at 1–7.

11. *Id.* at 46–47. The perceived danger of overdeterrence is that "useful technologies would be driven from the market and U.S. industry rendered less competitive in international markets, as it has been alleged that physicians have been driven from medical practice by . . . malpractice suits." *Id.* at 47.

12. *Id.* at 335 ("courts [implementing *Daubert*] can place overly restrictive, unscientific constraints on scientific inferences"). "Courts need to become more sophisticated about the scientific issues in toxic torts . . . to better ensure that verdicts comport with the science needed in a case, that there are fair admissibility reviews, and that there is the possibility of justice for injured parties." *Id.* at 337.

13. *Id.* at 147 ("scientists may well disagree about the importance or significance of each kind of evidence . . . and . . . there may be quite legitimate disagreements within a community of respectable, conscientious scientists about the toxicity of particular substances").

14. *Id.* at 224–27.

15. *Id.* at 206–07.

16. *Id.* at 192–99. Expressions of tentativeness, or hedging (for example, "it seems that," "it could be suggested that"), are endemic in science, but "[j]udges should not be misled by scientifically hedged language and permit it to be exploited for legal purposes." *Id.* at 201.

type gaps[17] in nondeductive reasoning, and (vii) the routine practices of consensus committees and peer review, which are not as restrictive as some judges imagine. Courts also need to be aware of the limitations of testing and evidence in the regulatory realm and how to recognize limitations (as agencies do) without declaring an *absence* of evidence.[18]

4. Judicial misunderstanding of science interferes with the tort system's goal of corrective justice.[19] The system is now tilted against plaintiffs, and the rules of evidence often serve as barriers to credible claims—ending toxic tort claims before trial, helping defendants win on summary judgment, and further advantaging defendants on appeal with a weak abuse-of-discretion standard.[20] Moreover, Justice Breyer's concern in *Joiner*[21] with keeping products on the market (that is, his concern that "tort law not falsely condemn nonharmful substances . . . .") exacerbates the effect of conventional scientific concerns with false positives.[22] To ensure that both sides in a trial get a fair hearing, and that cross-examination can work as it should, judges should admit all scientific testimony that "*is within the range of opinion where experts might reasonably differ on a scientific issue even though the evidence is shaky*."[23]

5. There are too many risky products on the market, not enough premarket screening procedures, too few studies, and insufficient postmarket remedies.[24] Uncertainty regarding toxicity is rampant because risks of harm are difficult to detect with precision. Problems include latency periods, rare diseases that make studies difficult, widespread diseases whose causes are hard

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17. General Electric Co. v. Joiner, 522 U.S. 136, 144–46 (expert testimony is inadmissible if there is "too great an analytical gap between the data and the opinion proffered."); *see* CRANOR, *supra* note 8, at 153 ("*every* nondeductive argument will have *some gap* between premises and conclusion. We might say that gaps are *irremovable* . . .."; *id.* at 82 (gaps are "an endemic feature of nondeductive arguments . . .."). "Nondeductive" arguments, in contrast to deductive arguments in mathematics and formal logic, are arguments "whose conclusions are *not guaranteed* by their premises," and include diagnostic induction, differential diagnosis, and inferences to the best explanation. *See id.* at 78.

18. CRANOR, *supra* note 8, at 160–66.

19. *Id.* at 31–33, 83–90.

20. *Id* at 83 ("*features of toxic substances* and recent rulings on the admissibility of evidence *increase* citizens' difficulties in obtaining access to the law and both increase the tilt in process against them.").

21. 522 U.S. at 148–49 (Breyer, J., concurring) (gatekeeper judges need to ensure that "the powerful engine of tort liability . . . points toward the right substances and does not destroy the wrong ones.").

22. CRANOR, *supra* note 8, at 89.

> Scientists are typically quite demanding in preventing factual false positives, that is, their procedures are designed to minimize study results that show that a substance has a toxic property when in fact it does not. . . . Although this is appropriate for theoretical scientific research, it risks problems in other institutional contexts, such as . . . in either the regulatory or tort law that have different mistake norms. . . . [The] epistemic norms implicit in science, do not protect as well against factual false negatives [i.e., results that show a substance has no toxic properties when indeed it does] . . . . Such errors can have substantial effects on the legal interests of litigants.

*Id.* at 214.

23. *Id.* at 289 (paraphrasing Kumho Tire Co. v. Carmichael, 526 U.S. 137, 153 (1999) (expert testimony must not go outside the "range where experts might reasonably differ, . . . even though the evidence is 'shaky.'")).

24. *Id.* at 160–70.

> to determine, lack of signature effects, and distribution errors.[25] Although "[j]udges cannot change the pace of discovery . . . , they can have a more realistic view of the availability of evidence, change what they expect of it and modify how they treat the evidence before them."[26]
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> 6. Defendants too easily exploit uncertainties in studies of toxicity and, in the process, construct an idealized image of scientific knowledge that is at odds with the scientific community.[27]
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> 7. *Kumho Tire* represents a plausible approach, (only) requiring of courtroom experts the same level of rigor that exists in their respective fields.[28] Whether this approach has penetrated the federal courts, however, is not clear, and even when it is adopted, it is troubling to see how easy it is to exaggerate the "rigor" required.[29]

Cranor supports the foregoing arguments in a manner not conveyed by my brief summation. He does so with a great deal of research, detailed explanations of scientific methodologies (epidemiology, statistics, animal studies, chemical-structure analysis, and case studies) and of their limitations, and careful examination of numerous judicial opinions and the expertise in each of those cases that was reviewed for admissibility. Indeed, the value of this book for those in law is its scientific orientation from beginning to end. Cranor provides lawyers and judges with the crucial understanding of how science works by explaining how studies are conducted, how evidence is integrated, and how inferences are made.

In the debates concerning *Daubert* and appropriate admissibility standards, some have argued that scientific standards are too low for the legal context—that is, "a legal decision should be on even firmer ground than a result in the scientific field itself."[30] Such a position results in the construction of a "legal science" at odds with existing science *and* an oscillating tendency (i) to allow the testimony of experts who exaggerate their confidence level and (ii) to exclude good experts who concede the pragmatic aspects of their practices.[31] On the other hand, some commentators argue that existing scientific

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25. *Id.* at 170–81.

26. *Id.* at 203.

27. *Id.* at 270–72.

28. *Id.* at 289–91 (discussing *Kumho Tire*, 526 U.S. at 152–53).

29. "That is, if courts insist that scientific reasoning must comport with the most *rigorous* reasoning in the fields of the typical toxicological sciences, this would be a mistake in the tort law." *Id.*at 74.

30. *Id.* at 52 (discussing language in Daubert v. Merrell Dow Pharmaceuticals Inc., 509 U.S. 579, 597 (1993)). Cranor notes that the Court "strangely" suggests that "the science admitted into legal cases should be more certain than the scientific studies that provide the foundation for future scientific developments." *Id.*

31. *See* DAVID S. CAUDILL & L. H. LARUE, NO MAGIC WAND: THE IDEALIZATION OF SCIENCE IN LAW 15–47 (2006). *See also* Soldo v. Sandoz Pharmaceutical Corp., 244 F.Supp. 2d 434, 505 (W.D. Pa. 2003) (stating:

> [While] it is sometimes necessary in a clinical, regulatory, or business practice to make decisions based on less than sufficient and/or reliable scientific evidence due to practical demands requiring immediate decision-making, such guesses, although perhaps reasonable hypotheses based on the best available evidence, do not constitute a scientifically reliable approach when used to assess causality via the scientific method.).

standards are too high for law and that experts should be allowed to testify in favor of causation, even if science has not established causation.[32] This position likewise constructs a "legal science" at odds with the scientific enterprise. Cranor comes close to making this second error in *Toxic Torts* when he emphasizes the barriers facing plaintiffs and seems to call for lower admissibility standards.[33] Cranor, however, never says that legal standards should be lower. Instead, he demonstrates that actual scientific practices are not as ideal as some judges who misunderstand scientific reasoning think they are.[34]

Cranor also comes close to judicial reductionism, identifying the judiciary as the site of all problems and solutions—if judges were more scientifically literate, all would be well. My own view is that all players in the system contribute to its success or failure. Trial judges need to understand science, but juries need to be able to evaluate expertise, lawyers need to be ethical, experts need to resist advocacy, and appellate courts need to reflect upon and correct rash decisions.[35] *Toxic Torts*, therefore, seems to suffer from a narrowness of focus, but I must concede that one book cannot cover every issue. And Cranor's coverage of the shortcomings of trial and appellate judges, with respect to understanding science, is admirably comprehensive. Moreover, Cranor is not unaware of the important role of attorneys—he is highly critical of defense attorneys who construct an idealized image of science for the trial judge.[36] Cranor might have emphasized as well the importance of understanding science for plaintiffs' counsel, who need to learn to construct a more realistic view of science for trial judges. In fairness, Cranor hints at this recommendation every time he qualifies his criticism of a defense verdict or summary judgment in a particular toxic tort case by speculating that the plaintiff's attorney may not have done a very good job.[37] Cranor also identifies an important role for juries. He cites to jury studies establishing that juries can handle complex scientific issues—he, therefore, rejects the notion that admissibility standards must be tightened to prevent jurors from being so easily fooled by scientifically sounding junk.[38]

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32. *See*, *e.g.,* Neil B. Cohen, *The Gatekeeping Role in Civil Litigation and the Abdication of Legal Values in Favor of Scientific Values*, 33 SETON HALL L. REV. 943, 949, 962 (2003).

33. CRANOR, s*upra* note 8, at 157–204.

34. *Id.* at 205–82.

35. *See* CAUDILL & LARUE, *supra* note 31, at 64–75.

36. CRANOR*, supra*, note 8, at 270–72.

37. *Id.* at 20 ("perhaps plaintiffs' attorneys and their experts could have explained the issues better"); *id.* at 325 ("the court appeared not to understand, or plaintiffs failed to explain well, the significance of the . . . studies.").

38. *Id.* at 71.

Cranor is at his best explaining the virtues and limitations of epidemiological studies, the seeming gold standard for toxicological evidence.[39] In explicating those limitations, Cranor acknowledges, but does not adequately develop, the "*social side* to the search for causation."[40] The *social side* includes shared goals for health and medical treatments and the social nature of consensus committees and their collective scientific judgments.[41] While some judges might hold an idealized view of the scientific enterprise as somehow avoiding subjectivity, Cranor explains that there is ample room for scientific judgments, differing interpretations of data, conflicting explanations of phenomena, and inconsistent conclusions.[42] Unfortunately, Cranor only emphasizes the "total scientific and personal experience" of the individual scientist—the "background knowledge"[43] and "understanding of the issues"[44]—that influence a scientific judgment. A richer conception of the *social*, acknowledging that each individual scientist's experience, background, and understanding are tied to a community with shared norms, institutional affiliations, and rhetorical conventions, would have been beneficial to the reader.[45] Cranor's effort to construct a less idealized and more realistic image of science and to reveal the uncertainties and disagreements in the field of toxicology would have benefitted from a less individualized account of scientific judgment.

Nevertheless, *Toxic Torts* deserves the attention of judges, lawyers, and legal scholars. Cranor's evaluation that *Daubert* is not working and that its regime is failing in terms of justice is compelling and timely. In chapter 7, Cranor argues that *Kumho Tire's* aphorisms—(i) that expertise (only) needs to reflect the rigor of the field and (ii) that expert testimony (only) needs to stay within a range where reasonable experts might disagree—could level the playing field for injured plaintiffs if followed. This argument is especially effective because *Kumho Tire* is current law. When the reader reaches the final chapter, Chapter 8, the myriad solutions offered seem less realistic. Major regulatory reform, including premarket screening, as well as more social concern and outrage, might be too much for which to ask.[46] Even more unrealistic,

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39. *Id.* at 96–105.

40. Cranor actually states that "for some scientific research there is a *social side* to the search for causation; this is especially true in medicine." *Id.* at 135. Cranor, thereby, misses the opportunity to explore generally the social aspects of the scientific enterprise. *See* CAUDILL & LARUE, *supra* note 31, at 85–119 (arguing that all of science reflects social, rhetorical, and institutional aspects).

41. CRANOR, *supra* note 8, at 135; *see also id.* at 259 (discussing scientific consensus committees).

42. *Id.* at 144–52.

43. *Id.* at 152.

44. *Id.* at 143.

45. Cranor, however, does acknowledge "hedging" as an "endemic rhetorical practice of scientists," *see id.* at 192, which suggests how community norms become part of the *social*.

46. "One possibility would be to have a major overhaul of our legal structure on the regulatory side to obtain better scientific information about products and better prevent injuries from toxicants. At present [that is, under the Bush administration], there appears to be little political will for this alternative." *Id.* at 338. Of course, environmental activism may well thrive under the Obama administration, and public fear concerning the risks of low-dose toxicity is more evident as biomonitoring technologies help create new narratives concerning toxic *body burdens*.

I think, are the prospects for new torts and tort standards or any shift in burdens of proof.[47] Finally, there is the suggestion that a return to *Frye* would help solve the problems Cranor identifies.[48] But I find that suggestion less than compelling because *Frye* judges often were not deferential and because reliability standards like *Daubert's* were already, and continue to be, used in *Frye* jurisdictions. In short, the most powerful arguments in *Toxic Torts* appear in the first seven chapters and not in the panoply of possible, but unlikely, solutions offered in Cranor's final chapter.

Even though there is a substantial canon of books and (thousands of) scholarly articles on *Daubert* and its aftermath, *Toxic Torts* is an insightful and important addition to the literature. Saying that trial judges need to understand more about science is far easier than specifying the means to achieve this. By focusing on the patterns of methodological conventions, collection of evidence, and inferential reasoning in numerous contexts of toxicological research, Cranor succeeds in his critical reappraisal of the *Daubert* regime for the field of toxic tort litigation. Most importantly, Cranor offers a more pragmatic, less idealistic, view of the scientific enterprise to counter the practices of those judges who reward experts claiming certainty and discredit experts who concede the uncertainties of science.

47. *Id.* at 363–66.
48. *Id.* at 359–63.